SECONDARY CAREER AND TECHNICAL STUDENT ACHIEVEMENT
MEASURED BY THE MISSISSIPPI CAREER PLANNING
AND ASSESSMENT SYSTEM

By
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The purpose of this study was to examine the relationship of teacher attributes and school contextual factors to student achievement in career and technical education in Mississippi. The teacher attributes years of teaching experience, degree(s) of attainment, professional development, and national board certification were included as independent variables. Additionally, the contextual factors of enrollment, academic achievement, and socio-economic status were included as independent variables. The statewide standardized assessment for career and technical education was used as the dependent variable measuring student achievement at the school district, career and technical program area, and individual career and technical course levels. The predictor model including all independent variables resulted in statistically significant variance explained in student achievement. National Board for Professional Teaching Standards® showed a statistically significant positive impact on student achievement at the school district level, the cooperative education and marketing program level, and the following five individual career and technical courses: allied health, automotive service technology, business and
computer technology, early childhood services and education, and horticulture.

Additionally at the career and technical program level, academic achievement and
degree(s) of attainment showed positive impacts on student achievement. Also, on the
program level, more years of teaching experience, higher enrollment, and higher levels of
socio-economic status showed negative impacts on student achievement. On the school
district and program levels, attendance at the professional development workshop had a
negative impact on career and technical student achievement.

Key words: career and technical, student achievement, predictors, vocational education
DEDICATION

My entire graduate education experience and this dissertation research are dedicated in honor and memory of Dr. Cindy H. Rose. She was the educators’ educator, a consummate professional, intelligent and strong woman, a mentor, and a friend. She counseled me in the very beginnings of my graduate school journey in pursuit of a master’s degree, and she helped to instill in me a zest for life and learning. As I reach the close of this doctoral passage, I imagine her being proud of her pupil and exclaiming, “Wunderbar!”. 
I wish to express sincere gratitude to all of the family, friends, colleagues, and fellow graduate students who provided support, encouragement, and assistance as I pursued this degree. Special recognition is given to the dissertation committee members. To Dr. Jerry Mathews who provided guidance and a flexible schedule. To Dr. Vince McGrath who gave words of encouragement, calmed fears, and eased my angst on numerous occasions during the process. To Dr. Ed Davis who always gave a reassuring smile and started this doctoral journey with my first course in the program of study. To Dr. Patti Abraham who provided enduring support and made me believe it could be done! Finally, I would like to thank Kelly Agee, Dr. Dwight Hare, Leanne Long, Ashleigh Murdock, and Jake Walker for lending their unique areas of expertise during this process.
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CHAPTER I
INTRODUCTION

Schools in today’s Age of Accountability are bound by standards set forth in federal and state legislation that control funding for programs essential to the livelihood of schools and economic development of communities. The Age of Accountability in the field of education has brought about a regimen of testing among students to show attainment toward established goals in order to sustain funding for programs at the local district level. An increase in standardized testing has brought the focus of education on the end product of student scores (Cruickshank & Haefele, 2001). Savage, Savage, and Armstrong (2006) speak of the “erosion of confidence in educators” today and the enforcement of accountability measures as one way of making teachers responsible for the outcomes of their teaching. They support the standardized test result as a fair and effective way to hold teachers accountable.

The focus of much of the post-No Child Left Behind (NCLB) research lends itself to a view of student success through the window of academic achievement. Little to no research has been conducted to provide an analysis of the effectiveness of secondary career and technical education (CTE) programs in regard to student achievement. Yet, many individuals in state level education are dedicated to making sure that individual CTE programs are compliant with the federal legislation that funds CTE and other CTE
issues related to NCLB. Career and technical educators are held accountable not only to the NCLB mandate but also to the Carl D. Perkins Career and Technical Education Act of 2006, the federal funding source for CTE. Rojewski (2002) explains that accountability, from a national perspective, has been at the core of CTE for a long time and Perkins III required states to take a closer look at program quality. He further states that attention should be focused on how program quality is defined and that a variety of information should be analyzed to determine quality. The role of the career and technical educator is not a cookie-cutter image of the secondary academic educator. Much of the same skill set is necessary to be successful in both settings; however, the career and technical educator must also be concerned with issues such as nontraditional student placement, academic attainment, career placement, CTE student organizations, adult education programs, special populations, lobbying for funding, and development of industry partnerships (Smith & Edmunds, 1999). While studies that have been conducted previously offer some insight into possible correlations of teacher or school attributes to academic student achievement, this study examined the relationship of career and technical educators’ attributes and school contextual factors to CTE student achievement.

In total, states reporting progress on federal accountability mandates may include numerous factors such as attendance rates, dropout rates, graduation rates, CTE program completers, college entrance rates, job placement rates, and a variety of testing data. These may be considered measures of accountability contingent upon the indicator of progress in question. Ravitch (2007) refers globally to educational accountability as “measurable proof that teachers, schools, districts, and states are teaching students
efficiently and well” (p. 8). That is, educators are required to be accountable for knowing what they teach and how to teach it as determined by student achievement in a given content area. Depending on the circumstance, student achievement may be measured using different areas of the student and school environment or outcomes. In many cases, student achievement is measured based on the outcomes of standardized testing.

In Mississippi, the CTE delivery system is guided by a *Mississippi State Plan for Vocational and Technical Education* that is aligned to the Carl D. Perkins federal law (MDE, 2001). A part of this plan imposes accountability upon CTE teachers to deliver high-quality programs as measured by student success on the statewide CTE assessment called the Mississippi Career Planning and Assessment System, 2nd edition (MS-CPAS2). The state plan, a guiding theoretical framework for CTE in Mississippi, provides a monitoring system that determines whether an individual CTE program is successful or should be placed in improvement status and possibly closed. Reeves (2002) argues that the degree of excellence in classroom teaching is directly related to student achievement. This places an incredible responsibility on CTE administrators to make scrupulous decisions regarding hiring, placement, and professional coaching of CTE teachers. The volume of accountability data that is provided to CTE administrators can be overwhelming and oftentimes deemed too much information to assist in making sound decisions. With threats of schools losing CTE programs and communities losing potential educated workforce due to inadequate MS-CPAS2 testing scores, a focused examination of possible predictors of CTE student achievement is beneficial.
This correlational study examined attributes of secondary CTE teachers and contextual factors of CTE centers or high schools in Mississippi that may be predictors of secondary career and technical student achievement as measured by the MS-CPAS2. This study focused on career and technical students in grades 10–12 in the Mississippi secondary CTE system. Secondary CTE teacher attributes examined include the following: number of years of teaching experience, degree(s) of attainment, national board certification, and participation in the professional development experience related to using testing data for instructional improvement. CTE center or high school contextual factors examined include the following: enrollment, Mississippi Assessment and Accountability Reporting System (MAARS) school performance classification, and socio-economic status. A multiple linear regression analysis was used to examine correlations between CTE teacher attributes and student achievement and CTE center or high school contextual factors and student achievement as measured by mean scores by location and by individual CTE program on the MS-CPAS2. An additional analysis of variance was conducted to compare differences in mean MS-CPAS2 scores of national board certified CTE teachers and non-national board certified CTE teachers by CTE course level.

