

EDUCATIONAL AND EMPLOYMENT OUTCOMES FOR STUDENTS
WHO COMPLETE A HIGH SCHOOL CAREER AND
TECHNICAL CONCENTRATION

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ABSTRACT

Participating in career technical education has been associated with increased completion of secondary and postsecondary educational programs, among other positive effects for students. Selected academic and vocational outcomes were examined relating to the curricular concentration students engaged in during high school and various demographic characteristics. There was no significant effect for curricular concentration on job satisfaction, as reported by survey respondents eight years after completing high school. Neither was there any significant effect for gender, ethnic identity, or socioeconomic status on job satisfaction, or for the prediction of future educational attainment. Nonconcentrators in career technical education scored significantly higher than career technical education concentrators on their judgment of how much they liked high school. Implications for educator practice, training, and funding were discussed.

DEDICATION

This dissertation is dedicated to my wonderful parents, Wayne and Brenda Hayes, whose support for me in all aspects of my life has been unwavering. Their loving encouragement has been especially appreciated during the time I spent involved in my doctoral studies as this timeframe has also included a number of personal setbacks. Without them, I can't imagine that I would have completed this journey.

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LIST OF ABBREVIATIONS

ACTE—Association for Career and Technical Educators

CTE—Career/Technical Education

EDAT—Education Data Analysis Tool

ELS 2002—Educational Longitudinal Study of 2002

PSO—Postsecondary opportunity

SCANS—Secretary’s Commission on Achieving Necessary Skills

UTC—The University of Tennessee at Chattanooga

CHAPTER I

INTRODUCTION

Career and Technical Education (CTE), otherwise known as occupational or vocational education has, in recent years, enjoyed a renaissance in the United States in transitioning from a much maligned training focus to one of meeting the needs of students, postsecondary institutions, and potential employers (Hull, 2005). Deluca, Plank, and Estacion (2006) asserted that recent shifts in thinking have increased the relevance of CTE coursework and provided a greater degree of focus on skills that were needed regardless of whether the student planned to enter the workforce or attend a postsecondary education program. College and Career-Ready (CCR) is the terminology that is currently being used to describe the ultimate desired outcome of a contemporary high school education (U.S. Department of Education, 2010). Achieve, Inc. (2015) stated that, “college and career readiness is the unifying agenda across the P-20 education pipeline” (para. 3).

In May of 2010, the U.S. Department of Education released a blueprint for revising the Elementary and Secondary Education Act (ESEA), supporting the stated goals of President Barack Obama (U.S. Department of Education, Office of Planning, Evaluation and Policy, 2010). In the proposed revision, key priorities for education were set forth addressing college and career readiness, support and improvement in teacher and leader quality, equal opportunities for all learners, increased expectation and reward for excellence, and promotion of continuous improvement (U.S. Department of Education, Office of Planning, Evaluation and Policy, 2010).

Under ESEA, states were required to develop or adopt a set of rigorous college and career-ready standards for English Language Arts (ELA) and Mathematics, and assess students' progress toward meeting them. The Act does not mandate, but leaves states open to developing college and career readiness standards and assessments for other subject areas, including career and technical courses (U.S. Department of Education, Office of Planning, Evaluation and Policy, 2010).

The ESEA was reauthorized and signed into law by President Barack Obama on December 10, 2015 (U.S. Department of Education, n.d.-a). The reauthorization is termed the Every Student Succeeds Act (ESSA) and will guide education spending and policy through fiscal year 2019 (ESSA, 2015). The ESSA supports expanded career counseling and work-based learning opportunities and allows more funding to be used for activities such as instruction and training for teachers. There is an increased emphasis for joint training between CTE teachers and those of other subjects, as well as collaboration with the higher education community and employers (ESSA, 2015). The term vocational has been replaced by career, and there is strong support for career competencies and skills to be integrated into the well-rounded education of students (ESSA, 2015).

While there is no agreed upon definition for the expression *college and career ready*, most U.S. states have adopted definitions that indicate students should possess academic knowledge and a set of skills that will allow them to successfully transition into their chosen postsecondary opportunity (PSO), whether that is a career or furthering their education (Mishkind, 2014). Thus, the connection between CCR and CTE seems clear. The United States government has allocated millions of dollars annually to study and implement CTE programs

through Perkins funding (U.S. Department of Education, 2013), indicating there is substantial interest in supporting this type of educational program.

Students in secondary schools often have options as to the types of coursework in which they wish to enroll; those who choose to take three or more courses in a CTE pathway area are sometimes known as CTE concentrators (Perkins Collaborative Resource Network, n.d.). According to the National Association of State Directors of Career Technical Education Consortium (NASDCTE), 90% of CTE concentrators completed high school compared to the national average of 75%, and a higher number stayed in postsecondary programs as compared to other students (NASDCTE, 2011). The statistics suggest that these students possessed attributes, whether innate or learned, that allowed them to out-perform non concentrators in terms of completing secondary and postsecondary school programs. This study seeks to determine whether these apparent benefits persist over time with regard to career or postsecondary academic program outcomes, and whether certain subgroups of students benefit more from CTE coursework in terms of postsecondary outcomes than other groups.

Historical Perspective

In 1990, then-President George H. W. Bush was in the midst of developing a new policy on education that would become known as America 2000. America 2000 eventually put forth goals including increasing the high school graduation rate and producing literate citizens with the skills needed to be competitive in the global economy (Bush, 1991). In relation to his plan, the U.S. Department of Labor created The Secretary's Commission on Achieving Necessary Skills (SCANS), which was composed of leaders from both the business and education worlds. This group was charged with determining the skills and qualities people should possess to be

successful in the workplace and also acceptable levels of competency with regard to those skills. After a year-long study, the primary outcomes of their work were the development of three sets of “foundation” skills and five sets of “competencies” along with recommendations for ways to define and assess proficiency for each (U.S. Department of Labor. Secretary’s Commission on Achieving Necessary Skills, 1991). Proficiency with regard to these skills was considered equally important whether a student intended to go straight into their vocation or further their education and, therefore, was considered crucial work for secondary schools. The SCANS foundation skills and competencies are listed below in Table 1, and an expanded version with added detail can be found in Appendix A.

Table 1 SCANS Foundation Skills and Competencies

Three Part Foundation	
Basic Skills	Reads, writes, performs arithmetic and mathematical operations, listens and speaks
Thinking Skills	Thinks creatively, makes decisions, solves problems, visualizes, knows how to learn, and reasons
Personal Qualities	Displays responsibility, self-esteem, sociability, self-management, and integrity and honesty
Five Competencies	
Resources	Identifies, organizes, plans, and allocates resources
Interpersonal	Works with others
Information	Acquires and uses information
Systems	Understands complex inter-relationships
Technology	Works with a variety of technologies

(U.S. Department of Labor. Secretary’s Commission on Achieving Necessary Skills, 1991)

A survey of 428 employers conducted in 1998 by Rider University’s Center for the Development of Leadership Skills (Hull, 2005) sought to determine what traits employers most value in their employees. The employers represented a wide range of career fields, and the results showed skills in the areas of computer literacy, critical thinking, problem solving,

teamwork, and interpersonal relations as the characteristics employers deemed most important. These skills are closely aligned with those noted in the original SCANS report (see Appendix A). More recent studies showed that these and related skills continue to be pivotal. For example, a study by Robles (2012) indicated the following as the Top 10 soft skills desired by business executives: “integrity, communication, courtesy, responsibility, social skills, positive attitude, professionalism, flexibility, teamwork, and work ethic” (p. 453). These skills are needed in addition to the hard skills or technical expertise required to do a job. Since the original SCANS study, the skills desired by business people in their employees and deemed necessary to be successful in the workplace appear to have remained largely stable.

Research regarding what constitutes college readiness has closely mirrored the work ready research. For example, Conley’s (2008) work asserted that students who were the most prepared for higher education, and therefore had more positive outcomes, shared strengths in the following four areas: Key cognitive strategies, academic knowledge and skills, academic behaviors, and contextual skills and awareness. Specifically, the category of cognitive strategies included problem formation and solving, research, argumentation and reasoning, interpretation, and precision and accuracy. Academic knowledge included a broad range of subject matter such as traditional academic courses like English (especially writing), math, and science. These subjects were important not only for the content knowledge gained, but also for types of thinking advanced by each subject. Academic behaviors included such elements as self-awareness and monitoring (study skills, time management), and evaluation of one’s own thinking. Contextual skills included knowledge on how to access and navigate higher education (Conley, 2008). As may be seen, there was considerable overlap among the findings of the aforementioned studies

with regard to skills that were deemed important for work readiness and readiness for postsecondary education programs.

Armed with information about skills desired by employers and needed for further educational endeavors, leaders in education reform sought to determine how to integrate these skills with core academic knowledge to make CTE more fundamental in secondary education (Lankard, 1995). The SCANS report encouraged the teaching of these skills contextually, in an environment similar to that in which they would be used, rather than having students learn them in an abstract fashion and then be expected to apply them (U.S. Department of Labor. Secretary's Commission on Achieving Necessary Skills, 1991). The premise of such contextual teaching of academic and personal skills remains central to CTE today (Association for Career and Technical Education, 2016).

In a large-scale government-funded study, Lokes et al. (2007) considered CTE concentrators and their transition to college and career. The researchers found that upon graduating from high school, "CTE students felt more prepared for college and career than their matched non-CTE counterparts" (p. 64). Further, they were more likely than their non-CTE peers to have career goals and plans for how to attain them, and reported that they possessed skills in research, communication, time management, problem solving, and other skills noted as crucial college and career skills by the SCANS report and other studies (Lokes et al., 2007). While there is considerable variation in proposed characterizations of college and career readiness (Mishkind, 2014), it seems logical that skills that are considered highly important for both vocational and postsecondary education options would be included. The work represented in this study is founded on this assumption.

Statement of the Problem

There is substantial evidence that suggests students who complete a CTE concentration graduate from high school in larger proportions than their peers who do not complete a CTE concentration, and tend to persevere in their postsecondary programs in greater proportions (NASDCTE, 2011). What is not known is whether any benefits persist beyond the initial entry into college or career and, also, whether certain demographic groups of students benefit more from pursuing a CTE concentration than others with regard to postsecondary outcomes. Further, it is not known if students who choose to enter a career rather than attend a postsecondary educational program benefit from completing a CTE pathway. Thus, the essential problems to be investigated in this study are: “Which groups of students benefit most from participating in CTE in high school?” and “In what ways do they benefit in subsequent educational endeavors and in their careers including reaching their predicted level of educational attainment and job satisfaction?”

A confounding issue in this study was the self-selection of students who took CTE coursework. Students who choose to get a concentration in a CTE pathway may possess attributes that nonconcentrators do not, and some of these attributes could be the real reason these students are more successful. In this study, this problem was dealt with in part by comparing students who obtained an academic diploma and a CTE concentration with those who obtained only one of the two.

Purpose of the Study

This study sought to ascertain whether CTE concentrators performed better on a number of indicators than their non-CTE concentrator peers. Due to inconsistent language used from

state to state regarding curricular concentrations, the following clarification is offered. The Education Longitudinal Study (ELS2002) study, from which the data for this study came, uses four categories to describe curricular concentrations a student could complete: academic, occupational, academic and occupational, and other. For purposes of this study, the term *CTE concentrator* refers to those students who completed an occupational curricular concentration combined with those who completed occupational plus academic concentrations. Nonconcentrators are those who completed an academic concentration or other concentration. The ‘other’ group consists of all students who took general high school coursework that did not fit into any of the above groups (Planty, 2006). Figure 1 shows the structure of these groups.

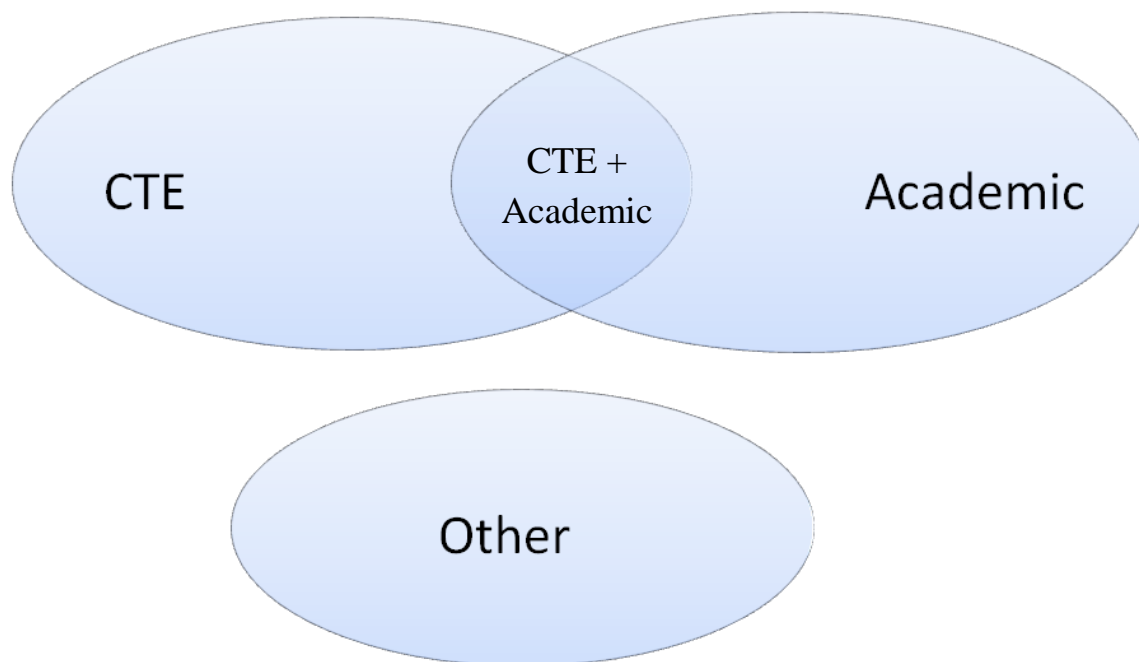


Figure 1 A Venn diagram clarifying curriculum concentration groups considered in this study

The longitudinal nature of the extant data that were used in this study allowed for students to be followed for eight years beyond high school graduation. The study also

considered whether certain ethnic and demographic groups benefitted more from completing a CTE concentration versus other groups. For those cases where favorable outcomes did exist, this may suggest a model for secondary schools to use in developing their courses of study and encouraging student participation in CTE courses. Specific funding decisions for CTE at the local or national level could be supported or unfounded by the findings.

Research Questions/Hypotheses

The following research questions guided this study:

- Research Question 1: Is there a difference in job satisfaction between students with an academic concentration only and students with both academic and CTE concentrations?
 - (H₀) There will be no statistically significant difference in job satisfaction between those students who completed both academic and CTE concentrations in high school and those students who completed only an academic concentration.
 - (H₁) There will be a statistically significant difference in job satisfaction between those students who completed both academic and CTE concentrations in high school and those students who completed only an academic concentration.
- Research Question 2: Is there a difference in job satisfaction between students with different curricular concentrations (academic only, academic and occupational (CTE), occupational only, and other)?
 - (H₀) There will be no statistically significant differences in job satisfaction between students who completed different curricular concentrations in high school.

- (H₁) There will be statistically significant differences in job satisfaction between students who completed different curricular concentrations in high school.
- Research Question 3: Is there a difference in job satisfaction between genders and each testable ethnic group between students with a CTE concentration and those without a CTE concentration?
 - (H₀) There will be no statistically significant difference in job satisfaction between CTE concentrators versus non concentrators for each racial and gender group.
 - (H₁) There will be a statistically significant difference in job satisfaction between CTE concentrators versus non concentrators for each racial and gender group.
- Research Question 4: Is there a difference in job satisfaction between socioeconomic groups between those with a CTE concentration and those without a CTE concentration?
 - (H₀) There will be no statistically significant difference in job satisfaction between CTE concentrators versus non concentrators for each socioeconomic group.
 - (H₁) There will be a statistically significant difference in job satisfaction between CTE concentrators versus non concentrators for each socioeconomic group.
- Research Question 5: Is there a difference in perception of school as interesting, challenging, and enjoyable between students with a CTE concentration and those without a CTE concentration?
 - (H₀) There will be no statistically significant difference in perceptions of interest, degree of challenge, and enjoyment of secondary coursework between CTE concentrators and non concentrators.

- (H₁) There will be a statistically significant difference in perceptions of interest, degree of challenge, and enjoyment of secondary coursework between CTE concentrators and non concentrators.
- Research Question 6: Is there a difference in the accuracy of predictions of future educational attainment between students with a CTE concentration and students without a CTE concentration?
 - (H₀) There will be no statistically significant difference in accuracy of predicting future educational attainment between CTE concentrators and non concentrators.
 - (H₁) There will be a statistically significant difference in accuracy of predicting future educational attainment between CTE concentrators and non concentrators.