Statement of the Problem

The literature is replete with studies investigating factors related to student achievement. Many of these studies have been conducted as qualitative or case study designs. Some of the same variables proposed in this study have been included in other
studies, such as enrollment and teacher’s level of educational attainment. However, studies have not quantitatively looked at this combination of attributes of CTE teachers in relationship to CTE student achievement or the contextual factors of a CTE center or high school in relationship to CTE student achievement. Furthermore, CTE student achievement measured in terms of a statewide, standardized technical skills assessment and the quantitative correlation to CTE attributes and CTE center or high school contextual factors have not been examined.

This study aimed to determine whether or not there is a relationship between secondary CTE teachers’ attributes of number of years of teaching experience, degree(s) of attainment, national board certification, and participation in the professional development experience related to using testing data for instructional improvement and secondary CTE student achievement. Furthermore, this study aimed to determine whether or not there is a relationship between school level contextual factors of enrollment, MAARS school performance classification, and socio-economic status and CTE student achievement. Additionally, the study aimed to determine differences in the CTE student achievement of national board certified teachers and non-national board certified teachers.

Hypotheses

1. There will be no statistically significant correlation in the relationship between the achievement of secondary career and technical students and attributes of secondary career and technical teachers based on number of years of teaching experience.
experience, degree(s) of attainment, national board certification, and participation in the professional development experience by district location.

2. There will be no statistically significant correlation in the relationship between the achievement of secondary career and technical students and district level contextual factors including enrollment, MAARS school performance classification, and socio-economic status by district location.

3. There will be no statistically significant correlation in the relationship between the achievement of secondary career and technical students and attributes of secondary career and technical teachers including number of years of teaching experience, degree(s) of attainment, national board certification, and participation in the professional development experience and the contextual factors of MAARS school performance classification, and socio-economic status, by the seven individual career and technical program areas.

4. There will be no statistically significant difference in student achievement of secondary career and technical students between the groups of national board certified career and technical teachers and non-national board certified career and technical teachers by individual career and technical course.

Justification of the Study

Given the gap in the literature regarding CTE student achievement in relationship to CTE teacher attributes and CTE center or high school contextual factors, this study was worthy of investigation. The recent reauthorization of the Carl D. Perkins law
requires a stricter level of scrutiny on the achievement of CTE students. Examination of the variables mentioned here and their relationship to CTE student achievement—the measure of CTE program and student success—will inform state and local district education leaders in Mississippi with essential information regarding instructional programs, recruitment of teachers, professional development, and coaching for CTE administrators and teachers. It is useful to recognize any significant relationships from this study to investigate further differences between CTE centers and individual programs with high-achieving students and those with low-achieving students.

Limitations of the Study

This study will be limited to 10th–12th grade secondary CTE students in the state of Mississippi who participate in the statewide, standardized assessment MS-CPAS2. External validity of the study may be threatened due to the generalizability of the results being limited to 10th–12th grade secondary CTE students in the state of Mississippi.

Definitions of Terms

For the purpose of this study, the following operational definitions were used:

**Achievement Level Index (ALI):** According to the Mississippi Public School Accountability Standards, the ordinal metric used to report the average school performance based on student achievement measured by academic standardized tests; higher ALI values represent overall school performance.
Career and Technical Education (CTE): According to the *Mississippi State Plan for Vocational and Technical Education*, which the state system operated under during the time of the data collection for this study, CTE refers to organized, competency-based educational programs offering a sequence of occupational courses directly related to the preparation of secondary students’ employment. The terms *career and technical education* and *vocational education* are used interchangeably in this research document.

Carl D. Perkins Vocational and Applied Technology Education Act of 1998: The federal law the state of Mississippi operated under during the period of time the data was collected for this study for the funding and delivery of career and technical education. In this document, this term is also referred to as Perkins 1998 or Perkins III.

Carl D. Perkins Career and Technical Education Improvement Act of 2006: The recent reauthorization of Perkins III funds career and technical education. It is also referred to in this document as Perkins IV.

Contextual Factors: These factors are related to the nature of characteristics of the unique school or district setting; this does not include teacher characteristics.

CTE Administrator: This person is charged with the leadership role in a vocational center or high school. He or she leads the career and technical education faculty and staff in the delivery of CTE programs. In this document, CTE administrator may also be referred to as CTE director or vocational director.

CTE Course: This is a secondary, two-year occupational course offering within one of the seven CTE program areas.
CTE Curriculum: This is the statewide adopted competency-based curriculum framework for each CTE course in Mississippi. CTE curricula are standards- and research-based and aligned with the Mississippi Career Planning and Assessment System, 2nd edition instrument.

CTE Program: The seven areas of classification for CTE in Mississippi include Agriculture Sciences, Business and Computer Technology, Cooperative Education and Marketing, Family and Consumer Sciences, Health Sciences Technology, Technology Applications, and Trade and Industrial Technology.

CTE Teacher: This is the person assigned to teach a particular course within a CTE program area.

Data Retreat: This focused, customized professional development for secondary CTE administrators and teachers helps them make instructional decisions that lead to student improvement. Participants learn how to interpret assessment data and use innovative instructional strategies to improve teaching and learning in their classrooms. Data retreat participation is examined at the school level and the program level as percentage of those who participated.

Degree(s) of Attainment: The degree(s) of attainment for CTE teachers at the school level and the program area level are examined as percentage with less than a bachelor’s degree and percentage with a bachelor’s degree or higher.

Enrollment: This is the number of students enrolled in a particular two-year occupational skills course who are classified as a completer and took the MS-CPAS2 end of course assessment.
Mississippi Assessment and Accountability Reporting System (MAARS) School Performance Classification: According to the 2006 Mississippi Public School Accountability Standards, individual school performance classification levels are assessed annually based upon the percentage of students performing at set criterion levels and the degree to which student performance has improved over time. For high schools, criterion levels are based on students’ performance on the Mississippi Subject Area Testing Program (SATP). Improved performance over time is determined based on an expected growth value for the individual high school.

Mississippi Career Planning and Assessment System, 2nd edition (MS-CPAS2): This state-mandated valid and reliable standardized testing instrument assesses student achievement in 2-year occupational skills career and technical courses. The MS-CPAS2 is aligned to the CTE statewide curriculum frameworks. The MS-CPAS2 scores are examined as average scores by school level, CTE program area, and CTE course.

Mississippi State Plan for Vocational and Technical Education: The implied theoretical framework for delivery of CTE in the state of Mississippi, this document is approved by the Mississippi State Board of Education and the U.S. Department of Education Office of Vocational and Adult Education.

National Board Certification: This nationally recognized teacher certification is in an area of specialization, career and technical or otherwise, by the National Boards for Professional Teaching Standards® organization.

Socio-economic Status: The percentage of students in the school district classified as free or reduced lunch status.
**Special Populations:** According to the *Mississippi State Plan for Vocational and Technical Education*, which the state system operated under during the time of the data collection for this study, special populations refers to individuals with disabilities, those who are economically disadvantaged, nontraditional students, single parents, displaced homemakers, and students with limited English proficiency.

**Student Achievement:** The cut score on the MS-CPAS2 results is used to determine mastery for each career and technical program area in spring 2007.

**Subject Area Testing Program (SATP):** The testing program includes four academic, end-of-course tests in Algebra I, Biology I, English II, and U.S. History from 1877. The percentage of students scoring basic and proficient on these instruments determines, in part, the school performance classification.

**Vocational Education:** According to the *Mississippi State Plan for Vocational and Technical Education*, which the state system operated under during the time of the data collection for this study, vocational education refers to organized, competency-based educational programs offering a sequence of occupational courses directly related to the preparation of secondary students’ employment. The terms *vocational education* and *career and technical education* are used interchangeably in this research document.

**Years of Teaching Experience:** The average number of years of teaching experience a CTE teacher has on record with the Mississippi Department of Education; this does not refer to the number of years experience in business and industry. This average number of years teaching experience is examined at the school level and by CTE program area.
Summary

This document is organized into five chapters. Chapter 1 provides the statement of the problem and justification for conducting this research, the hypotheses, limitations of the study, and operational definitions of terms for the study. Chapter 2 includes a comprehensive review of the literature in the field of education related to the study. Literature is included on the history and philosophy of CTE, the *Mississippi State Plan for Vocational and Technical Education* as a theoretical framework, independent variables in question, and the use of standardized testing to measure student achievement. Chapter 3 provides information on the research design, sample in the study, data collection, dependent variable, and the statistical analyses used. Chapter 4 provides the results of the analysis. Chapter 5 summarizes the findings, provides conclusions of the researcher, and includes implications for further research on this topic.
CHAPTER II
REVIEW OF LITERATURE

Introduction

Many studies exist in the field of education regarding the examination of student achievement. Studies that examine the relationships among such instructional factors as academic high-stakes tests compared to CTE achievement (Bass, 2006; Elliot & Zimmerman, 2002; Mooneyham, 2005; Sconyers, 2006) and contextual factors such as absenteeism (Todd, 2006) and dropout rates (Newman, 1991) compared to CTE student achievement have emerged. However, the balance of achievement studies reflects a focus on academic education, not career and technical education (Benigno, 2005; Clotfelter, Ladd, & Vigdor, 2007; Cordonnier, 2007; Herring, 1997; Holland, 2006; Kane, Rockoff, & Staiger, 2007; Rosenthal, 2007; Rouse, 2004). This study aimed to reflect the uniqueness of career and technical education as well as investigate predictors of CTE student achievement on the statewide, standardized technical skills assessment MS-CPAS2. Results of this study may be used by state and local CTE leaders to make informative decisions about CTE staffing and instruction. Plisko (2001), the acting commissioner of the National Center of Educational Statistics, reinforced the need for more CTE data in the field of education. CTE is undergoing reforms, and with the recent reauthorization of the Carl D. Perkins law, it begs a look at informative data to make
purposeful educational decisions at the state and local levels. In this chapter, a history of
career and technical education in the United States is discussed. An examination of the
philosophy of career and technical education and a description of the *Mississippi State
Plan for Vocational and Technical Education* are presented as the guiding theoretical
framework for the CTE delivery system in Mississippi. Previous investigations related to
student achievement and the selected independent variables of the study are discussed.

**History of Career and Technical Education in the United States**

A reflective look at the development of career and technical education in the
United States is a historical walk through the social, economic, and political influences of
the times. The advent of informal career and technical education, then known as
vocational education, in the United States may be traced all the way back to the pre-
industrial, colonial apprenticeships (McCaslin & Parks, 2002). Youth apprenticed under
masters of their craft for a period of possibly 10 years. During the 1700s, master
craftsmen recognized the need for their apprentices to learn basic academic skills. This
training was conducted separately from the skilled apprenticeship. The land grant
colleges, established by the Morrill Act in 1862, provided the springboard to the first of a
litany of federal legislation for formalized vocation education, called the Smith–Hughes Vocational Education Act of 1917. Since its inception, this legislation has intended to
serve national defense efforts; reduce unemployment; assist with training and retraining
of soldiers and civilians, training of women during wartime, and training of minorities
and disadvantaged youth; and assist with economic and career development (Lynch,
More than 80 years ago, the U.S. government listened to advocates and began a steadfast, often challenged, commitment to the educational and economic enterprise of vocational education. This section of chapter 2 presents a historical perspective of career and technical education through the lens of the ongoing federal laws that support it; the historical significance of career and technical education is indicative of its paramount importance to the American educational system.

The Smith–Hughes Act (Public Law 64-347), signed into law by President Woodrow Wilson, is referred to by many in the educational field as the formalized starting point of the current career and technical education system in the U.S. (Rojewski, 2002; Scott & Sarkees-Wircenski, 2004). This legislation provided federal funding for public secondary education in the fields of agriculture, skilled trades, and home economics. According to the Association of Career and Technical Education (2002), the initial 1.7 million dollar federal appropriation funded what was then referred to as vocational education and established an administrative oversight group, the Federal Vocational Education Board, and required states to establish separate state boards for vocational programs and match the federal funds for delivery of the vocational education. State vocational boards were required to submit state plans for the use of funding to the federal board. These state plans are the guiding framework for states’ delivery of career and technical education and are still a major requirement of the law that funds CTE today (Stasz & Bodilly, 2004). Two groups of regional vocational education supporters joined forces in 1926 to establish the American Vocational Association (AVA), a national advocacy organization for vocational education. This organization shepherded the
evolution of vocational education in the United States to what is now referred to as career and technical education, watching it grow into a significant and respected part of the secondary and postsecondary American education system. Today this professional organization is called the Association of Career and Technical Educators (ACTE) and is a powerful, public policy force on Capitol Hill to ensure equity and quality execution of CTE’s goals, and it is essential to the collection and dissemination of accurate and pertinent information to CTE stakeholders (ACTE, 2002).

During the 20 or so years following the passage of the Smith–Hughes Act, vocational advocates often fought for funding, and as a result the country has seen numerous laws providing federal funding in one way or another for vocational education. By 1936, 14 million dollars was allocated for vocational programming in agriculture, home economics, trade and industrial skills, and distributive education programs by the George Deen Act (Public Law 70-702). Additional programs were added as the workforce needs of the country moved more toward an industrial society.

With the ebb and flow of funding, the Federal Vocational Education Board eventually merged into the U.S. Office of Education. However, vocational education was and still is an essential thread woven in the fabric of the American economy since its informal inception during colonial times. Since the formalization of vocational education in this country, the AVA has played a large advocacy role with the federal government as well as a large support role for the federal government. During economic shifts in the United States, such as the Great Depression and World War II, the AVA ensured support
for workforce training, not only agricultural skills but also for a new industrial society and the training of women for their “Rosie the Riveter” roles (ACTE, 2002).