Rationale for the Study

Dropping out of high school carries with it consequences for individual students as well as for society. High school dropouts earned an estimated \$973,000 over a lifetime, while high school graduates earned \$1,304,000 in their lifetime (Carnevale, Rose, & Cheah, 2011). That translates to \$331,000 less over a lifetime of work, or \$8,275 less per year. The difference is even greater for someone with a bachelor's degree versus someone who attended some college but did not complete a degree. The difference between those who earned a bachelor's degree versus some college but no degree is \$721,000 over their lifetime, or about \$18,000 per year (Carnevale et al., 2011). In 2012, the United States ranked 15th in the world in completion of tertiary education, falling from number two in 1981 (Greenstone, Harris, Li, Looney, & Patashnik, 2012). Evidence shows that students who complete a CTE program have a higher rate of educational program completion than nonconcentrators (U.S. Department of Education, 2011).

According to a report by the U.S. Department of Education (2011), there was a strong correlation between completing a CTE concentration and completing future educational programs, and one goal of this study was to help clarify that relationship.

Additionally, students from low socioeconomic backgrounds and certain ethnic backgrounds have historically not taken advantage of postsecondary educational opportunities in as large a number as their counterparts. For example, according to the U.S. Bureau of Labor Statistics (BLS), 48% of Whites in the labor force in 2013 had an associate or bachelor's degree, while 38% of Blacks and 26% of Hispanics had attained a degree (U.S. Bureau of Labor Statistics, 2014a). According to the BLS (2014a), 29% of Hispanics in the job market in 2013 had not completed high school. Unemployment data from April, 2015, indicated a 4.7% unemployment rate for high school graduates versus 8.6% for those who did not complete high school (U.S. Bureau of Labor Statistics, 2015). Discovering whether CTE concentrators in these demographic categories benefit and close this gap could be beneficial for education policy makers.

Theoretical/Conceptual Framework

In 1973, 72% of jobs required a high school diploma or less; by the year 2020, that number is expected to drop to 24% (Carnevale, Jayasundera, & Hanson, 2012). In simple terms, 76% of jobs in the U.S. are expected to require some level of postsecondary education. This is a primary impetus behind the college and career-ready movement currently driving education reform. CTE's focus is on helping students become college and career-ready by providing career exploration, alignment of high school coursework with that of postsecondary programs, and

ensuring they are taught a relevant, applied curriculum that encourages students to remain in school (Bridgeland, DiIulio, & Morison, 2006; Carnevale et al., 2012).

Dropping out of high school has been described as a long-term process involving a student's disengagement from their education program (Plank, DeLuca, & Estacion, 2008). Student engagement in the learning process is driven by a number of factors both in the student's environment as well as internal factors. One environmental factor that helps students form a point of attachment to school and to learning is CTE (Plank et al., 2008). Sawyer (2006) asserted that motivation was prerequisite for academic engagement to occur, and that there were multiple ways for teachers to foster motivation in students. Fredricks, Blumenfeld, and Paris (2004) described engagement as being multifaceted, with behavioral, emotional, and cognitive components. Several models for student motivation have been developed based on a variety of theoretical frameworks including the ARCS model of motivation design (Keller, 1987). The ARCS model focuses on:

- getting the students' attention (A)
- helping the student see relevance (R)
- supporting learning through building student confidence (C)
- and generating satisfaction (S)

ARCS employs a motivational design process that involves understanding the components of human motivation, analyzing the characteristics of the audience, identifying characteristics of instructional materials, selecting appropriate tactics, and applying and evaluating the tactics (Keller, 2013). Another approach was the SCORE model for student engagement (Strong, 1995). Using this approach, success, curiosity, originality, and relations are highlighted in the instructional design process. If students fulfill their needs for mastery, understanding, self-

expression, and involvement with others through instruction designed in accordance with this model, they will ostensibly have the motivation and energy to deal with the task at hand. As students mature and enter the workforce or higher education, their requirements for engagement change somewhat. Knowles (1998), for example, argued that adult learners were driven in a more self-directed manner based on experience and relevance. The use of skills to solve problems and the ability to see the relevance of learning activities to their work or educational environment became prime motivators.

In social learning theory (Bandura, 1977; Moll, 2014; Vygotsky, 1978), Lev Vygotsky asserted that students were active participants in their learning and that when working with someone who was more knowledgeable, be it a peer or a teacher, learners were able to solve problems beyond what they could accomplish alone. In Vygotsky's view, students played an active and socially driven role in their own learning and used the shared experiences to construct meaning about their learning. In such instances, the context and social connections became integral to the learning process. Bandura (1977) stated that neither behaviorism nor cognitive theory alone could fully account for learning and that processes such as attention and motivation linked these together. CTE coursework seems to employ this type of thinking and learning process as a matter of design, and such thinking now permeates most of contemporary education best practices in classwork (Hull, 2005).

Significance of the Study

According to the report *The Silent Epidemic: Perspectives of High School Dropouts* (Bridgeland et al., 2006), there are myriad reasons high school dropouts give for not finishing high school. The authors conducted extensive focus groups and administered a survey to a large

group of high school dropouts and found that 47% of the subjects, including those with high GPAs who reported high levels of motivation, reported boredom and disengagement from their coursework as primary reasons for dropping out. Eighty-one percent of the subjects believed that more relevance in their schoolwork, that is, a connection between school and the world of work, would have helped them stay in school and graduate. In a study on the balance of coursework, Plank (2002) found that there is an ideal ratio of 60% academic to 40% CTE coursework that minimizes dropouts.

Understanding which educational programs aid students in obtaining important knowledge and skills needed to transition into postsecondary education or career options is crucial for making funding and policy decisions. This study helped clarify the role of secondary CTE coursework in today's competitive job world.

Definition of Terms

- Academic concentrator—category used by the ELS2002 researchers to denote the curricular concentration of students who earn four credits of English, three mathematics credits, at least one of which is beyond Algebra II, three credits in science with at least one being higher than biology, three credits in social studies with at least one being in U.S. or world history, and two credits in the same foreign language (Planty, 2006)
- ACTE—Association for Career and Technical Educators
- CTE—Career/Technical Education—“organized educational activities that offer a sequence of courses that provides individuals with the academic and technical knowledge and skills the individuals need to prepare for further education and for careers in current or emerging employment sectors. Career and technical education includes competency-

based applied learning that contributes to student’s academic knowledge, higher-order reasoning, and problem-solving skills, work attitudes, general employability skills, technical skills, and occupation-specific skills” (U.S. Department of Education Office of Vocational and Adult Education, 2013)

- CTE Concentrator—For this study, the term CTE concentrator will refer to high school students who take a minimum of three courses in the same career cluster. The ELS2002, the study from which the data for this study will be obtained, uses the terminology occupational concentration to specify students who attained a CTE concentration during high school. (Planty, 2006)
- EDAT—Education Data Analysis Tool. This is the data repository for the ELS2002 study which is used as the data source for this study.(National Center for Education Statistics, n.d.-b)
- ELS2002—Educational Longitudinal Study of 2002 (National Center for Education Statistics, 2007)
- Occupational concentrator— category used by the ELS2002 researchers to denote the curricular concentration of students who earn three credits in one career cluster (Planty, 2006). For purposes of this study, the same as a CTE concentrator.
- Other (in relation to curricular concentration)—category used by the ELS2002 researchers to denote the curricular concentration of students who completed a general curriculum that did not meet the criteria for an academic or CTE concentration (Planty, 2006)
- Perkins Funds—Monies allocated by Congress and given to the states to fund CTE (U.S. Department of Education, 2002)

- PSO—Postsecondary opportunity—Includes postsecondary educational programs or career.
- SCANS—Secretary’s Commission on Achieving Necessary Skills (U.S. Department of Labor. Secretary’s Commission on Achieving Necessary Skills, 1991)
- UTC—The University of Tennessee at Chattanooga

Methodological Assumptions

There was an assumption that the information in the extant database used in this study was collected and handled in an appropriate manner as to maintain the integrity of the longitudinal nature of the data. It was further assumed that the student participants were chosen using appropriate methods for maintaining randomness, and that their self-reported information is truthful. Since there were extensive efforts to maintain confidentiality for the survey respondents (National Center for Education Statistics, 2007), I assumed truthfulness of student responses for this study.

Delimitations

Due to the difficulties in accessing subjects for a longitudinal study, the database created by the National Center for Educational Statistics (NCES) for a study known as the Education Longitudinal Study of 2002 (ELS2002) was used. The current study was delimited to the individuals who were selected for and who participated in that study.

There is a large amount of information available from the surveys completed during the study; however, only those data related to the research questions listed above were considered, and all conclusions from this research were dependent upon the delimitations of this database.

Access to data from the ELS2002 is available through the NCES and was accessed via their data bank called the Education Data Analysis Tool (EDAT), for which one must register to gain access. While much of the data gathered from the surveys is restricted to those holding university or research institute credentials, the data used in this study were open access data that were freely available to all. No further information was accessed and no further permission was required by NCES. UTC-IRB approval was attained before accessing the data for this study.

Limitations

While some of the information from the ELS-2002 survey data was taken from transcripts where it was likely to be highly reliable, much of it was self-reported. This type of data may be somewhat less reliable due to the tendency of some individuals to present themselves in a favorable light in accordance with a social desirability bias (Paulhus, 2002). First described by Edwards (1953), a social desirability bias is a conscious or unconscious desire to make oneself appear to have traits that are desirable. Self-enhancement biases have been noted in many contexts including optimism about the future, feelings of control of one's own life, and aspects of personality (Krueger, 1998). A recent study investigated the social desirability bias of college students when they responded to a survey of student behavior (the National Survey of Student Engagement), that contained questions about academic, learning, challenge, support, and other elements of student life (Miller, 2011). This survey appears to have appreciable similarities to the ELS2002 surveys used in the proposed research. Miller (2011) found that there was no indication that social desirability was a significant factor in the students' survey responses, though there were minimal effect sizes for some subscales indicating that social desirability cannot be discounted as a possible source of error.

Since there were four survey information collection points for the ELS2002 spread years apart (2002, 2004, 2006, and 2012), and the participants completed high school and dispersed making them more difficult to locate, not all participants completed all the surveys. Only those who completed all relevant survey points will be included in this study. For each research question, analysis excluded those individuals who failed to complete one or more survey items related to that question. Also, there was some element of self-selection as some participants may have chosen not to complete all surveys and so caution must be taken when generalizing outside that sample.

Although the Perkins legislation required certain standards be met in CTE, there was some variation as to which states adopted various models of career readiness skills and which career pathways were offered (Haxton, 2015). This differential could not be controlled for in this study because there was no way to determine which subjects attended high school in which specific states. The data only specify in which geographic region of the country each subject attended high school.

A confounding issue in this study was the self-selection of students who take CTE coursework. Students who choose to get a concentration in a CTE pathway may possess attributes that nonconcentrators do not, and some of these attributes could be an unknown variable that affects student success.

CHAPTER II

REVIEW OF LITERATURE

Introduction

U.S. federal recognition and funding of CTE has its roots in higher education. In the 1800s, the federal government began funding programs to address the educational and training needs of the working class citizens of the country and later moved into the funding of programs at the secondary level (Library of Congress, 2010; Smith-Hughes Act, 1917). The focus of CTE today is on preparing students for college (or other training) and career by combining academic and vocational skills. Currently, the Carl D. Perkins Career and Technical Education Improvement Act of 2006, or Perkins IV legislation, provides specifications for programs ranging from middle schools, high schools, technical and community colleges as well as other postsecondary institutions (U.S. Department of Education, n.d.-c). These programs are charged with providing academic and technical knowledge needed for further education or a career field, while also addressing important skills that will be needed in a chosen career or educational field (U.S. Department of Education Office of Vocational and Adult Education, 2013).

History of Career Technical Education

In the mid-1800s, a professor at Illinois College, Jonathan Baldwin Turner, was active in the creation of a sociopolitical movement aimed at increasing access to higher education for the working class (Carriel, 1961). Carriel (1961) related that Turner was known to be passionate

about education, politics, and religion, and reportedly mixed them often. During his time as a professor, he became a strong advocate for his ideas that everyone should have access to higher education, and that this education should be practical (Carriel, 1961). His ideas caused turmoil at the College and he left in 1848 to return to a career in agriculture and pursue his political interests more fully (Carriel, 1961). Turner was a prolific speaker and sought to increase peoples' awareness of education and to advocate for increasing the availability and relevance of higher education to those who were often excluded, namely the working class (Carriel, 1961). He spoke of the need for what he called industrial education (Carriel, 1961), which included such subjects as agriculture, mechanics, and military science (Carriel, 1961).

Justin Morrill was a Vermont Congressman and contemporary of Turner who also advocated for industrial education for the masses. Morrill sponsored legislation that would grant land to states to develop colleges that would address the higher education needs of the working class. The Morrill legislation was introduced in 1857, signed into law by Abraham Lincoln in 1862, and is sometimes known as the Morrill Land Grant College Act. This was the first federal funding of higher education in the United States. Each state was given 30,000 acres of federal land per Congressional delegate which was sold to fund colleges that focused on agriculture and the mechanical arts as well as military tactics (Library of Congress, 2010). In 1890, Morrill sponsored further land grant legislation for colleges that specifically addressed access to higher education for people of color. Together, the Land Grant College Acts were instrumental in the establishment of over 100 college and universities.

At the secondary level, vocational education (as CTE was once called) was first funded by the Federal Government in 1917 under the Smith-Hughes Act (Smith-Hughes Act, 1917; U.S. Department of Education, 2013). This act appropriated money to states based on their rural

population relative to the total rural population in the United States, and was to be awarded on an annual basis perpetually (Smith-Hughes Act, 1917). This money was specifically earmarked for teacher salaries and associated administrative costs of vocational education programs including those related to agriculture, trade, industrial subjects, and home economics (Smith-Hughes Act, 1917). Restrictions in the funding provided by the Smith-Hughes Act served to separate Vocational Education from traditional academic programs (Stasz et al., 2004). Students in vocational programs learned vocational skills almost entirely to the exclusion of academic or theoretical content and this hampered their ability to adapt as technology changed on their jobs or when their jobs became obsolete and they had to learn new skills. There was soon a rift between academia and vocational education that has remained throughout most of the 20th century (Schimpf, 2011). With no common standards, curriculum, or accountability measures, CTE was fragmented and inconsistent (Hayward & Benson, 1993). The federal government had funded CTE, but with very little oversight, leading to isolation from other, traditional education programs and the lack of a comprehensive approach to CTE (Hayward & Benson, 1993).

Vocational education/CTE became widely accepted after World War I when a glut of workers returning from the war required training to re-enter the workforce. When World War II began, the military had become more complex with additional technology and was in need of skilled soldiers to fill new niches (Barlow, 1976). The 1944 GI Bill provided funding to send returning soldiers to college in an attempt to ensure they had marketable skills following their service to the country. Thus following WWI, the emphasis of education for returning soldiers was on efficient and utilitarian job training to fill available positions, while after WWII the emphasis was on training returning soldiers for increasingly complex and technologically advanced vocations.

Sputnik was launched in October of 1957, setting in motion a series of critical events in education, the first being the enactment of the National Defense Education Act. Section 101 of The National Defense Education Act (1958), also known as PL 85-864, stated that, “the security of the Nation requires the fullest development of the mental resources and technical skills of its young men and women” (para. 1). This Act, among other things, included provisions for increasing the quality of the science and math education, vocational and training programs in which students participated, and also ensuring that college became more economically accessible to bright but underprivileged students. Based on the language in the law, the impetus for passing this law derived from a sense of concern that the United States was falling behind other world powers in technological domains and that the national support of education was necessary to build the skills and knowledge potentially needed to defend the United States. Again, CTE was seen as a practical way to address a national education problem, the need for more skilled workers in technical fields.

A recession in the 1950s led to high unemployment and long-term unemployment for many, especially in the goods-producing industries, and those industries that relied on machinery as this economic downturn coincided with technological advances, particularly automation. White collar and service industries were less affected, leaving a glut of semiskilled and unskilled workers and an increasing economic gap between the affluent and the disadvantaged. The National Manpower council held a conference in 1955 entitled *Improving the Work Skills of the Nation*, and recommended guidelines for high schools that included providing more options for technical training and encouragement for more students to take these courses. Congress responded to the economic struggles of the country by enacting the Manpower Development and Training Act of 1961 (MDTA), which focused on retraining of workers displaced by technology,

followed by the Vocational Education Act of 1963 (VEA); (Kremen, 1974). Over the next 20 years, there were four iterations of the VEA beginning in 1963 with amended versions passed in 1968, 1972, and 1978 (Scott, 2004). These laws authorized federal funding for such things as vocational work-study programs, cooperative education, and postsecondary vocational programs. Historical analysis shows that federal spending on high school vocational programs increased over a span of about 40 years from about three million dollars in 1917 when 200,000 students were served under Smith-Hughes, to 176 million dollars and 3.4 million students served by the end of the 1950s (Hayward & Benson, 1993).

The Carl D. Perkins Act of 1984, along with several reauthorizations of the Perkins Act, serves as the basis for current federal funding for CTE. In 2013 under Perkins IV, over 1.1 billion dollars was allocated to the states and U.S. territories annually based on a formula. The formula considers each state's population in certain age groups as well as per-capita income in making funding determinations. The states then have some level of freedom to distribute the money according to the Perkins guidelines (U.S. Department of Education, n.d.-c). These funds are known as Title I and Title II funds and the specific use of the funds is laid out in the Perkins legislation.

Perkins legislation mandated accountability and improved academic achievement for CTE programs, encouraging policy makers to find ways to mesh CTE reform with the larger broader school reform measures that have been shown to improve academic achievement (Castellano, Stringfield, & Stone, 2003). Castellano et al. found a lack of solid research upon which to base programmatic decisions for CTE. Castellano et al. further noted that reform has generally been fragmented and addressed either CTE or academic areas and encourage comprehensive school reform with an emphasis on integrating academic content with CTE. Two

models that have shown value are *high schools that work* and *talent development high schools* (Castellano et al., 2003). Table 2 provides a timeline of major legislation related to CTE.

Table 2 Timeline of Major Legislation Related to CTE

Act	Date Enacted	Purpose
Morrill Land Grant College Act	1862	Granted land to states to build colleges that focused on agriculture, mechanics, and military tactics
Smith-Hughes Act	1917	Provided federal government funding for vocational education (which later became known as CTE)
GI Bill	1944	Provided funding to educate returning soldiers for available jobs
National Defense Education Act	1958	Increased focus on science, math, and vocational programs as well as increasing economic feasibility of college for the underprivileged
Manpower Development and Training Act	1961	Retrained workers who were displaced by technology
Vocational Education Act (and reauthorizations)	1963, 1968, 1972, 1978	Increased federal funding for vocational education including post-secondary vocational training
Carl D. Perkins Act (and reauthorizations)	1984, 1990, 1998, 2006	Expanded funding for CTE and increased accountability and integration into comprehensive school reform measures

Current Funding and Perspectives

Carl D. Perkins (1912-1984) was a Congressional Representative from Kentucky who championed causes related to education and the under-privileged. The Perkins student loan program and the Carl D. Perkins Career and Technical Education Acts are named for him. In 1984 the first Carl D. Perkins Vocational Education Act was passed. The Perkins Act along with three subsequent reauthorizations (1990, 1998, and 2006), focused on providing the workforce with workers who possessed advanced vocational skills, making CTE availability for

special populations such as handicapped or economically disadvantaged individuals, and holding schools more accountable for the programs they offered (Scott, 2004). There was also a strong push in the Perkins legislation to integrate academic and vocational studies rather than holding vocational and traditional academic studies as separate entities with vocational studies long being viewed as a lower form of education. The terminology changed from Carl D. Perkins Vocational and Technical Education Act of 1998 to Carl D. Perkins Career and Technical Education Act of 2006, reflecting a shift to a more inclusive approach.

The most recent reauthorization, Perkins IV, signed into law in 2006 by President George W. Bush, sought to further strengthen the quality of CTE programs and ensure accountability (U.S. Department of Education Office of Vocational and Adult Education, 2013). Specifically, the goals of the Act centered on seven primary areas:

- (1) building on the efforts of States and localities to develop challenging academic and technical standards and to assist students in meeting such standards, including preparation for high skill, high wage, or high demand occupations in current or emerging professions;
- (2) promoting the development of services and activities that integrate rigorous and challenging academic and career and technical instruction, and that link secondary education and postsecondary education for participating career and technical education students;
- (3) increasing State and local flexibility in providing services and activities designed to develop, implement, and improve career and technical education, including tech prep education;
- (4) conducting and disseminating national research and disseminating information on best practices that improve career and technical education programs, services, and activities;
- (5) providing technical assistance that—
 - (A) promotes leadership, initial preparation, and professional development at the State and local levels; and
 - (B) improves the quality of career and technical education teachers, faculty, administrators, and counselors;
- (6) supporting partnerships among secondary schools, postsecondary institutions, baccalaureate degree granting institutions, area career and technical education schools, local workforce investment boards, business and industry, and intermediaries, and;
- (7) providing individuals with opportunities throughout their lifetimes to develop, in conjunction with other education and training programs, the knowledge and skills needed

to keep the United States competitive. (Carl D. Perkins Career and Technical Education Improvement Act of 2006, 2006, sec. 2)

Perkins funds are administered by the Department of Education's Office of Vocational and Adult Education (OVAE). The funds are applied for by states and are awarded via a formula based on the number of the population in certain age groups and the average per capita income. States with a lower per capita income receive proportionally more funds. There are also minimum and maximum allocation amounts (NCES, n.d.-a).

Funds are divided into two types, State Basic Grants, also known as Title I part A funds, and Tech-Prep Education Grants, or Title II funds. Title IA funds must be matched by the state and are to be used for developing, improving, and expanding access to CTE. Specifically, funds can be used to pay for staff, instructional materials, laboratories, staff development, and other relevant materials and activities. Title II funds are awarded to states to allow them to make sub-grants to local consortia providing tech-prep programs that involve collaborations between secondary and postsecondary programs or other stakeholders such as employers (NCES, n.d.-a). Title II funds were cut from the federal budget in 2011 and have not been reinstated. This amounted to approximately \$1.3 million in cuts to CTE programs nationally (NASDCTE, n.d.).

States are required to submit a plan detailing how Perkins funds will be used and annual accountability reports showing how the state performed with regard to the Perkins Core Indicators. These Indicators include academic achievement in reading/language arts and math, technical skill attainment, secondary school completion, student graduation rate, secondary placement, and nontraditional participation and completion (U.S. Department of Education Office of Career, Technical, and Adult Education, 2014). The annual compliance reviews determine whether states are meeting benchmarks related to these indicators that are laid out in their respective plans.

As a component of the mandated increase in rigor called for in the Perkins legislation, the National Association of State Directors of Career Technical Education Consortium (NASDCTEC) worked with labor and industry leaders to develop Knowledge and Skills Charts for each career cluster (Advance CTE, 2016b). This took the place of the SCANS skills, which had been used for many years. These charts were updated in 2008 and are currently used by many states. NASDCTEC has more recently supported the creation of a new set of Common Career Technical Core (CCTC) standards that are more concise and more rigorous and these are expected to be voluntarily adopted by states over the coming years (NASDCTE, 2014).

In 2010, the NASDCTEC met to create a new vision for CTE and developed five core principles that drive their work. The following principles were laid out in a report by the NASDCTE (2012):

- CTE is critical to ensuring that the United States leads in global competitiveness
- CTE actively partners with employers to design and provide high-quality, dynamic programs
- CTE prepares students to succeed in further education and careers
- CTE is delivered through comprehensive programs of study aligned to The National Career Clusters™ Framework
- CTE is a results-driven system that demonstrates a positive return on investment (p.1)

Programs that adhered to these guidelines were expected to prepare students to be successful in their PSO and support themselves and our country in a demanding global economy. To that end, students in CTE courses choose a plan of study that is designed to prepare them for the demands of a specific career field.

The National Career Clusters Framework for CTE currently divides CTE courses into 16 Career Clusters (see Appendix B), and each cluster contains a number of specific pathways for a total of approximately 80 Career Pathways (Advance CTE, 2016a). Within these broad federally recognized categories, there are specific tracks in which students can focus their efforts, with

three courses in a particular concentration being known as a Pathway. Students who have taken three courses in a single Pathway are often referred to as “concentrators.” A comparison of CTE concentrators with those who did not take a CTE concentration is the primary focus of this study.

Training Versus Aptitude

The 2001 reauthorization of the Elementary and Secondary Education Act, better known as the No Child Left Behind Act, emphasized standardized testing as a means of accountability in education (No Child Left Behind, 2002). It has long been asserted that many students who take CTE coursework do so because they are not as academically inclined as their peers (Cohen & Besharov, 2002). Historically, there have been score discrepancies on standardized testing between vocational students and other students, with vocational students generally scoring lower than their peers (Bae, Gray, & Yeager, 2007).

Studies have shown that the discrepancies can be attributed to course-taking patterns rather than student aptitudes. For example, Bae, Gray, and Yeager (2007) found that students who took CTE coursework scored lower on state-mandated math assessments than other students who scored similar to them on 8th grade assessments, but when the math courses taken in high school were controlled, there were no differences. Elliot, Foster, and Franklin (2005) found that CTE students scored significantly lower than their counterparts on a high stakes achievement test, but when factors including limited English proficiency, socioeconomic status, and special needs were controlled, those turned out to be the indicators of lower performance rather than CTE status. Plank (2002) found that the lower performance that has been routinely found may not be due to the students themselves, but rather to lower academic expectations and failure to take higher level courses. Plank used data from a large longitudinal study and found a strong

relation between course taking patterns and achievement. Students who take CTE courses may not enroll in higher-level, more rigorous college prep courses.

There are also studies that point to a possible link between demographic characteristics and teaching methodology. In a recent study, Eddy and Hogan (2014) found that exams given in traditional, lecture-based college biology courses are disproportionately failed by Black students. When the format of these courses was changed to include active learning with increased interaction and feedback, all students benefitted, and the racial gap closed considerably. The authors concluded that the culture of universities has evolved based on the culture of the populations traditionally served, that is, White upper middle class, and that the most common teaching styles do not translate well to culturally diverse student populations. Populations bring their own cultural values with them and this research indicated that black students were reticent to speak during lecture-based courses but more open to asking questions and otherwise speaking out in class when the teaching methodology was switched to an active learning environment. The authors hypothesized that an atmosphere of cooperation served these students more effectively than one that stressed competition.

Active and cooperative learning are tenets of CTE, and if this study generalizes to other subject matter and ages of students, the active nature of the coursework should benefit Black students by closing the achievement gap between the Black and White subgroups of students. This study did not control for socioeconomic status and, since proportionally many more Black students fall into the low socioeconomic status (SES) range than White students (Milner, 2013), the effect might actually be attributable to socioeconomics rather than race.

Evidence exists that certain demographic groups including Blacks and Hispanics as well as those with low SES perform lower on academic measures than their peers who are White

and/or more affluent (Jeynes, 2015). Haberman (1991) indicates that students who live in poverty are not trained to solve complex problems like their more affluent counterparts. Teachers in high poverty schools conceive of themselves as the knowledgeable authority that helps students construct basic knowledge. This type of cultural bias can lead to social stratification where students with lower SES tend to be taught to obey rather than to question, thereby limiting their sense of empowerment in dealing with the world (Anyon, 1980). Children from lower socioeconomic levels have more than a 30% higher risk of being placed in programs for learning disabilities than their more affluent peers (Blair & Scott, 2002). There are clearly learning issues that are related to coming from a home with low socioeconomic status. Finding a link between SES and benefits from CTE coursework could help guide educational policy to help mediate some of these issues.

Preparation of CTE Teachers

Using effective contextual teaching helps shape neural pathways by creating schema that allow for understanding rather than rote memory (Hull, 2005). According to Hull (2005), these “pathways to recall” (p. 118) are solidified through a cluster of research supported contextual education strategies referred to by the acronym REACT (which stands for relate, experience, apply, cooperate, and transfer) that Hull believes instruction in CTE pathways should exemplify. CTE teachers are often people who have gained non-traditional access to the teaching field by virtue of being a professional in the career field they teach, and therefore are typically not trained through standard teacher preparation programs but rather enter the field through alternative certification methods (Camp & Heath-Camp, 2007; Szuminski, 2002). This can leave them unprepared for the pedagogical component of the job, thus, highly stressed according to

Szuminski (2002). These teachers may struggle with how to effectively deliver the material to students to help them learn (Camp & Heath-Camp, 2007).

More than 50% of all teachers leave the profession in the first few years of teaching (Szuminski, 2003). In order to retain potentially underprepared CTE teachers, it is crucial that they be properly trained in the methods of teaching and supported in becoming exemplary teachers. To that end, traditional induction and mentoring plans must be altered to better meet the diverse needs of these industry professionals entering the teaching profession. Szuminski (2003) recommended five core components for onsite teacher development programs: Partnerships, continuous support, administrative commitment to support, job-embedded teacher development activities, and flexibility. Teaching is a difficult job as evidenced by the high rate of leaving the profession. Without effective preparation, CTE teachers are likely to struggle.

Economic Perspectives

From an economic perspective, there may be implications related to CTE for both the student and the economy. Economist Peter Morici (2014) stated that the United States spent too much money helping students attend colleges and universities and not enough on vocational programs. Morici contended that the American economy supported a large number of high-paying, high-skill jobs, and a larger number of low-paying jobs in restaurants, but that the current educational system did not produce enough workers in middle-paying jobs such as manufacturing and construction. Morici (2014) stated that there were too many people in college, paying (or borrowing) large amounts of money to get degrees that did not position them well to succeed in the American economy. According to the Bureau of Labor Statistics, of the projected top growing jobs from 2012-2022, 13 of the Top 20 require an associate degree or less

(U.S. Bureau of Labor Statistics, 2014b). This underlines the importance of secondary education for preparing students for these fast growing fields. About half of the 20 fastest growing jobs mentioned in the Bureau of Labor Statistics report are in a medical related field, and 11 of them pay more than the median annual wage for all occupations.

For those who opted for 4-year degrees, there were also economic concerns. A study by the American Institutes for Research (2011) found that college dropouts, defined for this study as those who did not complete their bachelor's degree within six years of starting college, were losing \$3.8 billion in income, which translates into approximately \$7.3 million in lost state and federal income taxes. Over 40% of students who enroll in college fail to graduate, leaving them with less earning potential. These students often incur large personal debt, have paid tuition without earning a degree, and have often been subsidized by taxpayers. This study looked only at the cohort of students who began their college careers in 2002, so these numbers compound with each new class of freshmen (American Institutes for Research, 2011). The U.S. Department of Education (2014), in their yearly report on the condition of education, showed that, across all types of institutions, 10.0% of students who began paying on their student loans in 2011 had defaulted within one year. This was up from 9.1% in 2010 and 8.8% in 2009 (U.S. Department of Education, 2014). This report showed completion rates (those who finish in 150% of the normal time) of 59% for 4-year programs and only 31% for 2-year programs. Of note, private two-year institutes had completion rates over three times as high as public institutions. Further exploration is in order to determine whether the students who choose to attend the public versus private institutions differ significantly or whether the private institutions offer more support to their students to finish.

In a descriptive study commissioned by CALDER-American Institutes for Research, Velez (2014) found that it was generally possible to predict which students would successfully complete either a 2- or 4-year degree based on their “demographics, geographics, family background, and high school achievement” (p. 3). Velez used a logit model to predict outcomes should the student have chosen a different option (2-year versus 4-year college). The study reported that students who failed to complete their bachelor’s (4-year) degrees were very similar to those who completed their associate (2-year) degrees “in terms of demographics, geographics, family background, and high school achievement” (Velez, 2014, p. 3). Students who failed to complete their associate degrees were comparably similar to those who never entered college. These prior findings suggest it may be possible to identify students who are best prepared for each type of program, thus allowing for better advisement and increased positive outcomes. The earning of degrees should increase, if students are guided into the programs in which they are most likely to have success. An increase in completion rate would have economic impact on both the individual students’ earning potential and the economy in general. This study did not address attainment of certificates or other postsecondary options, and did not include CTE participation in the creation of the logit, but it did show that it is possible to use a variety of observable factors to predict success. The current study was designed to determine whether CTE completion is a causal factor in postsecondary education outcomes.

Carnivale, Jayasundera, and Hanson (2012) reported that, while the U.S. ranks second (behind Norway) among Organisation of Economic Co-operation and Development (OECD) nations in the share of workers who have earned a bachelor’s degree, the U.S. ranks 16th among industrialized nations in terms of postsecondary sub-baccalaureate attainment. This is especially pronounced in the 25-34 year old range. The percentage of postsecondary sub-baccalaureate

attainment for 24-34 year olds is essentially the same as for those who are in the 55-64 year old range, while the percentages of sub-baccalaureate attainment have grown during the same timeframe in most other OECD nations (Carnevale et al., 2012). According to this report, there are five ways to obtain sub-baccalaureate career and technical training. These options include employer-based training with 87% of the spending, industry-based certificates, apprenticeships, postsecondary certificates, and associate degrees.