By the mid-1940s, annual federal funding for vocational education was about 30 million dollars. During the post-World War II era, vocational education played a large role in the retraining of veterans through President Franklin D. Roosevelt’s G.I. Bill of Rights. In the 1950s, political candidates began including vocational education as a part of their platforms. Many political and vocational education leaders worked with the U.S. Congress during these years to show the absolute critical need for increasing and sustaining funding for vocational programming to keep pace with a global marketplace and the major economic Cold War competitors at the time, the Russians. The 1950s decade ended with federal funding for vocational education topping 40 million dollars (Smith & Edmunds, 1999).

In 1967, AVA historian Melvin Barlow stated that vocational education was a socio-economic endeavor, meaning that by design vocational education was created for the best interest of people with the focus of occupational training for a better society (ACTE, 2002). The evolution of vocational education in the 1960s reflects Barlow’s statement. President John F. Kennedy, a president with a record of strong support for vocational training, included vocational education in the passage of the Manpower Development and Training Act of 1962 (Public Law 87-415) providing a series of funding to assist Americans who were inadequately trained or unemployed. Also during this decade, the educational field had its first national research seminar in vocational education in 1962 at Purdue University. In the late 1960s federal funding for vocational
education rose to more than 220 million dollars and included programming for high
school, adult education, and disadvantaged students unable to succeed in regular
vocational instructional settings (ACTE; Scott & Sarkees-Wircenski, 2004).

Beginning with the most comprehensive funding for vocational education,
President Lyndon B. Johnson signed into law the Vocational Education Act of 1963
(Public Law 88-210). This is the first iteration of the law named posthumously for Carl
D. Perkins in 1984. It provided 60 million dollars in federal funds to support vocational
programs in the states. A democratic congressman from Kentucky, Perkins spent the
better part of his 36 years in Congress as the primary leader in the fight for funding
vocational education. Still bearing the name of its number-one advocate, the federal law
for vocational education was recently reauthorized as the Carl D. Perkins Career and
Technical Education Improvement Act of 2006. The funding during the early 1960s also
included dollars for the construction of new vocational centers or facilities for the first
time (ACTE, 2002; Smith & Edmunds, 1999). Unanimously passed by Congress, the
1968 Vocational Education Amendments Act (Public Law 90-576) was signed into law
by President Lyndon B. Johnson. It included funding for research and cooperative
education. During this time, vocational education was evolving into a training path that
prepared skilled technical workers for the Space Age (Scott & Sarkees-Wircenski, 2004).

A changing social landscape in America during the late 1960s and 1970s forced
vocational education advocates to address the training and educational needs of minority
workers, displaced workers, incarcerated individuals, and special populations groups and
the need to promote higher education for vocational students. The Educational
Amendments Act of 1976 (Public Law 92-318) brought about the first notion of accountability in the CTE field and the establishment of the National Assessment of Vocational Education (NAVE). The NAVE is a congressionally mandated evaluation system that provides research for advocates and policy makers to enact decisions in the best interest of workforce and economic development in the United States. NAVE results play a vital role in the reauthorization of funding for CTE today (ACTE, 2002).

For vocational education supporters, the 1980s loomed with a desperate attempt to regain support after President Ronald Reagan’s administration announced the intent to cut funding by 2 million dollars. Also during this time, education reform reached a tipping point with the 1983 publication of *A Nation at Risk*, a report that declared the woes of the American education system and a challenge to make changes (Lynch, 2000; Rojewski, 2002). After a strong effort by supporters in Congress, vocational education funding was reauthorized under the Carl D. Perkins Vocational Act of 1984 (Public Law 98-524). It included a modernization of the vocational system and measures for vocational program improvement. The reauthorization also included funding for career guidance counselors, special populations programs, disadvantaged and incarcerated youth, and learners of a second language. By the end of the 1980s, funding for vocational education had increased by 30 million dollars (Gray & Herr, 1998; Scott & Sarkees-Wircenski, 2004).

The Technology Age of the 1990s ushered in the Carl D. Perkins Vocational and Applied Technology Act of 1990 (Public Law 101-392) signed into law by President George H. W. Bush. The 1.6 billion dollars in funding for a period of 5 years was to be
used to establish state and local programs that focus on developing and enhancing applied technology skills of students. This funding established the tech prep programs across the nation (ACTE, 2002; Scott & Sarkees-Wircenski, 2004). Also during this time, according to Rojewski (2002), came the establishment of the Labor Secretary’s Commission on Achieving Necessary Skills (SCANS), a blueprint outlining the necessary basic workplace readiness skills and competencies of the time and the coming future. Many blamed the failing U.S. economy on a failed education system, and policy makers started turning to vocational educators for answers to enhance the academic and technology skills of the emerging workforce. During President William J. Clinton’s tenure in the late 1990s, he saw to the establishment of the School-to-Work federal vocational program funding. This provided funding to ensure partnerships with schools and employers to provide students real-world application of workplace skills. He also signed into law the reauthorization of the Carl D. Perkins Vocational and Technical Education Act of 1998 (Public Law 105-332), also referred to as Perkins III, which created new funding formulas for state grants, increased funding for tech prep programs, increased articulation with postsecondary institutions, and required stronger accountability and data collection and reporting systems by the states (Rojewski, 2002; Cramer, 2004). The allocation of Perkins grants to states is based on population: 15% for state administration and 85% distributed to local education agencies, an increase from the previous iteration of Perkins (Stasz & Bodilly, 2004).

At the close of the 1990s the AVA members began revisiting an earlier national debate about changing the association’s historical name from vocational education to the
more contemporary career and technical education. Many members felt that the vocational delivery system had changed so dramatically in the way of academic and technological offerings that the term vocational education did not adequately encapsulate the system as well as a desire to change the perceived negative stigma that the term evoked to potential students and employers. Therefore, the AVA voted to change its name to the Association of Career and Technical Education (ACTE). Many state departments of education and local education agencies followed by changing the names of vocational departments and centers. At this time, the federal office in the U.S. Department of Education retained the name vocational (ACTE, 2002).

In 2001, President Clinton assembled the National Task Force on Preparing Youth for 21st Century College and Careers with the charge of examining workforce education needs for the 21st century. This helped lay the foundation for the newly reauthorized Carl D. Perkins Career and Technical Education Improvement Act of 2006 (Public Law 109-270), referred to as Perkins IV, signed into law by President George W. Bush, which will be in effect until 2012. The act provides 1.3 billion dollars in federal funding for CTE programs (ACTE, 2006). Changes in the 2006 version of the law include the following: officially changing at the federal level the name from vocational education to career and technical education, stronger linkage of academic and CTE instructional content, establishment of secondary programs of study that articulate to postsecondary, and stronger state and local accountability measures to foster ongoing CTE program improvement (ACTE, 2006).
Changes in the national economic framework and other educational reforms may be considered by many as the drivers of change in career and technical education, even back to its apprenticeship origins. In the Information Age of the 21st century, the reauthorization of the Perkins law has recognized today’s workforce needs and the reforms of the No Child Left Behind Act of 2001 and provides more than 1 billion dollars of support for the delivery of CTE programs at the state and local levels.

According to Lynch (2006), at least 97% of all high school students in the United States complete at least one CTE course of study in the more than 35,000 secondary and postsecondary settings that offer CTE programs nationwide. The sheer volume of offerings and numbers of participants as well as a long history of continued federal support, indicating the CTE enterprise as a valuable contributor to the socio-economic framework of the United States, may be argued as evidence of the critical need to examine CTE in a careful way for continued enhancement of the education system for an improved workforce.

Philosophy of Career and Technical Education

The impetus of the vocational education movement in the late 1800s, formalized by the Smith–Hughes Act in 1917, was embedded in Americans’ desires to provide a more equitable, practical education for all Americans. Socio-economic and philosophical issues were at the heart of the movement. From the early formalization of CTE, advocates have operated primarily under current needs of business and industry economic forces to support more practical education experiences. While practicality may have been a
recurrent theme in notable philosophies of vocational education, debates existed over such fundamental philosophical ideas as goals of vocational education, administration and teaching methodologies, and curriculum (Scott & Sarkees-Wircenski, 2004). This section of chapter two examines the educational philosophies of Charles Prosser’s view of essentialism and John Dewey’s view of pragmatism as they relate to career and technical education.

An early advocate of CTE, Charles Prosser participated in the framing of the Smith–Hughes Act. At the time, Prosser was the executive secretary of the National Society for the Promotion of Industrial Education, and much of the Smith–Hughes Act includes his theories. Prosser, a critic of idealism and education’s exclusive focus on academic scholarship and college preparation, believed that the goal of vocational education was to provide specific, practical training for gainful employment. He endorsed Edward Thorndike’s habit learning theory and believed that the student’s role was to develop specific habits related to specific occupational tasks. The context of “habit learning,” Prosser believed, should take place on the job or in a practical, learning laboratory scenario by teachers who are considered masters of their trade. Academic training such as mathematics, in Prosser’s view, should take place only in the context of the specific job task being learned and should be taught only by the vocational teacher. He supported a dual-education system that separately administered vocational and general education (Wirth, 1972).

Ideologies of Prosser’s time, such as social Darwinism and dualism, likely influenced his thoughts on how vocational education should be delivered. Social
Darwinism supports the idea that individuals are “fittest” at different levels of occupations. Dualism supports the idea that individuals are either innately handy or intellectually talented (Gray & Herr, 1998). Prosser outlined 16 distinct theorems for the purpose and delivery of vocational education that are comparable to these ideologies in many ways, and these theorems remained the foundation of the vocational education system until the early 1960s (Scott & Sarkees-Wircenski, 2004). Basically, Prosser’s view was a separate, narrower scope of practical vocational education that prepared non-college-bound individuals for specific levels of occupations in their areas of interest or aptitude. He promoted the idea that basic vocational skills should be systematically taught by only those considered masters in their crafts and made available to those students who are deemed best suited for them. The benefits of his view of vocational education included an educated citizenry for the benefit of industrial needs, not personal fulfillment. This was quite a different view from another educational American philosopher of the same era, John Dewey.

Considered the father of pragmatism (Gutek, 1998), John Dewey was a supporter of vocational education, and much of his philosophical ideas about curriculum and instruction remain prevalent in the current system. Dewey supported a practical education. According to Wenrich, Wenrich, and Galloway (1988) Dewey said, “The fundamental point in the psychology of an occupation is that it maintains a balance between the intellectual and practical phases of experience” (p.19), supporting the idea of a practical or pragmatic education. According to Scott and Sarkees-Wircenski, pragmatism is rooted in the philosophy of progressivism that was emerging at the birth of
formalized vocational education in the late 1800s. As Dewey noted in his 1916 publication *Democracy and Education*, the educational aim of pragmatism is to promote a democracy of competent citizens using a socially active, relevant problem-solving process. In the spirit of democracy, Dewey did not support a dual system for academic and vocational education.

Unlike Prosser’s idea, Dewey’s concept of education focused on the needs and experiences of the individual student. He believed that educational exercises begin with hands-on problem-solving skills and relating one’s existing schema to new knowledge, a concept closely associated with the constructivist learning theory still used today in CTE (McCaslin & Parks, 2002). His pragmatic philosophy supported the idea that students are educated to be adaptable and successful in life experiences, not just work-related experiences. Shumer (2001) echoes this concept in a proposed vision of vocational education for the 21st century. He supports the idea of vocational education’s educating the “whole person.”

While both Prosser and Dewey supported a practical view of education, the more traditional views, such as Prosser’s, supported an essentialist curriculum that prepared a suitable student for a specific trade or craft to benefit the needs of society (Stasz & Bodilly, 2004). Prosser’s view of pedagogy rested in the idea that a vocational student learns best from a master of the trade, not a general education teacher. Dewey believed in a vocational system that was more complementary to academic education, rather than separate, and led by education professionals. He supported a more democratic view of the purpose of education to meet the needs of the individual for the betterment of society.
The historical ideas supported by both of these nationally recognized educationalists are important to note for a study such as this, especially the concept of the type of classroom teacher best for vocational education. Recently, the No Child Left Behind Act of 2001 has turned a nationwide focus on raising the quality of teachers in the classroom; therefore, this idea of the credentialing of educators continues to be in dispute among CTE supporters and is relevant to this study.

A Theoretical Framework for the Delivery of CTE in Mississippi

According to McCaslin and Parks (2002), CTE teachers have been guided by some level of accountability standards since the inception of the 1963 Vocational Education Act; more recently, the contemporary Perkins legislation has held states and local education agencies more accountable for the federal grants to states than in past iterations of the vocational education laws. It has required states to set performance standards, obtain performance data, and report outcomes for the purposes of improving student achievement and CTE programs and advancing a broader and more flexible delivery of CTE (Stasz & Bodilly, 2004). The integration of academics into vocational curricula brought rise to scholars examining the impact of vocational education on academic success. Although academic attainment is one of the accountability factors for which vocational teachers are scrutinized, it is not the only one. In Mississippi, the State Plan for Vocational and Technical Education, submitted to the federal Office of Vocational and Adult Education, requires that students are successful on the statewide technical skills assessment, Mississippi Career Planning and Assessment System (MS-
CPAS2). This indicates a need to see what factors may be predictors of student success on this measure. Teachers’ MS-CPAS2 scores are aligned with state level accountability measures that can ultimately result in the closure of a CTE program for unsatisfactory results. In this section of chapter 2, an overview of the *Mississippi State Plan for Vocational and Technical Education* (State Plan) is discussed in the context of establishing it as a theoretical framework for the delivery of CTE in Mississippi.