CTE in high school is voluntary because the U.S. education system does not track students into a career pathway that leads to exclusion of other options such as baccalaureate and beyond. Rather, the American CTE system is uniquely flexible and allows students to explore careers, prepare for a career, and even switch careers later in life. Participation in high school CTE coursework has steadily decreased in recent years, and according to this report, the authors feel this is because of the focus on traditional college as being the way to ensure a place in the middle class. However, jobs data show an increase in middle level jobs, those that require more than a high school diploma but less than a bachelor's degree, and that pay middle class wages (defined by Carnevale et al. as a minimum of \$35,000 per year with no maximum specified) (Carnevale et al., 2012). Carnevale et al. suggest that an exchange be formed that would allow CTE and the labor market to work together to better align CTE programs with industry standards. Such an alliance would also facilitate investing money to better link secondary and postsecondary CTE education with employer-based training.

How CTE Instruction Differs

In a small study conducted in Michigan, 451 high school seniors were asked about their perceptions of CTE. Specifically, they were asked which students CTE is designed to serve, who

were the people who were instrumental in their decision to take CTE courses (or not), and what other factors played into their decision about their course taking decisions (Gaunt & Palmer, 2005). While the study was small and limited to a cluster of seven high schools, thus having potentially limiting generalizability, there were some interesting results:

1. When asked which students CTE best serves (the choices were those going directly to work, military, college, academically struggling students, students who have discipline issues, and all ability levels), CTE students and non-CTE students responded differently in only one category. A statistically significantly larger number of CTE students than non-CTE students agreed or strongly agreed that CTE serves those who are planning to attend college, about 50% versus 80% (Gaunt & Palmer, 2005).
2. Slightly but significantly more CTE students than non-CTE students saw CTE as being more appropriate for students who plan to join the military and those who have discipline problems (Gaunt & Palmer, 2005).
3. There was strong agreement for both groups that CTE serves those who are going directly into the workforce with over 80% of both groups agreeing or strongly agreeing, showing they understand the workforce readiness connection (Gaunt & Palmer, 2005).
4. There was also strong agreement between groups that CTE is good for all ability levels with the percentages approaching 80% (Gaunt & Palmer, 2005).

The results of this study support the idea that negative perceptions and narrow ideas about which students CTE should serve may be waning. When asked about who influenced their course taking decisions, the most important factor was friends, followed by mother and then

father. Least influential were high school teachers and principals (Gaunt & Palmer, 2005). This could have implications for better training school staff and parents about advising students more effectively about curricular options.

Characteristics of CTE Students

In order to understand how CTE affects student outcomes, it is important to know the characteristic of the students who are served, that is, whether and how they differ from the rest of the student population. If this information is known, more can be done to better serve the CTE students while also learning how to better recruit and serve underserved populations (Bierlein Palmer & Gaunt, 2007).

It has long been known that low SES is related to poor school performance, but the mechanisms for how to overcome that difference is not well understood (Sirin, 2005). Historically, students who take a CTE pathway generally have lower academic performance as demonstrated by lower GPAs, and they tend to come from less affluent backgrounds than their non-CTE counterparts (Bierlein Palmer & Gaunt, 2007). Bierlein, Palmer, and Gaunt (2007) undertook a study to determine whether they could determine if the students' living arrangements might account for the lower socioeconomic standing with some interesting findings. The non-CTE group lived with both parents in much larger numbers than CTE students. Another interesting finding was, while only 1.9% of the non-CTE group lived with other adults who were not relatives, 9.5% of the CTE students in this study had that living arrangement (Bierlein Palmer & Gaunt, 2007).

Summary

Over the last century, CTE has shifted from being a way to specifically prepare students, often low achieving or disengaged students, for particular job fields, to being seen as a way for all students to gain important and generalizable employability skills (Dalton, Lauff, Henke, Alt, & Li, 2013). This trend seems to be helping change the historically, somewhat unfavorable, view of CTE as a lower form of education for those who cannot perform at a high level to one of increased rigor and utility for all students. While there have been different points of emphasis over the course of time, the basic focus of CTE as providing employment-related skills embedded into academic instruction has remained. The current vision for CTE revolves around the ideas of global competitiveness, partnering with employers, and providing a comprehensive and rigorous education that prepares students for work or further education.

The research questions for this study were intended to probe areas of CTE that remain largely unexplored and unanswered, namely: Do students who participate in CTE pathways experience greater job satisfaction in their chosen career? Does CTE instruction benefit some demographic groups more than others? Does CTE lead to greater engagement in school work?

CHAPTER III

METHODOLOGY

This study was designed to examine potential differences between CTE concentrators versus nonconcentrators, those students who did not complete three courses in the same CTE career cluster, with regard to outcome indicators for postsecondary opportunities. Also, the study compared a variety of demographic factors including socioeconomic status, race, and gender to determine whether any group(s) benefit disproportionately from CTE when compared to the other groups. In the ELS2002, the NCES study that was used as the data source for this study, subjects were followed from 10th grade until eight years after their high school graduation.

Following UTC IRB approval, the data files from the ELS2002 database (years 2002, 2004, 2006 and 2012) were downloaded and those data points required for the study were combined into one file for ease of use. Data were then be uploaded into SPSS™ to facilitate the descriptive and statistical analyses. No additional data were collected or used in this study.

Research Design

This study employed a quasi-experimental design known as causal-comparative or ex-post-facto research using longitudinal data from the ELS2002 databank (Patten, 2009). In a causal-comparative study, researchers explore causality of current conditions by trying to find causes that led to these conditions (Patten, 2009). This approach assumes that the subjects were not randomly assigned to the study groups and, in this case, the subjects chose the treatment they

received when they decided upon their high school course of study. This historical fact, while unavoidable, may hamper the internal validity of the study and must be considered heavily in the interpretation of the study results. Information about the subjects' programs of study was taken by NCES researchers directly from the students' high school transcripts and should represent an accurate account.

Students were coded as either academic concentrators, occupational concentrators, both academic and occupational concentrators, or other. Academic concentrators had a minimum of four credits in English, three math courses with at least one beyond Algebra II, three science courses with at least one higher than biology, three credits in social studies including U.S. or world history, and two credits in a foreign language. An occupational concentrator was defined as a student who took at least three courses in the same career cluster and was the same as a CTE concentrator as it was defined for this study. For the sake of clarity, the term CTE concentrator is used from this point forward in place of the term occupational concentrator. The category listed as *other* represented any other set of courses (Planty, 2006).

Descriptive statistics were employed to describe characteristics of the subject groups. These included demographic characteristics of the subjects and categorical trends related to postsecondary educational and vocational paths undertaken. Nonparametric and parametric tests were conducted to determine whether students in a CTE pathway exhibited more positive outcomes with regard to a variety of variables than their nonconcentrator counterparts. Descriptive statistics including mean, median, and standard deviation were used to characterize the subjects. The following sections provide an outline indicating how each question was treated. See Appendix D for a detailed description of each variable.

Population and Sample

All data used in this study were drawn from the databank created for the ELS2002. This is an extensive longitudinal survey study that began with a national sample of over 15,000 high school sophomores in 2002. The study then followed up with these students in 2004 when most were high school seniors; again in 2006, two years after high school graduation; and finally in 2012. In this study, this timeline was used to compare selected outcomes longitudinally. The ELS2002 databank includes demographic information, information about the schools attended, parent and school personnel survey data, transcript data and self-reported data on a wide variety of school, community, and work-related activities. This longitudinal study was performed by the NCES, which is a division of the U.S. Department of Education and the Institute of Education Sciences. This division is responsible for collecting and analyzing educational data in the U.S. and publishes related reports that can be found online (U.S. Department of Education Institute of Education Sciences, n.d.)

The student sample utilized was best termed a census since all subjects who completed the relevant questions on the ELS2002 surveys were used in this study. The required data were available through the NCES (NCES, n.d.-b) and were accessed through their Education Data Analysis Tool (EDAT) portal via computer interface. The extant data that were used for this study were unrestricted and could be accessed and used by anyone for educational research. Permission to use the data for statistical purposes was granted by NCES in their data usage agreement, which was agreed to prior to accessing the data. Before any data were accessed, retrieved, or analyzed, approval was attained through the UTC IRB process (see Appendix C).

A total of 15,362 students completed the initial ELS2002 survey in 2002 (NCES, 2004), and 13,250 completed the third (and final) follow up survey in 2012 (NCES, 2014). The

participant selection process for the ELS2002 study involved two stages. The first was to choose the schools that would participate in the study, and the second was to choose the students within those schools who would participate. First, researchers with the NCES chose a national sample from among some 27,000 public and private schools that served 10th grade students. The schools were chosen using stratified probability sampling proportional to the size of the school. Of the 1,221 schools chosen, representing all 50 states and Washington, DC, 752 participated. A random sample of approximately 26 students who were sophomores in the spring semester of the 2001-2002 school year was taken per participating school.

Additionally, an oversampling procedure was needed to provide adequate numbers of students within some subgroups. To meet the precision requirements established for the study, a sample size of 1,356 was needed in order to meet the most rigorous statistical test. Taking into consideration expected return rates, an oversampling procedure was employed in order to ensure that there were enough members of each subpopulation to compare groups (NCES, 2004). The procedure involved taking a stratified systematic sample within each school with the strata being the racial/ethnic groups Black, Asian, Hispanic, or other. In a stratified systematic sample, the strata are identified, then a systematic approach is taken with every *k*th member of the strata taken (Hinkle, Wiersma, & Jurs, 2003).

Data Analysis

This study was largely involved with the comparisons of groups; for example, the comparisons of CTE concentrators versus nonconcentrators with regard to dependent variables such as answers to survey questions regarding job satisfaction. Since data were both parametric and nonparametric, both parametric and nonparametric statistics were employed. According to

Hinkle, Wiersma, and Jurs (2003), nonparametric tests can be used with nominal or ordinal level data. Nominal data are based on categorical characteristics, but no order is implied whereas scale data have an implied order or rank (Gliner, Morgan, & Leech, 2009). Parametric tests can only be used when certain assumptions are met, one of which is that the data must be scale (Hinkle et al., 2003). Descriptive statistics such as frequency distributions, measures of central tendency, and variability were utilized. Data were analyzed using *t* tests, ANOVA, Kruskal-Wallis, and other inferential tests as needed to answer the research questions posed.

Research Questions

In this study, six research questions were explored. These questions were attempts to clarify the current understanding of the differences between students who took coursework leading to a CTE concentration in high school and those who did not. An explanation of the procedures and analysis that was implemented for each research question is delineated in the next section.

Procedures and Analysis for Research Question 1

Is there a difference in job satisfaction between students with an academic concentration only and students with both academic and CTE concentrations?

A comparison between the students whose transcripts indicated they were academic concentrators and those who had both academic and CTE concentrations was conducted with regard to an employment satisfaction index at the time of the third follow up survey (eight years out of high school). The two groups, students who only had an academic curricular concentration in high school and those who had both an academic concentration and a CTE

concentration, were used as the independent variable for this question, while the subjects' score on a job satisfaction index served as the dependent variable. This index was calculated by the NCES as a composite score derived from responses to survey items that read "you feel fairly well satisfied with your present job" (variable: F3B34D from third follow up survey), "most days you are enthusiastic about work" (variable: F3B34E from third follow up survey), and "most days you find real enjoyment in your work" (variable: F3B34F from third follow up survey).

Since the independent measure was represented as dichotomous, nominal level data, and the job satisfaction index was a continuous, interval level scale, an independent *t*-test was conducted. A *t*-test is a parametric test that determines whether the means of two groups on a particular variable are significantly different (Hinkle et al., 2003). The *t*-test was used to indicate whether there was a statistically significant difference between the two groups with regard to the groups' mean scores on the job satisfaction index. The purpose of this question was to determine whether adding a CTE concentration to an academic concentration benefits the student in terms of future job satisfaction. Additionally, the question addressed the confounding issue of self-selection of curricular concentration by students. There was an underlying assumption that this analysis would somewhat control for ability since all students considered here had an academic concentration.

Procedures and Analysis for Research Question 2

Is there a difference in job satisfaction between students with different curricular concentrations (academic only, academic and CTE, CTE only, and other)?

This research question differed from Research Question 1 in that it looked at the same job satisfaction index with regard to all four curricular concentration options. Subjects were divided

into four groups based on their transcript indicated high school concentration (academic concentrator, occupational (CTE) concentrator, academic and occupational (CTE) concentrator, and other). For all subjects who were employed at the time of the third follow-up (8 years after completing high school), comparisons were made between the groups indicated above and their satisfaction with their employment at that time. Subjects who were not employed at the time of the third follow-up survey were excluded from the sample for purposes of this research question since the question addressed satisfaction in the workplace.

For those individuals who were employed at the time of the third follow up survey, a 1-way ANOVA was conducted using the four concentration options (academic concentrator, CTE concentrator, academic and CTE concentrator, and other) as levels of the independent variable and the job satisfaction index as the dependent measure. To determine whether the curriculum concentration groups differed, a 1-way analysis of variance (ANOVA) was performed. The results of the ANOVA determined whether job satisfaction was related to which curricular path students took in high school for the group of subjects who were in the workforce.

Procedures and Analysis for Research Question 3

Is there a difference in job satisfaction between genders and testable ethnic groups between students with a CTE concentration and those without a CTE concentration?

A comparison was made between CTE concentrators (to include those who completed a CTE concentration only and those who completed both academic and CTE concentrations), and nonconcentrators (to include those who completed an academic concentration only and those with other (general) curricular concentrations) with regard to employment satisfaction for those students who identified their ethnic group as American Indian/Alaska Native, Asian/Pacific

Islander, Black or African American, Hispanic, more than one race, or White. For each racial/ethnic group selected for study, a *t*-test was performed with the independent variable being the two levels of curricular concentration and the dependent variable being the job satisfaction index. The same procedure was used with men and women. This resulted in six *t*-tests for racial identity and two *t*-tests for gender. These tests revealed whether CTE concentrators had greater job satisfaction than nonconcentrators for each of the groups tested. Alpha was adjusted using the Bonferroni correction, which is used to lower the chances of a type I error when making multiple comparisons (Abdi, 2007).

Procedures and Analysis for Research Question 4

Is there a difference in job satisfaction between socioeconomic groups among those individuals with a CTE concentration and those without a CTE concentration?

A comparison was made of CTE concentrators (including students who completed a CTE concentration only and those who completed both academic and CTE concentrations), and non-concentrators (including students who completed an academic concentration only or those with other (general) curricular concentrations) with regard to employment satisfaction for those students whose family fell into each quartile with regard to socioeconomic status (SES) which served as the independent variable. Those students from families in each SES quartile and representing each of the two concentrations were compared to those in the other quartiles using a two-way ANOVA. This analysis revealed whether there were significant differences in job satisfaction between groups using SES levels and curriculum concentration levels as factors. The potential for an interaction among the levels of the independent variables was also investigated.

Procedures and Analysis for Research Question 5

Is there a difference in perception of school as interesting, challenging, and enjoyable between students with a CTE concentration and those without a CTE concentration?

Students who completed a CTE concentration (to include students who completed a CTE concentration only and those who completed both academic and CTE concentrations) versus non-concentrators (to include students who completed an academic concentration only or those with other [general] curricular concentrations) were compared on their response to the survey item on the base year survey about whether they felt their classes were interesting and challenging and to the item that asked whether they liked school. According to Schlechty (2011), when students are engaged in their work, they are attracted to their work, they persist in their work, and they take delight in their work. Thus, engagement should manifest in positive responses to the survey items about classes being interesting and challenging and about enjoying school.

Subjects were divided into two groups based on their curricular concentration. The four curricular designations indicated on students' transcripts (academic, CTE, academic and CTE, and other) were combined into two groups, those who include a CTE concentration and those that do not. Group One was CTE only concentrators and dual academic and CTE concentrators grouped together, and Group Two was academic only and 'other' grouped together. These groups served as the independent variable and the ordinal answer choices (strongly agree, agree, disagree, and strongly disagree) were the dependent measure for the responses to the statement, "Classes are interesting and challenging." The groups were compared using the Mann-Whitney *U* test. The Mann-Whitney *U* test is a nonparametric test that compares the medians of groups for a variable (Hinkle et al., 2003).

A second analysis was conducted using the ordinal answer choices (not at all, somewhat, and a great deal) to the question, “How much do you like school?” Using the same groups as above, the independent variable was dichotomous and nominal and the dependent variable was ordinal level. The data were analyzed using the Mann-Whitney *U* test to determine whether these two groups differ.

Procedures and Analysis for Research Question 6

Is there a difference in the accuracy of predictions of future educational attainment between students with a CTE concentration and students without a CTE concentration?