Stasz and Bodilly (2004) argue that the structure of the state education office greatly impacts the implementation of the vision of the State Plan. According to the Mississippi Department of Education’s (MDE’s) web site, the Office of Vocational Education and Workforce Development (OVE&WD) is organized under the Deputy State Superintendent for Business and Support Services. Within the OVE&WD is the Bureau of Compliance and Reporting. The purpose of the Bureau of Compliance and Reporting is to maintain quality control and accountability for the successful implementation of the State Plan as well as provide technical assistance to school districts that have CTE programs in improvement status. Under the auspices of the State Plan, this bureau is responsible for the following: fiscal resource management, local CTE program equipment procurement, state and federal reporting, collection and maintenance of CTE teacher data, contracts and grants, Office of Civil Rights, and the occupational assessment for secondary and postsecondary CTE (MDE, 2007). With responsibility for occupational assessment (MS-CPAS2) and technical assistance for CTE program improvement, the Bureau of Compliance and Reporting benefits from the results of a study such as this that examines predictors to student achievement as measured by the MS-CPAS2.
According to the State Plan (MDE, 2001), a collective effort of secondary and postsecondary CTE educators and administrators, community members, government officials, and business and industry personnel contributed to the authorship of the State Plan under the direction of the Bureau of Compliance and Reporting. The State Plan guiding the delivery of CTE in Mississippi at the time of the data collected for this study is a revised version of the State Plan published in 1999 and is aligned with the Carl D. Perkins Vocational and Applied Technology Education Act of 1998 (Perkins III). Written in state board policy code 8209 (1991), the State Plan includes activities regarding evaluation and improvement of vocational and technical programs and specifically addresses the following areas of CTE in Mississippi: funding directives, state administration, state leadership funds, secondary and postsecondary funds, distribution of funds to local education agencies, federal tech prep grants, modifications to equity and special populations program requirements, and the CTE performance accountability and evaluation system. For the purposes of this study, the latter is presented.

Stasz and Bodilly (2004), in a case study of selected states (Mississippi was not included) for the National Assessment of Vocational Education, stress the importance of the Perkins legislation and its critical role in sustaining the state and local school district efforts to maintain quality education. Perkins III required states to take measures to ensure continuous program improvement in CTE. Core indicators were established as a rubric for evaluating progress at the state level: student attainment of academic skills and occupational competency; student attainment of diploma, postsecondary degree, credentialing, or the equivalent; placement in postsecondary, advanced training, military
service, or employment; and student completion of programming and placement in nontraditional training and employment. Funding levels to the state of Mississippi are based on meeting levels of performance on these indicators as indicated in the State Plan. According to Mike Mulvihill (personal communication, November 13, 2007), the Director for the Bureau of Compliance and Reporting, the State Plan was executed in fiscal year 2006—07 with a Perkins grant of $15,593,206; therefore, studies resulting in information about ways to meet the State Plan indicators are critical to sustaining funding for CTE in Mississippi. This study focused on the indicator of occupational competency as a measure of student achievement and suggests administrative decisions to be made based on predictors of that student achievement.

According to the State Plan, the measure of occupational competency may be demonstrated by one of the following: passage of a comprehensive occupational examination, completion of an individual education program, or documentation through the use of an individual student competency profile (p. 41). For this study, student achievement predictors will be examined as measured by occupational competency demonstrated on the statewide, standardized comprehensive examination MS-CPAS2. Completion of an individual education program is an approved measure of occupational attainment for special populations students. According to Mulvihill, documentation through the use of an individual student competency profile was not used during the time of the data collected and will no longer be used in the future (personal communication, November 14, 2007).
Synthesis of Prior CTE Studies Related to Student Achievement

When looking at student achievement, it is important to examine multiple assessment measures, not just standardized, high-stakes test scores (Boudett, City, & Murnane, 2005). However, in the Age of Accountability, standardized test results are used to show compliance with the Perkins law in Mississippi CTE programs. Lynch (2000) echoes the need for work-related assessments to measure student achievement. Stasnz & Bodilly’s 2004 case study of seven states shows results from field interviews with teachers reporting that state academic standards have an impact on CTE courses. Factors related to predicting student achievement on the MS-CPAS2 are helpful in making important decisions regarding teacher placement and training. Austin and Mahlman (2002) attempted to examine trends and issues of high-stakes testing in CTE that included a showcase of three different states’ experiences; however, in their conclusions, they note, “Little material is published in CTE sources that speaks directly to high stakes testing.” New information resulting from this study will make a needed contribution to the field. In this section of chapter 2, a review of various studies related to student achievement is presented.

Elliot and Zimmerman (2002) presented a study at the Western Regional Agricultural Education Research Conference that compared CTE students’ and non-CTE students’ achievement on the Stanford9 standardized, high-stakes test. After controlling for extraneous variables related to special populations and learner type (visual or auditory), no difference was found on the Stanford9 test between the two groups. The
main conclusion of Elliot and Zimmerman’s study focused on the need for researchers to control for extraneous variables when making raw score comparisons.

Mooneyham’s (2005) Texas study focused on relationships between CTE and the academic statewide test scores for math and reading and found no statistically significant difference in the scores of CTE students and non-CTE students. Mooneyham examined some other relationships of CTE and non-CTE students such as attendance, dropout rates, and graduation rates and found no statistical significance. The study compared the relationship between the perceived effectiveness (as defined by CTE administrators) and statewide test scores for math and reading and found no statistical significance. The study’s focus was slanted toward determining achievement on math and reading tests rather than an assessment of occupational competency. Also, the results did not provide information at the CTE program level, such as any significant relationships correlated in the agriculture program area only. She recommends additional research with a narrower focus and determinant of the effectiveness of CTE programs. The study conducted here provides information that shows relationships among the variables at the CTE program level.

Using a causal–comparative design, Sconyers (2006) conducted a study in Alabama to determine whether the completion of a CTE agriculture education course helped 11th and 12th grade students achieve higher scores on the American College Test (ACT). The only significant difference found was the reading ACT scores for the high school diploma and advanced academic track students not enrolled in CTE agricultural education were higher than those who were enrolled in CTE agricultural education.
Sconyers challenges researchers to examine other variables, such as socio-economic status, school classification, and teachers’ certification levels as influencing CTE high school students. He also encourages conducting studies that examine not only ACT scores but also statewide tests required for graduation because all students are required to complete these exams. The study conducted here did not use a causal–comparative design but a correlational design that showed the strength of relationships among variables, including socio-economic status, school classification, and teachers’ certification levels, to the statewide occupational assessment for CTE students.