At the time of the first follow-up survey while the students were in 12th grade, students predicted the level of educational attainment they expected to achieve (high school diploma or less, some college, bachelor’s degree, master’s degree or higher, or I don’t know). At the time of the third follow up survey (eight years after high school graduation), students reported that they either exceeded, met, or did not meet their expectancy or their original answer to the question about their educational expectancy was “I don’t know” (no expectancy). Only those students who answered the item exceeded, met, or did not meet were considered for this analysis so that the variable could be considered ordinal. The independent variable for this question was whether the student was a CTE concentrator or non-concentrator and the dependent variable was the three levels of expectancy listed above. Since the independent variable data was nominal and the dependent variable data was ordinal, the Mann-Whitney test was used to tell whether the expectation and reality of educational attainment differed for CTE concentrators and non-concentrators.

Summary

This study was a quasi-experimental examination of an extant data set compiled from a longitudinal survey study known as the ELS2002. The ELS2002 was a large-scale study that followed over 15,000 high school students for 10 years and periodically collected information about their education and employment as well as other information not being considered for this study. The study considered students who participated in various curricular concentrations, with an emphasis on comparing those who took CTE coursework versus those who did not, on a variety of educational and employment outcomes.

CHAPTER IV

DATA ANALYSIS

Introduction

The purpose of this study was to explore outcomes among students who chose to take various curricular concentrations in high school. The indicators of outcomes include interest in school, attainment of expected level of education, accuracy in predicting eventual level of education, and job satisfaction once employed. The study also compared outcomes for students of different gender, ethnic, and socioeconomic status on job satisfaction.

Subjects for this study were the respondents to the ELS2002 surveys that were administered by the NCES from the period of 2002 through 2012. All data were drawn from this longitudinal study that surveyed students four times over a 10-year span of time from their sophomore year in high school (2002) until eight years after graduation (2012). The original ELS2002 surveys addressed an extensive array of educational, social, and occupational topics bridging students' transition from high school to postsecondary education and career.

Descriptive Characteristics of Respondents

Of the 16,197 students who participated in at least the initial survey, 7,653 were male and 7,717 were female (note that numbers do not total accurately due to non-response to survey items). The racial/ethnic composition of the research sample included 130 American Indian/Alaska Native respondents, 1,460 Asian Hawaiian/Pacific Islander respondents, 2,020

Black respondents, 1,196 Hispanic respondents (consisting of a combination of those who specified their race and those who did not), 735 multiracial respondents, and 8,682 White respondents.

Survey respondents considered in this study were grouped into four curricular concentrations descriptive of the course enrollment pattern completed in high school. Students completed an academic concentration ($n=3,649$), an occupational (CTE) concentration ($n=1,869$), academic plus occupational concentrations ($n=346$), or any other course taking pattern ($n=8,944$).

Analysis of Data

All data used in this study were retrieved from the EDAT portal of the Institute of Education Sciences, NCES website (NCES, n.d.-b). This tool allows researchers to choose variables from a number of studies, and to download the desired data onto a computer for analysis. The EDAT also provides details on the derivation and meaning of certain variables such as the job satisfaction index used in this study. Once the data for the current study were downloaded from EDAT, they were uploaded to SPSS for statistical analysis. The specific analyses conducted are detailed in the following sections.

Research Question 1

Research Question 1: Is there a difference in job satisfaction between students with an academic concentration only and students with both academic and CTE concentrations? The corresponding null hypothesis was that there would be no statistically significant difference in

job satisfaction between those students who completed both academic and CTE concentrations in high school and those students who completed only an academic concentration.

Table 3 shows the descriptive statistics for students with an academic curricular concentration and those with both academic and CTE concentrations relating to the job satisfaction index. The job satisfaction index is a composite variable derived from several survey questions and is standardized to a mean of zero and a standard deviation of one (EDAT variable detail).

Table 3 Research Question 1-CTE Versus Academic Plus CTE and Job Satisfaction

	Transcript indicated curriculum concentration	<i>n</i>	<i>M</i>	<i>SD</i>	<i>SEM</i>
Job satisfaction index/scale score	Academic concentrator	2,613	.0146	.989	.019
	Academic and CTE concentrator	247	.0042	.959	.061

An independent samples *t*-test was chosen to test for a difference between the means for the two groups. Having no significant differences in variance meets one of the assumptions necessary to run the parametric *t*-test. Before conducting the *t*-test, the Levene's Test for Homogeneity of Variance was performed to determine whether the two groups could be considered to have similar homogeneity of variances [$F(1, 2,858) = .294, p = .588$]. Since the significance value is of greater magnitude than .05, this test indicated that the homogeneity of variance between the groups could be assumed.

Once homogeneity of variance was established, an independent samples *t* test was conducted to determine if the difference in means on a job satisfaction index for students who

completed an academic concentration in high school ($n=2,613$) compared to those who completed both academic and CTE concentrations ($n=247$) was statistically significant. The t test revealed no significant differences [$t(2,858)=-.158, p=.875$] between academic concentrators and those who had dual academic and CTE concentrations. Based on the results of the t test, the null hypothesis must be retained. These results suggest that students who earned a CTE concentration in addition to an academic concentration were not different with regard to their eventual job satisfaction from those who earned only an academic concentration.

Research Question 2

Research Question 2: Is there a difference in job satisfaction between students with different curricular concentrations (academic only, academic and occupational [CTE], occupational only, and other)? The corresponding null hypothesis was that there would be no statistically significant differences in job satisfaction between students who completed different curricular concentrations in high school. Table 4 shows the descriptive statistics for students who completed each curricular concentration as related to the job satisfaction index. The minimum and maximum columns represent the possible low and high scores for the statistic.

Table 4 Research Question 2-Curricular Concentration and Job Satisfaction

	<i>n</i>	<i>M</i>	<i>SD</i>	<i>SE</i>	95% Confidence Interval for Mean		Min	Max
					Lower Bound	Upper Bound		
Academic concentrator	2,613	.0146	.988	.019	-.023	.053	-2.66	1.25
CTE concentrator	1,071	.0348	.971	.030	-.023	.093	-2.66	1.25
Academic and CTE concentrator	247	.0042	.958	.061	-.116	.124	-2.66	1.25
Other	4,973	-.0199	1.02	.014	-.048	.008	-2.66	1.25
Total	9,636	-.0022	1.00	.010	-.022	.018	-2.66	1.25

In order to compare the means of the four curricular groups, a one-way ANOVA was conducted. Prior to conducting the ANOVA, a test for homogeneity of variance was used to determine whether the assumptions of the parametric ANOVA were met. The Levene's Test had a value greater than .05 which indicated that there was no statistically significant differences in the variances for the groups [$F(4, 9631)=1.525, p=.192$] and the ANOVA could legitimately be conducted. With homogeneity of variance established, a one-way between subjects ANOVA was conducted to compare scores of students who completed different curricular concentrations in high school scored differently on a job satisfaction index once employed. Table 5 shows the results of the ANOVA.

Table 5 ANOVA-Curricular Concentration and Job Satisfaction

Job satisfaction	<i>SS</i>	<i>df</i>	<i>MS</i>	<i>F</i>	<i>Sig.</i>
Between Groups	3.777	4	.944	.942	.438
Within Groups	9,654	9,631	1.002		
Total	9,658	9,635			

Based on the results of the ANOVA, there were no significant differences for curricular concentration on job satisfaction for the four concentrations [$F(4, 9,631)=.492, p=.438$]. The null hypothesis that there was no difference in the effect of various high school curricular concentrations on job satisfaction was retained. These results suggest that students who participated in each of the four curricular concentrations in high school and who were employed eight years after graduating scored similarly on the job satisfaction index.

Research Question 3

Research Question 3: Is there a difference in job satisfaction between genders and testable ethnic groups (American Indian/Alaska Native, Asian Hawaiian/Pacific Islander, Black, Hispanic [race specified and race not specified], more than one race [non-Hispanic], White) between students with a CTE concentration and those without a CTE concentration? The corresponding null hypothesis was that there would be no statistically significant difference in job satisfaction between CTE concentrators versus nonconcentrators for each ethnic and gender group. The gender and ethnic groups are considered in the following sections.

Because eight comparisons were run between curricular backgrounds across the attribute characteristics of the population the possibility of an inflated Type I error emerged. This potential for error is widely recognized (Field, 2009) and is most often partially offset by the

Bonferroni technique (Field, 2009). Although this approach has been severely criticized (Perneger, 1998) the alternative is to risk Type I error which, in this case, is considered more of a concern than the risk of a Type II error. With that thought in mind the Bonferroni was calculated at $.05/8 = .006$. Thus all *t*- test results were tested at alpha .006 before significance was concluded. Ethnicity categories are reported in this study as they were in the original data collection.

Female

The descriptive statistics for females related to their curricular concentration and the job satisfaction index are shown in Table 6.

Table 6 Research Question 3-CTE Versus Non-CTE on Job Satisfaction (Female)

	CTE vs non-CTE	<i>n</i>	<i>M</i>	<i>SD</i>	<i>SEM</i>
Job satisfaction	non-CTE	3,895	.036	1.000	.016
	CTE	543	.021	1.001	.043

Before conducting a *t*-test, Levene’s Test for equal variances was performed [$F(1, 4,436)=.028, p=.868$]. Since this test was not significant, equal variances were assumed and the *t*-test was conducted to determine whether females with a CTE curricular concentration in high school scored differently than those without a CTE concentration on job satisfaction. Table 7 shows the results of the *t* test.

Table 7 *t*-test for CTE Versus Non-CTE on Job Satisfaction (Female)

		<i>t</i> -test for Equality of Means						
		<i>t</i>	<i>df</i>	Sig. (2-tailed)	Mean Difference	Std. Error Difference	95% Confidence Interval of the Difference	
							Lower	Upper
Job satisfaction	Equal variances assumed	.330	4,436	.742	.015	.046	-.075	.105

The results of the *t* test showed no significant difference in scores on the job satisfaction index between females with a CTE concentration and those who did not have a CTE concentration; [$t(4,436)=.330, p=.742$]. This suggests that female students who had a CTE concentration and those who did not scored similarly on the job satisfaction index. The null hypothesis was retained.

Male

The descriptive statistics for males related to their curricular concentration and the job satisfaction index are shown in Table 8.

Table 8 Research Question 3-CTE Versus Non-CTE on Job Satisfaction (Male)

	CTE vs non-CTE	<i>n</i>	<i>M</i>	<i>SD</i>	<i>SEM</i>
Job satisfaction	non-CTE	3,371	-.0553	1.01294	.01745
	CTE	747	.0477	.93013	.03403

The analysis for this question began with conducting a Levene’s test to determine whether equal variances could be assumed [$F(1, 1,172)=6.339, p=.012$]. The results were significant at $p=.012$ indicating that equal variances could not be assumed. This was taken into account when interpreting the t -test results. When equal variances cannot be assumed, SPSS automatically applies the Welch-Satterthwaite method which corrects for the violation (Laerd Statistics, 2013). The values given by this method correct for the differences and are reflected in the values for instances when equal variances are not assumed (Field, 2009).

An independent t test was conducted to determine whether males with a CTE curricular concentration in high school scored differently than those without a CTE concentration on job satisfaction. Table 9 shows the results of the t test.

Table 9 t -test for CTE Versus Non-CTE on Job Satisfaction (Male)

		<i>t</i> -test for Equality of Means						
		<i>t</i>	<i>df</i>	Sig. (2-tailed)	Mean Difference	Std. Error Difference	95% Confidence Interval of the Difference	
							Lower	Upper
Job satisfaction	Equal variances not assumed	-2.69	1,172	.007	-.103	.038	-.178	-.028

The appropriate t -test values were used for analysis; [$t(1,172)=-2.70, p=.007$]. This suggests that male students who had a CTE concentration and those who did not scored similarly on the job satisfaction index. The null hypothesis was retained.

American Indian/Alaska Native

The descriptive statistics for Research Question 3 for the American Indian/Alaska Native subgroup related to curricular concentration and the job satisfaction index are shown in Table 10.

Table 10 Research Question 3-CTE Versus Non-CTE on Job Satisfaction (American Indian/Alaska Native)

	CTE vs non-CTE	<i>n</i>	<i>M</i>	<i>SD</i>	<i>SEM</i>
Job satisfaction	non-CTE	50	.0850	.85369	.12073
	CTE	12	-.0588	.71877	.20749

Before conducting a *t* test, Levene’s Test for equal variances was performed [$F(1, 60)=.164, p=.687$]. Since this test was not significant, equal variances were assumed and the *t*-test was conducted to determine whether American Indian/Alaska Natives with a CTE curricular concentration in high school scored differently than those without a CTE concentration on job satisfaction. Table 11 shows the results of the *t* test.

Table 11 *t*-test for CTE Versus Non-CTE on Job Satisfaction (American Indian/Alaska Native)

		<i>t</i> -test for Equality of Means						
		<i>t</i>	<i>Df</i>	Sig. (2-tailed)	Mean Difference	Std. Error Difference	95% Confidence Interval of the Difference	
							Lower	Upper
Job satisfaction	Equal variances assumed	.539	60	.592	.14380	.26700	-.39028	.67788

The results of the *t* test showed no significant difference in scores on the job satisfaction index between American Indian/Alaska Native students with a CTE concentration and those who did not have a CTE concentration; [$t(60)=.539, p=.592$]. This suggests that American Indian/Alaska Native students who had a CTE concentration and those who did not scored similarly on the job satisfaction index. The null hypothesis was retained.

Asian Hawaiian/Pacific Islander

The descriptive statistics for Research Question 3 for the Asian Hawaiian/Pacific Islander subgroup related to their curricular concentration and the job satisfaction index are shown in Table 12.

Table 12 CTE Versus Non-CTE on Job Satisfaction (Asian Hawaiian/Pacific Islander)

	CTE vs non-CTE	<i>N</i>	<i>M</i>	<i>SD</i>	<i>SEM</i>
Job satisfaction	non-CTE	669	-.039	.9879	.038
	CTE	66	-.206	1.018	.125

Before conducting a *t* test, Levene’s Test for equal variances was performed [$F(1, 733)=.383, p=.536$]. Since this test was not significant, equal variances were assumed and the *t*-test was conducted to determine whether Asian Hawaiian/Pacific Islanders with a CTE curricular concentration in high school scored differently than those without a CTE concentration on job satisfaction. Table 13 shows the results of the *t* test.

Table 13 *t*-test for CTE Versus Non-CTE on Job Satisfaction (Asian Hawaiian/Pacific Islander)

		<i>t</i> -test for Equality of Means						
		<i>t</i>	<i>df</i>	Sig. (2-tailed)	Mean Difference	Std. Error Difference	95% Confidence Interval of the Difference	
							Lower	Upper
Job satisfaction	Equal variances assumed	1.308	733	.191	.16722	.12781	-.08369	.41813

The results of the *t* test showed no significant difference in scores on the job satisfaction index between Asian Hawaiian/Pacific Islander students with a CTE concentration and those who did not have a CTE concentration; [$t(733)=1.308, p=.191$]. This suggests that Asian Hawaiian/Pacific Islander students who had a CTE concentration and those who did not scored similarly on the job satisfaction index. The null hypothesis was retained.

Black

The descriptive statistics for Research Question 3 for the Black subgroup related to curricular concentration and the job satisfaction index are shown in Table 14.

Table 14 Research Question 3-CTE Versus Non-CTE on Job Satisfaction (Black)

	CTE vs non CTE	<i>n</i>	<i>M</i>	<i>SD</i>	<i>SEM</i>
Job satisfaction	non-CTE	793	-.1462	1.06585	.03785
	CTE	176	-.0596	1.00841	.07601

Before conducting a *t* test, Levene’s Test for equal variances was performed [$F(1, 967)=1.564, p=.211$]. Since this test was not significant, equal variances were assumed and the *t*-test was conducted to determine whether Blacks with a CTE curricular concentration in high school scored differently than those without a CTE concentration on job satisfaction. Table 15 shows the results of the *t* test.

Table 15 *t*-test for CTE Versus Non-CTE on Job Satisfaction (Black)

		<i>t</i> -test for Equality of Means						
		<i>t</i>	<i>Df</i>	Sig. (2-tailed)	Mean Difference	Std. Error Difference	95% Confidence Interval of the Difference	
							Lower	Upper
Job satisfaction	Equal variances assumed	-.985	967	.325	-.08660	.08796	-.25922	.08602

The results of the *t* test showed no significant difference in scores on the job satisfaction index between Black students with a CTE concentration and those who did not have a CTE concentration; [$t(967)=-.985, p=.325$]. This suggests that Black students who had a CTE concentration and those who did not scored similarly on the job satisfaction index. The null hypothesis was retained.

Hispanic

The descriptive statistics for Research Question 3 for the Hispanic subgroup related to curricular concentration and the job satisfaction index are shown in Table 16.

Table 16 Research Question 3-CTE Versus Non-CTE on Job Satisfaction (Hispanic)

<i>Group Statistics</i>					
	CTE vs non CTE	<i>n</i>	<i>M</i>	<i>SD</i>	<i>SEM</i>
Job satisfaction	non-CTE	954	.0424	1.00628	.03258
	CTE	138	.0379	.87612	.07458

Before conducting a *t* test, Levene’s Test for equal variances was performed [$F(1, 1,090) = 3.231, p = .073$]. Since this test was not significant, equal variances were assumed and the *t*-test was conducted to determine whether Hispanics with a CTE curricular concentration in high school scored differently than those without a CTE concentration on job satisfaction. Table 17 shows the results of the *t* test.

Table 17 *t*-test for CTE Versus Non-CTE on Job Satisfaction (Hispanic)

<i>t</i> -test for Equality of Means								
		<i>t</i>	<i>df</i>	Sig. (2-tailed)	Mean Difference	Std. Error Difference	95% Confidence Interval of the Difference	
							Lower	Upper
Job satisfaction	Equal variances assumed	.050	1,090	.960	.00449	.09024	-.17257	.18156

The results of the *t* test showed no significant difference in scores on the job satisfaction index between Hispanic students with a CTE concentration and those who did not have a CTE concentration; [$t(1,090) = .050, p = .960$]. This suggests that Hispanic students who had a CTE concentration and those who did not scored similarly on the job satisfaction index. The null hypothesis was retained.

More Than One Race (Non-Hispanic)

The descriptive statistics for the Multi-racial subgroup related to curricular concentration and the job satisfaction index are shown in Table 18.

Table 18 Research Question 3-CTE Versus Non-CTE on Job Satisfaction (More Than One Race-Non-Hispanic)

<i>Group Statistics</i>					
	CTE vs non CTE	<i>n</i>	<i>M</i>	<i>SD</i>	<i>SEM</i>
Job satisfaction	non-CTE	326	-.0653	1.00590	.05571
	CTE	55	-.0159	1.08406	.14617

Before conducting a *t* test, Levene’s Test for equal variances was performed [$F(1, 379)=.256, p=.613$]. Since this test was not significant, equal variances were assumed and the *t* test was conducted to determine whether multi-racial students with a CTE curricular concentration in high school scored differently than those without a CTE concentration on job satisfaction. Table 19 shows the results of the *t* test.

Table 19 *t*-test for CTE Versus Non-CTE on Job Satisfaction (More than One Race-Non-Hispanic)

<i>t</i> -test for Equality of Means								
		<i>t</i>	<i>df</i>	Sig. (2-tailed)	Mean Difference	Std. Error Difference	95% Confidence Interval of the Difference	
							Lower	Upper
Job satisfaction	Equal variances assumed	-.333	379	.739	-.04937	.14831	-.34098	.24223

The results of the *t* test showed no significant difference in scores on the job satisfaction index between students who identified as More Than One Race-Non-Hispanic with a CTE concentration and those who did not have a CTE concentration; [$t(379)=-.333, p=.739$]. This suggests that More Than One Race-Non-Hispanic students who had a CTE concentration and those who did not scored similarly on the job satisfaction index. The null hypothesis was retained.

White

The descriptive statistics for White subgroup related to curricular concentration and the job satisfaction index are shown in Table 20.

Table 20 Research Question 3-CTE Versus Non-CTE on Job Satisfaction (White)

	CTE vs non-CTE	<i>n</i>	<i>M</i>	<i>SD</i>	<i>SEM</i>
Job satisfaction	non-CTE	4,449	.0167	.99792	.01496
	CTE	831	.0785	.95577	.03316

Before conducting a *t* test, Levene’s Test for equal variances was performed [$F(1, 5,278)=.998, p=.318$]. Since this test was not significant, equal variances were assumed and the *t* test was conducted to determine whether White students with a CTE curricular concentration in high school scored differently than those without a CTE concentration on job satisfaction. Table 21 shows the results of the *t* test.

Table 21 *t*-test for CTE Versus Non-CTE on Job Satisfaction (White)

		<i>t</i> -test for Equality of Means						
		<i>t</i>	<i>df</i>	Sig. (2-tailed)	Mean Difference	Std. Error Difference	95% Confidence Interval of the Difference	
							Lower	Upper
Job satisfaction	Equal variances assumed	-1.649	5,278	.099	-.06179	.03747	-.13523	.01166

The results of the *t* test showed no significant difference in scores on the job satisfaction index between White students with a CTE concentration and those who did not have a CTE concentration; [$t(5,278)=1.649, p=.099$]. This suggests that White students who had a CTE concentration and those who did not scored similarly on the job satisfaction index. The null hypothesis was retained.

Research Question 4

Research Question 4: Is there a difference in job satisfaction between socioeconomic groups among those individuals with a CTE concentration and those without a CTE concentration? The corresponding null hypothesis was that there would be no statistically significant difference in job satisfaction between CTE concentrators versus nonconcentrators for each socioeconomic group.

Table 22 shows the descriptive statistics for Research Question 4 relating to SES and curricular concentration and the job satisfaction index.

Table 22 Research Question 4-Socioeconomic Status and Job Satisfaction by Curricular Concentration

Dependent Variable: Job satisfaction

Socioeconomic Quartiles	CTE vs non CTE	<i>M</i>	<i>SD</i>	<i>n</i>
Lowest quartile	non-CTE	-.0202	1.008	1,368
	CTE	.0196	.969	317
	Total	-.0127	1.0009	1,685
Second quartile	non-CTE	-.0176	1.012	1,539
	CTE	-.0049	1.00009	388
	Total	-.0151	1.010	1,927
Third quartile	non-CTE	-.0262	1.033	1,814
	CTE	.0390	.930	330
	Total	-.0162	1.018	2,144
Highest quartile	non-CTE	.0230	.982	2,520
	CTE	.1136	.942	243
	Total	.0310	.979	2,763
Total	non-CTE	-.0061	1.006	7,241
	CTE	.0350	.963	1,278
	Total	-.0001	1.0001	8,519

The analysis began with Levene’s Test for Equality of Variances which was found to be not significant [$F(7, 8511)=1.626, p=.123$]. The assumption of equal variances was met and a 2-way ANOVA was performed to test whether being a CTE concentrator or nonconcentrator benefits any socioeconomic quartile more than others on job satisfaction. The interaction effect between SES and curricular concentration on job satisfaction was also tested. Table 23 shows the results of the ANOVA.

Table 23 ANOVA for Effects of Socioeconomic Status and Curricular Concentration on Job Satisfaction

Source	Type III SS	df	MS	F	Sig.
SES	3.670	3	1.223	1.223	.300
CTEvsnonCTE	2.851	1	2.851	2.851	.091
Interaction	.887	3	.296	.296	.829
Error	8,513	8,511	1.000		
Total	8,520	8,519			

Dependent Variable: Job satisfaction

The analysis showed that there were no statistically significant main differences for either curricular concentration [$F(1, 8511)=2.85, p=.09$] or socioeconomic quartile [$F(3, 8511)=1.22, p=.30$]. Therefore, none of the socioeconomic quartiles benefits more than others in terms of increased job satisfaction as a result of their curricular concentration (CTE versus non-CTE). There were also no statistically significant interactional effects [$F(3, 8511)=.296, p=.83$] indicating that SES and curricular concentration operate independently on job satisfaction. The null hypothesis was retained.

Research Question 5

Research Question 5: Is there a difference in perception of school as interesting, challenging, and enjoyable between students with a CTE concentration and those without a CTE concentration? The corresponding null hypothesis was that there would be no statistically significant difference in perceptions of interest, degree of challenge, and enjoyment of secondary coursework between CTE concentrators and nonconcentrators. Table 24 shows the descriptive

statistics for CTE concentrators versus nonconcentrators with regard to their answers to the survey item related to classes being interesting and challenging.

Table 24 Research Question 5-CTE Versus Non-CTE on “Classes are Interesting and Challenging”

	CTE vs non-CTE	<i>n</i>	Mean Rank
Classes are interesting and challenging	non-CTE	11,328	6,670.64
	CTE	2,049	6,790.52
	Total	13,377	

Since the variables were nominal and ordinal, a Mann-Whitney *U* test was performed to test whether students who participated in CTE coursework found their high school work to be interesting and challenging ($U=11,397,518$, $z=-1.409$, $p=.159$). Results of the test indicated that the median of CTE concentrators’ answers to a survey item that asked whether students thought classes were interesting and challenging was not greater than the median for students who were non-CTE concentrators. Therefore the null hypothesis was retained.

Also related to Research Question 5 was the survey item that asked students how much they like school. Table 25 shows the relative medians for CTE concentrators and non-concentrators.

Table 25 Research Question 5-CTE Versus Non-CTE on “How Much Do You Like School”

	CTE vs non CTE	<i>n</i>	Mean Rank
How much likes school	non-CTE	11,442	6,793.25
	CTE	2,051	6,489.01
	Total	13,493	

A Mann-Whitney U test was performed using CTE and non-CTE concentrators as the grouping variable. The results indicated that the difference between the two groups was statistically significant ($U=11,204,632$, $z=-3.859$, $p<.001$). The null hypothesis was rejected indicating that there was a statistically significant difference between CTE concentrators and non concentrators on how much they liked school. Since the non concentrator group showed a higher mean rank, it can be surmised that they indicated they liked school more than the CTE concentrator group.

Research Question 6

Research Question 6: Is there a difference in the accuracy of predictions of future educational attainment between students with a CTE concentration and students without a CTE concentration? The corresponding null hypothesis was that there would be no statistically significant difference in accuracy of predicting future educational attainment between CTE concentrators and nonconcentrators. Table 26 shows the descriptive statistics related to Research Question 6.

Table 26 Research Question 6-CTE Versus Non-CTE on Accuracy of Educational Expectations

	CTE vs non-CTE	<i>n</i>	Mean Rank
Fulfillment of 12th grade educational expectations as of 8 years after graduation	non-CTE	8,067	4,641.67
	CTE	1,185	4,523.24
	Total	9,252	

The Mann-Whitney U test was not significant ($U=4,657,335$, $p=.078$) and the null hypothesis that there would be no statistically significant difference in accuracy of predicting future educational attainment between CTE concentrators and nonconcentrators was retained.

Summary

A variety of parametric and non-parametric tests were performed on data from the ELS2002 study to examine relationships between various curricular concentrations and academic and employment indicators. Significant findings were found for responses to the survey item related to how much the respondents like school between CTE and non-CTE concentrators. No other statistically significant results were found. Implications of these findings will be discussed in Chapter V.

CHAPTER V

SUMMARY AND DISCUSSION

Summary of the Study

This study examined outcome criteria related to education and employment for students who participated in a CTE concentration in high school versus students who did not. Chapter Five includes a summary of the study. This chapter begins with a re-examination of the statement of the problem, significance, and methodology of the study and concludes with a discussion of the findings, threats to validity, suggestions for further research, and discussion and implications for practice.

Statement of the Problem

This study was designed to ascertain whether CTE concentrators performed better on a number of indicators than their non-CTE concentrator peers. As has been established by the literature, there are benefits of taking CTE coursework during high school. For example, students who engage in CTE coursework during high school graduate from high school and persevere in their postsecondary programs in larger proportions than their peers who do not take CTE courses (NASDCTE, 2011). What is not well established is the mechanism by which this persistence occurs and if benefits of CTE coursework persist once a person enters their career.

A focus of this study was to establish whether a person's job satisfaction, once employed, is related to their high school curricular concentration, especially as related to CTE coursework.

The study also examined whether certain ethnic and demographic groups benefitted disproportionately from taking CTE coursework with regard to job satisfaction. In addition, the study was used to determine whether students who had a CTE concentration were more engaged in their high school coursework, a factor that has been linked to persistence in educational programs. Finally, the study clarified whether students who had a CTE concentration were better able to predict the level of education they would attain by eight years after high school.

Significance of the Problem

According to the report *The Silent Epidemic: Perspectives of High School Dropouts* (Bridgeland et al., 2006), there are myriad reasons high school dropouts cite for not finishing high school. The authors conducted extensive focus groups and administered a survey to a large group of high school dropouts and found that 47% of the subjects, including those with high GPAs and who reported high levels of motivation reported boredom and disengagement from their coursework as primary reasons for dropping out. Eighty-one percent of the subjects believed that more relevance in their schoolwork, that is, a connection between school and the world of work, would have helped them stay in school and graduate. This finding is congruent with a study on the balance of coursework in which Plank (2002) found that there is an ideal ratio of 60% academic to 40% CTE coursework for minimizing dropping out.

Understanding which educational programs aid students in obtaining important knowledge and skills needed to successfully transition into postsecondary education or career options is crucial for making funding and policy decisions. From an economic perspective, there may be implications related to CTE for both the student and the economy. According to the American Institutes for Research (2011), over 40% of students who enroll in college fail to

graduate, leaving them with less earning potential. These students often incur large personal debt, have paid tuition without earning a degree, and have often been subsidized by taxpayers. Some students receive government subsidized student loans based on need in which the government pays the interest on those loans for a period of time (U.S. Department of Education, n.d.-b). Understanding of career goals and the choice of appropriate educational programs to reach those goals would seem to benefit both the student and society.

Halkos (2010) has shown that there is a positive relationship between productivity and satisfaction so it seems logical to assume that employers want employees who enjoy their jobs. Understanding whether CTE coursework leads to greater job satisfaction, encourages student engagement, and allows students to better predict their educational needs might lead to better course and program placement decisions by students, parents, and school administrators.

Methodology

This study employed a quasi-experimental design known as causal-comparative or ex-post-facto research using longitudinal data from the ELS2002 databank (Patten, 2009). In a causal-comparative study, researchers explore causality of current conditions by trying to find causes that led to these conditions (Patten, 2009). This approach assumes that the subjects were not randomly assigned to the study groups and, in this case, the subjects chose the treatment they received when they decided upon their high school course of study. This historical fact, while unavoidable, may hamper the internal validity of the study and must be considered heavily in the interpretation of results from this study.

Six research questions relating to curricular concentration and various outcomes guided this study. The research questions considered are as follows:

- RQ1-Is there a difference in job satisfaction between students with an academic concentration only and students with both academic and CTE concentrations?
- RQ2-Is there a difference in job satisfaction between students with different curricular concentrations (academic only, academic and CTE, CTE only, and other)?
- RQ3-Is there a difference in job satisfaction between genders and testable ethnic groups between students with a CTE concentration and those without a CTE concentration?
- RQ4-Is there a difference in job satisfaction between socioeconomic groups among those individuals with a CTE concentration and those without a CTE concentration?
- RQ5-Is there a difference in perception of school as interesting, challenging, and enjoyable between students with a CTE concentration and those without a CTE concentration?
- RQ6-Is there a difference in the accuracy of predictions of future educational attainment between students with a CTE concentration and students without a CTE concentration?

Descriptive statistics were employed to describe characteristics of the subject groups.

These included demographic characteristics of the subjects and categorical trends related to postsecondary educational and vocational paths undertaken. Nonparametric and parametric tests were conducted to determine whether students in a CTE pathway exhibited more positive outcomes with regard to a variety of variables than their nonconcentrator counterparts.

Significance was reached only for Research Question 5 and those findings will be discussed in some detail in the following section.

Significant Findings from Research Question 5

The findings from this study failed to identify statistically significant differences between groups with one exception. Statistically significant results were found for non-CTE students indicating they liked school more than their CTE counterparts. The remainder of the tests showed no significant differences among groups for the indicators tested. There was no significant difference between the various curricular concentrations with regard to eventual job satisfaction, no gender or ethnic groups benefitted more than others from CTE on job satisfaction, no differences between CTE and non-CTE groups on whether they found their high school classes to be interesting and challenging, and no differences in the ability of CTE and non-CTE students to predict their eventual educational attainment.

The single comparison that returned statistically significant results in this study was between CTE and non-CTE concentrators examining how much they liked school. The results of the test showed that non-CTE students enjoyed school significantly more than the CTE concentrators. This could be an artifact of adults encouraging students who are struggling or unhappy with school into CTE coursework hoping they will find something to engage them in those courses.

Students who participate in CTE tend to persist in their educational programs and complete them in higher numbers than their non-CTE peers (U.S. Department of Education, 2011). Whether this was due to some attribute(s) of students who took CTE coursework or due to some aspect of the coursework itself was not clarified by this study. It appears that this tendency to complete educational programs is not due to the enjoyment of school since students who do not take a CTE concentration indicated they enjoyed school more than those who did take CTE coursework. Since the question about how much the student liked school was asked

when the respondents were in the tenth grade, the answers might have changed if the question had been asked later in their education once they had taken more CTE coursework. The ELS2002 survey did not provide that information.