Cordonnier’s (2007) Ohio study used a stepwise regression analysis to examine demographic predictors (e.g., school size, school wealth, and per pupil expenditure) for academic achievement and using those identified predictors to determine which were significant for predicting state and federal test scores in the state’s joint vocational school districts. His study revealed that the post-program placement rate of vocational students was the highest predictor affecting scores. This study provides some potentially interesting correlations of performance and demographic indicators of academic success in joint vocational school districts in Ohio regarding strong correlations between school wealth and per pupil expenditure; however, it is a critical factor for Mississippi to know what may be predictors of success on the MS-CPAS2 accountability measures, as this knowledge determines whether a program is high performing or moves into improvement status. A reverse of this study, in a sense, to examine academic indicators and additional demographic factors as a predictor of vocational success fills this gap in the literature, and this is recommended by Cordonnier.
A Louisiana qualitative study by Bass (2006) shows the state’s academic graduate exit exam has a declining emphasis on career education. This is opposite of what is happening in Mississippi today. The current state superintendent of education is currently in the pilot phase of implementing a reform movement entitled “Redesigning Education for the 21st Century Workforce in Mississippi.” The cornerstone of this plan includes an overall revamping of education in Mississippi with career and technical education at the core of the change, including integrating basic workforce education at the elementary school levels. The superintendent’s plan retains the use of the MS-CPAS2 instrument as a measure of vocational student success and program success or failure (Mississippi Department of Education, 2006). This echoes Hoyt’s (2001) recommendation that CTE should be one of the drivers for whole educational reform. Therefore, it is clear that information about predictors of success on this assessment would be of great interest to Mississippi educators. Quantitative data reflecting factors of high correlation to success of CTE students and programs would set the stage for training needs for CTE teachers.

A Texas correlation study conducted by Todd (2006) in one school district was to determine relationships between enrollment in CTE courses and grade point averages, absenteeism, and dropout rates. He interpreted results to show CTE students possess a higher grade point average, attend school more often, and possess a lower dropout rate. At the CTE program level, health occupations students and trade and industrial students possess a higher grade point average than business and marketing students; however, health occupations students have higher absenteeism. There was no examination of academic achievement and other proposed variables of this study and success of a CTE
program or CTE center. Todd recognizes the limitation of this study to one school district and suggests broadening the study. The study conducted here addressed a different set of predictors with a statewide impact for Mississippi.

CTE student achievement studies in Mississippi are limited and dated in the literature. For example, Newman (1991) conducted a study that focuses primarily on the high school dropout issue in Mississippi. He groups students as college preparatory, general track, and vocational track students. One area he studied used a multiple analysis of variance and found students enrolled in the college preparatory track score higher overall on the Functional Literacy Exam (FLE), which assesses overall academic achievement, than students enrolled in the general and vocational tracks. Furthermore, students enrolled in the vocational track score lower on the FLE than those in the general track. This study used the FLE, which is no longer a high-stakes test in Mississippi high schools. The study conducted here used accreditation levels (achievement level index) based on the current high-stakes test used in Mississippi, the Subject Area Testing Program (SATP), as a measure of academic achievement. This study filled a gap looking at CTE student achievement on contemporary academic measures as related to the Perkins legislation.

According to Bottoms and Presson (1999), holding CTE students to demanding standards for technical achievement is important in raising student achievement. The MS-CPAS2 instrument, the dependent variable in this study, is the measure of technical skills of CTE students in Mississippi. With the increase in states using a statewide assessment for accountability in CTE (Stansz & Bodilly, 2004), the study conducted here looked at
predictors of student achievement on the MS-CPAS2 and may be a model for other states to use.

Synthesis of Prior Studies and Literature Related to Variables in This Study

Education advocates, leaders, and policy framers in the United States are immersed in the examination of school reform and accountability. They support the idea that funding is not the sole solution to increasing student achievement; rather, a combination of variables is to be considered. They want to know variables that can predict achievement of students in the public school system (Okpala, Smith, Jones, & Ellis, 2000). According to the Education Trust’s review of well-qualified teachers, these advocates support the most influential factor impacting student achievement is the teacher (Haycock, 1998). This section of chapter 2 examines literature in the field related to the independent variables proposed for this study: years of teaching experience, teachers’ degree(s) of attainment, National Board for Professional Teaching Standards Certification®, teachers’ participation in a data retreat, enrollment numbers of students, high school performance level, and socio-economic status of the school district.

Years of Teaching Experience

According to Rosenthal (2007), some studies show longer tenure in the classroom does not necessarily make a person a better teacher. Okpala, Smith, Jones, & Ellis (2000) conducted a correlation study in North Carolina elementary schools to examine the relationship of selected resources and student demographics on fourth-grade math and
reading student achievement. One of their results showed that the percentage of teachers with 10 years of teaching experience was positively correlated to student achievement in both reading and math. The study conducted here expanded this study using the same variable in relationship to high school career and technical student achievement.

A New York study conducted by Kane, Rockoff, and Staiger (2007) using third-through eighth-grade students’ math and reading standardized test scores shows more improvement in achievement for students who have teachers with three years of experience than those students who have 1st year teachers; however, there is little difference in achievement of students who have teachers with experience beyond three years. The study conducted here examined the relationship between high school CTE student achievement and the number of years of teaching experience of CTE teachers.

A study using 10 years of North Carolina standardized math and reading test results of elementary students in grades 3–8 by Clotfelter, Ladd, and Vigdor (2007) looked at teacher and student characteristics in relation to student achievement. This study deals with teacher quality and what specific “educational production functions” impact student achievement and what that means for policy makers. Their findings show teachers with more years of teaching experience are more effective than teachers with less experience.

Degree(s) of Attainment

With the enactment of the No Child Left Behind Act of 2001, education policy makers have been focusing more closely on the quality of teachers from a credentialing
standpoint (Rosenthal, 2007). States have been required to develop definitions of highly qualified teachers for academic and career and technical education. Lynch (2000) remarks in his review of CTE literature that student achievement is directly related to the “professional competence” of the teacher. Rosenthal reports that some studies show that advanced degrees are only significant at the high school level math and science courses and that certification does not guarantee student achievement. Conversely, a finding of the Okpala, Smith, Jones, & Ellis (2000) study shows the percentage of teachers with master’s degrees was significant in explaining higher scores in elementary math but not reading. The authors boast empirical support from their results to support the notion of equitable distribution of resources, implying also the equitable distribution of qualified teachers among students. The study conducted here expanded this study using the same variable in relationship to high school CTE students’ achievement.

In 2004, Cramer conducted an interesting study of how well prepared CTE teachers are for the classroom. He examined quite a few variables including educational attainment of vocational teachers and the relationship to success on the Praxis Series assessment (an Educational Testing Services exam required for teacher certification in most states). Cramer found that academic and vocational teacher candidates seeking teacher certification attained similar levels of education at the undergraduate level; academic teacher candidates were more likely to possess an advanced degree than vocational teacher candidates, and they performed better overall in their undergraduate degree programs. He further reports that the passing rate of vocational teacher candidates is lower than academic teacher candidates in the reading and writing Praxis Series
assessment indicating a lower level of academic skill attainment, not vocational skill attainment. Cramer suggests that educational attainment as an indicator of academic skills may have some influence on student outcomes in CTE.

Using the Iowa Test of Basic Skills test scores of students in grades 4–9 in Mississippi, Herring (1997) conducted a correlation study to examine the relationship of various educational variables, controlling for demographics, and student achievement. She reported finding the percentage of teachers with advanced degrees as a good predictor of student language, reading, and math achievement for fourth-grade students.