Non-CTE students scored higher on the survey item related to how much they liked high school, but that advantage did not persist into the work environment. Eight years after high school graduation those respondents who were working were asked questions about their level of satisfaction with their employment and there was no difference between those who took a CTE concentration in high school and those who did not. Upon further examination of the data at a more granular level, answers to the three questions that were used to calculate the job satisfaction index indicated that people are generally happy with their jobs approximately eight years after graduating from high school. For each question about how satisfied they were with their job, how enthusiastic they were about their job, and the degree of enjoyment they received from their job, approximately 65% of respondents indicated they agreed or strongly agreed. These answers were indicative of positive feelings about their current employment. While non-CTE students appear to be happier with the school environment, both CTE concentrators and non-concentrators seem content with their jobs early in their careers. This is a potentially important finding for students, educators, and employers.

Threats to Internal and External Validity

As with any study, there are aspects of the design that could have contributed to error in the results. For this study, one concern stems from the self-selected nature of the groups tested. The primary goal of this study was to examine the relationship of students' curricular concentration, especially as it relates to whether they took CTE coursework or not, to various

indicators about their relationships to school and career. While the participants for the original ELS2002 survey study were randomly selected from the high school population, students along with counselors and parents decide which curricular concentration(s) they will engage in during their high school careers. The groups are said to be self-selected since the participants are not randomly assigned to the groups. In order to generalize from statistical results, there must be an assumption of randomness in the data. The self-selected groups in this study introduced a potential significant source of error. Given the nature of the data this was unavoidable, but in order to address the issue as thoroughly as possible the first research question was designed to control for this factor to the degree possible.

Research Question 1 compared students who had only an academic concentration to those who had an academic concentration and had a CTE concentration in addition on job satisfaction. The rationale was that both of these groups had an academic concentration and the only difference would be the added CTE component. These two groups scored similarly on the job satisfaction index, indicating that there was no advantage of the CTE concentration with regard to job satisfaction if other factors were controlled for to the degree possible. The results of this test indicated that the two groups were no different on job satisfaction, so the assumption was made that the two groups could be treated as if they were randomly assigned.

The survey instruments used to gather data were developed by the NCES and administered over the course of 10 years. Painstaking efforts were detailed in reports of the ELS2002 study indicating the efforts made to ensure reliability of the data collected, and efforts made to promote completion of the surveys over the course of the longitudinal study. Even with these efforts, failure to complete all surveys was an issue. Table 27 shows the percentages of

each group shown that did not answer the survey items (either did not complete the survey or skipped those specific items) that were used to calculate the job satisfaction index.

Table 27 Percentage of Respondents From Demographic Groups who did not Answer Job Satisfaction Items

Group Name	Percent Not Answering Items
Non-CTE	22.0%
CTE	25.3%
Male	26.7%
Female	18.9%
American Indian/Alaska Native	27.7%
Asian/Hawaiian Islander	24.2%
Black	29.0%
Hispanic	26.0%
More than One Race	23.8%
White	19.7%
SES-Lowest Quartile	29.0%
SES-2 nd Quartile	25.1%
SES-3 rd Quartile	22.9%
SES-Highest Quartile	15.9%

Although statistical significance was not determined, some differences were noted in terms of which students failed to complete the questions related to job satisfaction on the final follow up survey. For example, there is a discrepancy of nearly eight percent between males and females, and over a 13% difference in nonresponse between the highest and lowest SES quartile groups. This could have led to a nonresponse bias and could possibly be a factor in the lack of significant differences between some groups. Such discrepancies as found with this study can sometimes lead to a bias if respondents with certain traits have higher attrition rates than others (Ahern & Brocque, 2005). If this happens, it can affect results in longitudinal surveys such as

the ELS2002 because the respondents to later surveys in the study might possess somewhat different characteristics than those who failed to complete all of the surveys.

In a longitudinal study about mental health incidence rates Graaf et al. (2000) found that urban respondents and those with a lower educational level dropped out of the study in higher percentages than others. It is plausible that respondents to the ELS2002 study who failed to complete all of the surveys were different in some important ways than those who completed the surveys. There is likely no way to know for certain whether these potential sources of bias affected the results of the current study, however, the researchers responsible for the ELS2002 data calculated bias estimates for survey items for which the response rate fell below their target, some of which might be related to this study. For example, there was statistically significant bias for several racial groups, gender, high school type (public versus private), and postsecondary attendance for a survey item related to the number of hours worked per week (Ingels, 2014), which is potentially related to job satisfaction.

Most of the data used for this study were self-reported. Curricular concentration was obtained from the respondents' high school transcripts, but all other data were taken from the surveys. Self-reported data can be influenced by a number of factors including a social desirability bias (Miller, 2011). Since the surveys were administered by another entity, there was an assumption made based on extensive reporting from the organization that created and administered the surveys that every effort was made to ensure the validity of the survey data.

Suggestions for Future Research

Based on the results of this study, understanding the role CTE plays in our educational system should be a priority given the millions of dollars earmarked yearly for CTE. One goal of

this study was to explore potential causes of CTE students graduating from high school in much larger percentages than non-CTE students. The results of this study failed to support the commonly stated view that this was because CTE students are more engaged in their schoolwork. CTE students indicated they liked school less than their non-CTE counterparts and there was no difference in how enjoyable and challenging they found their school work. Further research into the actual mechanism of this phenomenon is warranted since understanding what aspects of CTE are causal could be instrumental in designing educational programs for at risk students. Also, understanding those causal factors could potentially benefit all students if implemented in more educational settings.

The ability of a high school student to predict the level of education s/he would ultimately undertake was tested in the current study. CTE students do not predict their education level more accurately than non-CTE students. A future study looking at whether students more accurately predict the type and level of work they would eventually do would add to our understanding of the potential benefits of CTE. This would show whether CTE students actually have a better understanding of their career goals but perhaps lack a full understanding of the required education for the vocation they choose, or if their ideas about their educational and vocational choices evolve over time. A tremendous amount of money is invested on partially completed educational programs (American Institutes for Research, 2011) and with greater understanding this might be mitigated to some degree.

In this study, certain outcomes were tested for CTE versus non-CTE students as this was the focus of the study. In retrospect, it would have been useful to have tested all of the curricular groups on all questions rather than limiting the analysis to CTE versus non-CTE on some outcomes. Useful information might be gleaned if all curriculum groups were tested for all

outcomes in a future study. There may be nuances between the curricular groups that would appear if the data were considered at a more granular level. This is an area in need of further exploration since students are often dependent on guidance counselors and other adults to place them into a particular curricular path. A full understanding of the advantages and disadvantages of each would be helpful in advising students.

Further research is needed to determine whether CTE participation can be used to predict completion of specific types of educational programs and subsequent successful work in a related field. With 16 different Career Clusters, there is a possibility that CTE in some areas is more beneficial to the student working toward a career than other areas. A future study specifically examining the various career pathways a student might take could reveal variations in the results for these indicators.

While the ELS2002 study has concluded and the participants are no longer being followed, long-term longitudinal studies into employment satisfaction might clarify what happens over the course of a career. For example, are people still equally happy 20 years into their career? Studies show that pay for technical jobs stagnates and college graduates out-earn those with technical degrees or other job related training (Hill, 2014).

The ELS2002 data were extensive and documented many facets of secondary and post-secondary life, but the surveys did not capture the students' perceptions of their experience with CTE. In order to explore the student voice, and in particular students' experiences relating to CTE, a qualitative study addressing students' overall experience with completing a CTE pathway might help clarify some seemingly contradictory information that came to light during this study. For example, Lekes et al. (2007) indicated that students who complete a CTE pathway felt more prepared to transition from high school to post-secondary programs, but the current research does

not support this idea when considering whether students better predict their ultimate level of education. A deeper analysis of the CTE experience from the students' perspective would be accorded through such a qualitative study.

Discussion and Implications for Practice

The results from this study are perhaps most interesting because of what they do not show. For example, eight years after graduation, students who earned a CTE concentration in high school do not report greater job satisfaction than those who were non concentrators (for those who were working at that time). Conversely, students who prepare for college do not seem happier or more satisfied in their careers than those who directly prepare for a career or technical program, although a large majority of all students placed themselves in the top two categories of a five point scale for the component questions related to job satisfaction indicating they are generally satisfied. Carnevale, Jayasundera, and Hanson (2011) related that participation in high school CTE coursework has steadily decreased in recent years, and according to this report, the authors suggest this is because of the focus on traditional college as being the way to ensure a place in the middle class. The current research indicates that students who prepare for traditional college do not end up happier and more satisfied in their careers than those who participate in a CTE curricular concentration. Jobs data show an increase in middle-level jobs, those that require more than a high school diploma but less than a bachelor's degree, and that pay middle-class wages, defined by Carnevale et al. (2012) to be a minimum of \$35,000 per year, with no maximum specified.

In a descriptive study commissioned by CALDER-American Institutes for Research, Velez (2014) found that it was generally possible to predict which students would successfully

complete either a 2- or 4-year degree based on their “demographics, geographics, family background, and high school achievement” (p. 3). The suggestion is that it may be possible to identify students who are best prepared for each type of program, thus allowing for better advisement and increased positive outcomes. Based on the variables used in the current study, participating in a CTE concentration does not appear to better prepare students to predict their future educational attainment than those who are not CTE concentrators. Taking the most appropriate educational pathway to employment would benefit a person by cutting unnecessary time and money spent on training and education rather than earning money (Carnevale et al., 2012).

According to Carnivale, Jayasundera, and Hanson (2012), CTE in high school is voluntary because the U.S. education system does not track students into a career pathway that leads to exclusion of other options such as baccalaureate and beyond. Rather, the U.S. CTE system is uniquely flexible and allows students to explore careers, prepare for a career, and even switch careers later in life. Transferrable skills are a primary focus of CTE. Since students only spend a portion of their time in CTE coursework, ideally educators should be working across all disciplines to reinforce those skills. According to Bessen (2014), the skills gap is an actual phenomenon despite criticisms to the contrary. Bessen describes the gap not as a problem of the education system nor one of employers, but rather as one of the work force’s inability to adapt to new technologies and use them to their best advantage. According to the Talent Shortage Survey which is administered yearly, 39% of U.S. companies had difficulty filling positions in 2013 (Bessen, 2014). Bessen stated that “new technologies frequently require specific new skills that schools don’t teach and that labor markets don’t supply” (para 5). Thus, there is an interplay between education and industry that is not being effectively addressed.

Community and Technical colleges could be an important link in this supply chain. Attendance at these schools is increasing in part because families can save money by sending their child to them for the first two years of a bachelor's degree (Hill, 2014). In some fields the difference in salary is not largely discrepant from a bachelor's degree in the same field, but Hill notes that the discrepancy grows as time progresses and that after a person has 10 years of experience the difference can be as much as \$30,000 (Hill, 2014). This stagnation in wages could discourage students from obtaining technical training that could help remediate the skills gap.

The Every Student Succeeds Act (2015) has expanded career counseling and work-based learning opportunities and encourages increased collaboration with higher education and industry. These steps could help alleviate the disparity between education and industry in coming years. Carnevale et al. (2012) suggested that an exchange be formed that would allow CTE and the labor market to work together to better align CTE programs with industry standards. Such an alliance would also facilitate investing money to better link secondary and postsecondary CTE education with employer-based training.

There were some interesting anecdotal findings that appeared in this study. Approximately 12% of women earn a CTE concentration while 18% of men do so. This raises questions as to whether males are more often guided in the direction of vocational studies, or if males have more interest in the courses offered through the CTE program, or some other factor. When broken down by racial group, American Indian/Alaska Native and Black students have a relatively high participation in CTE (18-19%); Hispanic, multiracial, and White students are in the 12-16% range; and Asian/Hawaiian Native students only participate in CTE at a rate of 9% (with the overall rate being 15%). Again, what factors lead to these disparities are not known,

but the implications for advisors and counselors are many. The current study did not reveal any differences among these groups in terms of eventual job satisfaction, but that does help eliminate some of the concerns that a student might be wrongly placed in coursework that might one day hinder their enjoyment of their chosen profession.

Another demographic connection became evident in looking at the descriptive data for SES and job satisfaction. The CTE participation rates for students in the bottom two SES quartiles are approximately 20%. The third quartile is at 15%, which is just at the average, and the top quartile is at 8.7%. Less than half the number of students from high SES households participate in CTE as those from the lowest half of households. Are some students encouraged toward CTE more than others by parents, counselors and others, or do their life experiences shape their goals and ambitions? And how well are schools working with parents and students to insure that students are placed into coursework that adequately and effectively meets their educational needs? How well are counselors and other school officials trained in understanding the employment situation in their community and the skills gaps rendering employers responsible for training the schools did not provide?

The findings of this study raise questions about the mechanisms by which students who take CTE coursework complete educational programs in much higher numbers than those who did not engage in CTE coursework. Non-CTE students report enjoying high school more than their CTE counterparts, but once in the job market, all seem to be equally satisfied with their jobs. Since the longitudinal study upon which this study is based only followed students for eight years after graduation, differences that might occur midcareer once wages begin to stagnate for many skilled workers as compared to their traditionally college educated cohorts cannot be ascertained. The study indicated that more research is needed to help educators and employers

understand how to best identify which students will benefit from CTE and how to best educate those students to fill available jobs.

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APPENDIX A
SCANS SKILLS DETAIL

Below are the skills and competencies recognized as essential to enter the work environment by the 1992 SCANS report (p. x-xi).

Basic Skills: Reads, writes, performs arithmetic and mathematical operations, listens and speaks

A. *Reading* — locates, understands, and interprets written information in prose and in documents such as manuals, graphs, and schedules

B. *Writing* — communicates thoughts, ideas, information, and messages in writing; and creates documents such as letters, directions, manuals, reports, graphs, and flow charts

C. *Arithmetic/Mathematics* — performs basic computations and approaches practical problems by choosing appropriately from a variety of mathematical techniques

D. *Listening* — receives, attends to, interprets, and responds to verbal messages and other cues

E. *Speaking* — organizes ideas and communicates orally

Thinking Skills: Thinks creatively, makes decisions, solves problems, visualizes, knows how to learn, and reasons

A. *Creative Thinking* — generates new ideas

B. *Decision Making* — specifies goals and constraints, generates alternatives, considers risks, and evaluates and chooses best alternative

C. *Problem Solving* — recognizes problems and devises and implements plan of action

D. *Seeing Things in the Mind's Eye* — organizes, and processes symbols, pictures, graphs, objects, and other information

E. *Knowing How to Learn* — uses efficient learning techniques to acquire and apply new knowledge and skills

F. *Reasoning* — discovers a rule or principle underlying the relationship between two or more objects and applies it when solving a problem

Personal Qualities: Displays responsibility, self-esteem, sociability, self-management, and integrity and honesty

A. *Responsibility* — exerts a high level of effort and perseveres towards goal attainment

B. *Self-Esteem* — believes in own self-worth and maintains a positive view of self

C. *Sociability* — demonstrates understanding, friendliness, adaptability, empathy, and politeness in group settings

D. *Self-Management* — assesses self accurately, sets personal goals, monitors progress, and exhibits self-control

E. *Integrity/Honesty* — chooses ethical courses of action

Five Competencies

Resources: Identifies, organizes, plans, and allocates resources

A. *Time* & Selects goal-relevant activities, ranks them, allocates time, and prepares and follows schedules

B. *Money* & Uses or prepares budgets, makes forecasts, keeps records, and makes adjustments to meet objectives

C. *Material and Facilities* & Acquires, stores, allocates, and uses materials or space efficiently

D. *Human Resources* & Assesses skills and distributes work accordingly, evaluates performance and provides feedback

Interpersonal: Works with others

A. *Participates as a Member of a Team* & contributes to group effort

B. *Teaches Others New Skills*

C. *Serves Clients/Customers* & works to satisfy customers' expectations

D. *Exercises Leadership* & communicates ideas to justify position, persuades and convinces others, responsibly challenges existing procedures and policies

E. *Negotiates* & works toward agreements involving exchange of resources, resolves divergent interests

F. *Works with Diversity* & works well with men and women from diverse backgrounds

Information: Acquires and uses information

A. *Acquires and Evaluates Information*

B. *Organizes and Maintains Information*

C. *Interprets and Communicates Information*

D. *Uses Computers to Process Information*

Systems: Understands complex inter-relationships

A. *Understands Systems* & knows how social, organizational, and technological systems work and operates effectively with them

B. *Monitors and Corrects Performance* & distinguishes trends, predicts impacts on system operations, diagnoses deviations in systems' performance and corrects malfunctions

C. *Improves or Designs Systems* & suggests modifications to existing systems and develops new or alternative systems to improve performance

Technology: Works with a variety of technologies

A. *Selects Technology* & chooses procedures, tools or equipment including computers and related technologies

B. *Applies Technology to Task* & Understands overall intent and proper procedures for setup and operation of equipment

C. *Maintains and Troubleshoots Equipment* & Prevents, identifies, or solves problems with equipment, including computers and other technologies.

U.S. Department of Labor. Secretary's Commission on Achieving Necessary Skills. (1991). What work requires of schools. A SCANS report for America 2000 (pp. 60). Washington, DC

APPENDIX B
FEDERALLY RECOGNIZED CAREER CLUSTERS

Federally Recognized Career Clusters and Descriptions (Advance CTE, 2016a)

Career Cluster	Description
Agriculture, Food & Natural Resources	The production, processing, marketing, distribution, financing, and development of agricultural commodities and resources including food, fiber, wood products, natural resources, horticulture, and other plant and animal products/resources.
Architecture & Construction	Careers in designing, planning, managing, building and maintaining the built environment.
Arts, A/V Technology & Communications	Designing, producing, exhibiting, performing, writing, and publishing multimedia content including visual and performing arts and design, journalism, and entertainment services.
Business, Management & Administration	Careers in planning, organizing, directing and evaluating business functions essential to efficient and productive business operations.
Education & Training	Planning, managing and providing education and training services, and related learning support services such as administration, teaching/training, administrative support, and professional support services.
Finance	Planning and related services for financial and investment planning, banking, insurance, and business financial management.
Government & Public Administration	Planning and executing government functions at the local, state and federal levels, including governance, national security, foreign service, planning, revenue and taxation, and regulations.
Health Science	Planning, managing, and providing therapeutic services, diagnostic services, health informatics, support services, and biotechnology research and development.
Hospitality & Tourism	Preparing individuals for employment in career pathways that relate to families and human needs such as restaurant and food/beverage services, lodging, travel and tourism, recreation, amusement and attractions.
Human Services	Preparing individuals for employment in career pathways that relate to families and human needs such as counseling and mental health services, family and community services, personal care, and consumer services.

Information Technology	Building linkages in IT occupations for entry level, technical, and professional careers related to the design, development, support and management of hardware, software, multimedia and systems integration services.
Law, Public Safety, Corrections & Security	Planning, managing, and providing legal, public safety, protective services and homeland security, including professional and technical support services.
Manufacturing	Planning, managing and performing the processing of materials into intermediate or final products and related professional and technical support activities such as production planning and control, maintenance and manufacturing/process engineering.
Marketing	Planning, managing, and performing marketing activities to reach organizational objectives such as brand management, professional sales, merchandising, marketing communications, and market research.
Science, Technology, Engineering & Mathematics	Planning, managing, and providing scientific research and professional and technical services (e.g., physical science, social science, engineering) including laboratory and testing services, and research and development services.
Transportation, Distribution & Logistics	The planning, management, and movement of people, materials, and goods by road, pipeline, air, rail and water and related professional and technical support services such as transportation infrastructure planning and management, logistics services, mobile equipment and facility maintenance.

APPENDIX C

IRB FORM A AND APPROVAL



Institutional Review Board

**FORM A:
APPLICATION FOR REVIEW OF RESEARCH INVOLVING HUMAN
SUBJECTS**

INVESTIGATOR’S ASSURANCE: By submitting this protocol, I attest that I am aware of the applicable principles, policies, regulations, and laws governing the protection of human subjects in research and that I will be guided by them in the conduct of this research.

Title of Research: **EDUCATIONAL AND EMPLOYMENT OUTCOMES FOR STUDENTS WHO COMPLETE A HIGH SCHOOL CAREER AND TECHNICAL CONCENTRATION**

		Dept	Mail Code	Email
Principal Investigator	Terri Hayes	LEAD		tgm562@mocs.utc.edu
Other Investigator				
Other Investigator				
Faculty Advisor	Dr. Ted Miller	LEAD		Ted-miller@utc.edu

Anticipated dates of research project: 10/15/2016 through 10/15/2017

Type of Research:

- Dissertation/Thesis Class Project
 Faculty Research Other (Please explain):

If this research pertains to a grant opportunity: Grant Start Date:

Funding Agency:

Please check that all of the following items are attached (where applicable) before submitting the application:

- Any research instruments (any tests, surveys, questionnaires, protocols, or anything else used to collect data)
- All informed consent documents (see www.utc.edu/irb for sample informed consent documents)
- Permission from applicable authorities (principals of schools, teachers of classrooms, etc.) to conduct your research at their facilities
- Appropriate permission and signatures from your faculty advisor (if applicable).
- Please be sure the entire application is filled out completely.

All student applications must be either signed by the faculty advisor then scanned and submitted electronically, OR submitted directly by the faculty advisor.

- Allow at least 2 weeks for IRB processing from date of submission.
- You may not begin your research until it has been officially approved by the IRB.
- This form should not be used if your research involves protected health information. Please refer to the HIPAA section of the website (www.utc.edu/irb) for the appropriate forms.

All applications should be submitted by email to instrb@utc.edu.

Purpose/Objectives of Research: Briefly state, in non-technical language, the purpose of the research and the problem to be investigated. When possible, state specific hypotheses to be tested or specific research questions to be answered. For pilot or exploratory studies, discuss the way in which the information obtained will be used in future studies so that the long term benefits can be assessed.

The purpose of this research is to determine whether students who have a concentration in Career Technical Education coursework while in high school reap future benefits in terms of career satisfaction and other criteria. The research questions to be explored are as follows:

- RQ1- Is there a difference in job satisfaction between students with an academic concentration only and students with both academic and CTE concentrations?
- RQ2- Is there a difference in job satisfaction between students with different curricular concentrations (academic only, academic and occupational (CTE), occupational only, and other)?
- RQ3- Is there a difference in job satisfaction between each testable ethnic and gender group between students with a CTE concentration and those without a CTE concentration?

- RQ4- Is there a difference in job satisfaction between socioeconomic groups between those with a CTE concentration and those without a CTE concentration?
- RQ5- Is there a difference in perception of school as interesting, challenging, and enjoyable between students with a CTE concentration and those without a CTE concentration?
- RQ6- Is there a difference in the prediction of future educational attainment between students with a CTE concentration and students without a CTE concentration?

Relevant Background and Rationale for the Research: This section should present the context of the work by explaining the relation of the proposed research to previous investigations in the field. Include citations for relevant research. Please include at least twice as many peer reviewed articles as “lay” publications.

The central questions to be explored by this research are which groups of students benefit most from participating in Career Technical Education in high school, and in what ways do they benefit?

Dropping out of school carries with it consequences for individual students as well as for society. High school dropouts earned an estimated \$9,200 less per year than high school graduates, and over \$1 million less over their career than do college graduates (Bridgeland et al., 2006). But without the necessary skills to be successful in schools and training, it stands to reason that students would be less able and less inclined to complete educational programs. In 2012, the United States ranked 15th in the world in college completion, falling from number two 30 years ago (Greenstone et al., 2012). According to a report by the U.S. Department of Education (2011) U.S. Department of Education (2011) U.S. Department of Education (2011) U.S. Department of Education (2011) U.S. Department of Education (2011) U.S. Department of Education (2011) U.S. Department of Education (2011) U.S. Department of Education (2011) U.S. Department of Education (2011), there was a strong correlation between completing a CTE concentration and completing educational programs, and this study will seek to clarify that relationship. Additionally, students from low socioeconomic backgrounds and certain ethnic backgrounds have historically not taken advantage of postsecondary educational opportunities in as large numbers as their majority counterparts. Discovering whether CTE concentrators in these demographic categories benefit and close this gap would be beneficial for education policy makers.

Methods/Procedures: Briefly discuss, in non-technical language, the research methods which directly involve use of human subjects. Discuss how the methods employed will allow the investigator to address his/her hypotheses and/or research question(s).

There will be no contact with human subjects. All data are available online and cannot be tied to the subjects. Using the data from the ELS2002 longitudinal survey study, descriptive and statistical analyses will be performed to attempt to answer the questions listed above. Parametric

and non-parametric statistical tests will be used to examine patterns in the data and a careful interpretation of the results will attempt to establish meaning.

Subject Population: List the size of population to be used, and check if any of the populations listed apply to the study. Discuss criteria of selection or exclusion, population from which they will be selected, and duration of involvement. NOTE: Federal guidelines require selection of subjects be equitable within the exclusions, and subjects meeting the criteria cannot be discriminated against for gender, race, social or financial status, or any other reason.

Describe Sample: The sample includes approximately 15,000 tenth graders who were followed longitudinally for 10 years. This sample was originally obtained by the National Center for Education Statistics using a stratified probability sampling procedure with an oversampling procedure to account for underrepresented groups.

Approximate Number of Subjects: 15,000

Subjects Include (check if applicable):

- Minors (under 18)
- Involuntarily institutionalized
- Mentally handicapped
- *Health Care Data/Information

*Visit www.utc.edu/irb to download and complete additional HIPAA forms.

Informed Consent: Describe the consent process and attach all consent documents. See www.utc.edu/irb for sample informed consent forms and complete information regarding informed consent. All research must be conducted with the informed consent (signed or unsigned, as required) of all participants.

Data from an extant database will be used. The issue of minors and permission to participate most certainly was addressed by the original researchers who obtained the survey results. I have secured permission to access the database and to use the data by agreeing to the ‘terms of use’ tied to the data. The database is public and anyone is able to access and use the data once they agree to the terms. See attached at end of IRB application.

Incentives: Indicate whether or not subjects are to be paid, how and when they will be paid, amount, and the rationale for payment. The proposed payment should be commensurate with the time required for participation, travel expenses, and/or inconvenience assumed by the subject, but should not be so great as to constitute undue influence on an individual to assume risks of study participation that would not otherwise be undertaken.

Individual subjects will not be indentified or contacted during the review of the publicly available group data.

Risks/Benefits to Participants and Precautions to Be Taken: This section should discuss all possible risks and discomforts from participation in the study, indicating both severity and likelihood of occurrence for each. Risks may range from the physical to the psychological. Inconvenience, travel, or boredom may also be considered risks of participation in the study. The methods that will be used to minimize these risks should also be discussed. Many studies hold the potential for loss of privacy and confidentiality. These concerns should be noted in this section. If subjects are vulnerable populations, or if risks are more than minimal, please describe what additional safeguards will be taken.

There is no risk to subjects involved in this study. The data that will be used for the proposed study will be downloaded from an extant database and represents answers to surveys that have already been administered by the National Center for Education Statistics, a division of the U.S. Department of Education. There is also academic information that has been taken from these same students' high school transcripts. There is no way for this researcher to know the identity or location of any individual subject.

The questionnaires originally used to gather the data that will be used for this study can be accessed at the following website: <http://nces.ed.gov/surveys/els2002/questionnaires.asp>

Privacy/Confidentiality: Please describe whether the research would involve observation in situations where subjects have a reasonable expectation of privacy. If identifiable existing records are to be examined, has appropriate permission been sought, i.e. from institutions, subjects, and physicians? What provision has been made to protect the confidentiality of sensitive information about individuals? Are research records anonymous? If not, there should be discussion of how records will be coded, and where and how they will be stored. It should also note where and how signed consent forms will be maintained. If video or audio tapes will be made as part of the study, disposition of these tapes should be addressed. In general, the IRB recommends that research tapes be destroyed as soon as the needed data are transcribed, and that only restricted study personnel be allowed access to the tapes. List the names of individuals who will have access to names and/or data. If other procedures are proposed [for example, retaining tapes for future use, allowing individuals other than study investigators access to the tapes] justification should be presented and separate. There will be no contact with subjects during the proposed study. The subjects involved have already answered surveys and the data has been grouped by the original researcher so that there is no way for me to determine the identity or even locality of any individual.

Signatures:

Terri L. Hayes

Principal Investigator or Student

Date

*Faculty Advisor (for student applications)

Date

** If submitted by a faculty member, electronic (typed) signatures are acceptable. If submitted by a student, please print out completed form, obtain the faculty advisor's signature, scan completed form, and submit it via email. Only Word documents or PDF files are acceptable submissions.*

[Print Page](#)

NCES DATA USAGE AGREEMENT

Under law, public use data collected and distributed by the National Center for Education Statistics (NCES) may be used only for statistical purposes. Any effort to determine the identity of any reported case by public-use data users is prohibited by law. Violations are subject to Class E felony charges of a fine up to \$250,000 and/or a prison term up to 5 years.

NCES does all it can to assure that the identity of data subjects cannot be disclosed. All direct identifiers, as well as any characteristics that might lead to identification, are omitted or modified in the dataset to protect the true characteristics of individual cases. Any intentional identification or disclosure of a person or institution violates the assurances of confidentiality given to the providers of the information. Therefore, users shall:

- Use the data in any dataset for statistical purposes only.
- Make no use of the identity of any person or institution discovered inadvertently, and advise NCES of any such discovery.
- Not link any dataset with individually identifiable data from other NCES or non-NCES datasets.

To proceed you must signify your agreement to comply with the above-stated statutorily based requirements. This window will close and you can now download the file.

[I agree to the terms above.](#)

[I do not agree. Close window.](#)

Institutional Review Board
Dept. 4915
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Chattanooga, TN 37403-2598
Phone: (423) 425-5867
Fax: (423) 425-4052
instrb@utc.edu
<http://www.utc.edu/irb>

MEMORANDUM

TO: Terri Hayes **IRB # 16-160**
Dr. Ted Miller

FROM: Lindsay Pardue, Director of Research Integrity
Dr. Amy Doolittle, IRB Committee Chair

DATE: 11/9/2016

SUBJECT: IRB #16-160: Educational and Employment Outcomes for Students who Complete a High School Career and Technical Concentration

The IRB Committee Chair has reviewed and approved your application and assigned you the IRB number listed above. You must include the following approval statement on research materials seen by participants and used in research reports:

The Institutional Review Board of the University of Tennessee at Chattanooga (FWA00004149) has approved this research project # 16-160.

Since your project has been deemed exempt, there is no further action needed on this proposal unless there is a significant change in the project that would require a new review. Changes that affect risk to human subjects would necessitate a new application to the IRB committee immediately.

Please remember to contact the IRB Committee immediately and submit a new project proposal for review if significant changes occur in your research design or in any instruments used in conducting the study. You should also contact the IRB Committee immediately if you encounter any adverse effects during your project that pose a risk to your subjects.

For any additional information, please consult our web page <http://www.utc.edu/irb> or email instrb@utc.edu

Best wishes for a successful research project.

APPENDIX D

DESCRIPTION OF VARIABLES

	Variable Label	Levels of the Variable	Scale of Measurement
Independent (Attribute) Variables	Gender	1= male 2= female	Nominal
	Race	1= American Indian/Native Alaskan-non-Hispanic 2= Asian/Pacific Islander 3= Black/African American 4= Hispanic-no race specified 5= Hispanic-race specified 6= Multi-racial 7= White-non-Hispanic	Nominal
	Family Income	1= lowest quartile 2= second quartile 3= third quartile 4= highest quartile	Ordinal
	Curricular concentration	1= Academic concentrator 2= Occupational concentrator 3= Academic and Occupational concentrators 4= other	Nominal
Dependent Variables	Interest in school	Classes are interesting and challenging? 1= strongly agree 2= agree 3= disagree 4= strongly disagree	Ordinal
		How much do you like school? 1= not at all 2= somewhat 3= a great deal	Ordinal
	Expectancy outcomes for education	Student's attainment 8 years after high school versus tenth grade prediction. 1= exceeded 2= met	Ordinal

		3= did not meet	
	Employment satisfaction	Continuous (scaled) Composite score job satisfaction index.	Interval

VITA

Terri Hayes is a science teacher at Gordon Lee High School in Chickamauga, GA. Following high school, she enrolled at the University of the South and later transferred to the University of Alabama where she earned a B.S. in Psychology and an M.A. in Counselor Education. Following graduation, she went to work at Fortwood Center in Chattanooga, TN as a child and adolescent therapist. Later, she moved to Dickson, TN and took a position at an inpatient diagnostic and acute care unit at Goodlark Hospital. After two years she moved back to Chattanooga and worked for Joseph Johnson Mental Health Center as a therapist for the residents of several adolescent group homes. She joined the team tasked with opening the first Alternative Education Center in nearby Walker County GA and taught science and math there for four years while taking coursework to become a certificated teacher. She then went to Ridgeland High School in Rossville, GA where she taught science for two years and earned her Ed.S. in Education Leadership from Lincoln Memorial University. This was followed by a seven year stint at Gordon Lee High School in Chickamauga, GA including work on a number of projects through the GA Department of Education and in 2007, she took a job at the DOE as a Science Mentor where she worked to improve science education in the state. She went to work for NWGA RESA, a support and training organization for educators for four years prior to returning to the classroom. In 2018, she earned an Ed.D. in Learning and Leadership from the University of Tennessee at Chattanooga.