In Mississippi, teachers have a monetary incentive to achieve graduate degrees. The study conducted here addressed a gap in knowing whether or not a CTE teacher’s degree(s) of attainment is correlated with CTE student achievement measured by the MS-CPAS2. Recruitment of quality CTE teachers, professional development, and policy issues such as salary supplements and licensure in Mississippi warranted an examination of a relationship between CTE student achievement and teachers’ advanced degrees.

*National Board for Professional Teaching Standards®*

The National Board for Professional Teaching Standards® certification (NBC) organization recently celebrated 20 years as an education credentialing organization and major policy movement to improve teacher quality in the United States. With a desire to elevate the teaching profession to the same level as other board certified professions, a group of education leaders built the organization by developing a peer-reviewed set of rigorous standards supporting what all k–12 teachers should know and be able to do in 24
fields of instruction, including career and technical education (Vandervoort, Amrein-Beardsley, & Berliner, 2004). According to the National Board for Professional Teaching Standards® (2007, p. 4), these standards are rooted in five core propositions:

- Teachers are committed to students and their learning.
- Teachers know the subjects they teach and how to teach those subjects to students.
- Teachers are responsible for managing and monitoring student learning.
- Teachers think systematically about their practice and learn from experience.
- Teachers are members of learning communities.

Accomplishment of the NBC process is a testament to high-quality teaching as demonstrated by a two-part assessment process including a comprehensive portfolio submission and standardized proficiency examination in a specific area of certification. It is a voluntary assessment process for accomplished teachers wishing to advance their national boards teaching credentials (10 year certificate) (National Board for Professional Teaching Standards, 2007).

NBC has become a major policy issue at the federal and state levels as evidenced by the funding allocated for mentoring and incentive programs encouraging teachers to obtain NBC (Kelley & Kimball, 2001). In Mississippi, the state legislature provides a $6,000 teaching supplement to all teachers who obtain NBC for the life of their certificate. School districts provide monetary support and professional development days to candidates going through the NBC process, which bears a direct cost in excess of $2,300 (Mississippi World Class Teaching Program, 2007; Jackson, 2006; Swoger, 2002). As of January 2007, there are more than 55,000 NBC teachers in the nation. Ranking eighth in the nation on number of NBC teachers, Mississippi boasts 2,555
(Aguerrebere, 2007), and 202 of those are NBC teachers who hold the certification in Career and Technical Education/Early Adolescence through Young Adulthood (National Board for Professional Teaching Standards, 2007). This is a clear indication that Mississippi wants to foster a professional culture of quality teachers in the state’s public education system. The number of NBC teachers continues to grow across the nation, and states are continually pressing for additional resources to boost their teacher workforce through NBC. There is a critical need for research to continue in the area of NBC and its impact on student achievement so that policy makers can make informed decisions.

Recently, studies have been conducted to determine the impact of NBC on raising student academic achievement resulting in contradictory findings. The state of North Carolina was the leader in the NBC movement. The Clotfelter, Ladd, & Vigdor (2007) study of elementary teachers mentioned previously also examined the relationship of student achievement to teachers with NBC. They reported that NBC teachers are more effective than those without NBC. Conversely, Rouse’s 2004 North Carolina study of elementary and secondary NBC teachers compared to non-NBC teachers found no statistically significant difference in the reading and math student achievement at the elementary level; however, Rouse reports finding that secondary students who are taught by NBC teachers have higher achievement on end-of-course exams than those students taught by non-NBC teachers.

Holland (2006) and Benigno (2005) conducted studies to determine the impact of NBC teachers on student achievement on the Mississippi Curriculum Test (MCT). Holland used a sample of Mississippi students in grades three through five to determine
the impact of NBC teachers on student achievement as determined by scores on the
MCT. Using a multiple analysis of variance comparing NBC teachers’ students to non-
NBC teachers’ students, she found NBC teachers did impact students’ achievement in
reading and language arts. She recommends further study in Mississippi that includes
secondary grade levels and other areas of national board certification. The study
conducted here addressed these gaps in the literature by examining achievement of
secondary students in career and technical education taught by NBC teachers. Benigno
used an analysis of covariance to determine if NBC teachers made a difference in MCT
student test results in grades 3—8. He found that non-NBC teachers’ students scored
higher than NBC teachers’ students on the MCT in language and math, indicating NBC
did not impact student achievement. Benigno recommends further studies that explore the
relationship of NBC teachers to school district performance level ratings are needed in
Mississippi. The study conducted here included school district performance ratings
(achievement level index) as a predictor of student achievement.

Leatherwood (2004) used 18 CTE business technology education teachers in her
Oklahoma study that examined the impact of NBC teachers on CTE business technology
students. She used an independent sample t-test to determine if CTE 2-year program
completion rates and student placement rates of NBC teachers of CTE business
technology were higher than those non-NBC teachers of CTE business technology. This
was the chosen measure of student achievement. She found no statistically significant
difference. Goldhaber & Brewer (2000) examine the idea of teacher certification and high
school student achievement and suggest that not enough evidence in the field exists to
determine the impact of teacher certification. The study conducted here used standardized test scores as a measure of student achievement. A multiple regression analysis was used to determine predictors of student achievement using NBC CTE teachers as one independent variable across all CTE program areas, not just one as in Leatherwood’s study. Furthermore, the study investigated significant differences in mean MS-CPAS2 scores of NBC CTE teachers and non-NBC CTE teachers at the individual course level.

Data Driven Professional Development

According to Bennett (2002), the educational environment in the U.S. today may be characterized by the use of high-stakes testing in schools for meeting accountability requirements. In basic terms, high-stakes testing may reference any assessment used for accountability that has significant consequences, such as sanctions or penalties for not meeting accountability standards such as those outlined in the State Plan. High-stakes test results may be used for school improvement plans and may ultimately impact students, teachers, administrators, and communities. Bennett further suggests that learning how to use high-stakes test data effectively can be a powerful force in guiding school leaders to transform themselves from high-stakes test data victim to data victor.

In CTE particularly, a “laser like focus” on data such as standardized test results is essential to move traditional-type CTE programs to more contemporary CTE programs (Daggett, 2007). Bottoms & Presson (1999) of the Southern Regional Education Board have worked closely with high schools across the Southeast, including high schools in Mississippi. They express that routine measuring and reporting CTE student achievement
on specific technical skills attainment in a user-friendly way will result in high-performing CTE programs. Schmoker (2003) likens teachers’ not using student achievement data to determine instructional issues in their classrooms to the same as a “mechanic not knowing which part of the car needs repair.” Schmoker is an advocate of using data in a user-friendly way by teams of teachers to help determine areas of weakness in teaching.

Collection of data is not a new concept to CTE. Primarily for administrative reasons and satisfaction of tallies for Perkins legislation, CTE teachers and administrators have been collecting different types of data such as CTE course completers, enrollment, and student placement into jobs or the military. Creighton (2007) stresses the importance of using data to be proactive, not reactive, by systematically looking at data to make instructional decisions. CTE teachers are obligated to evaluate their programs to show evidence of accomplishment and justification for state and federal expenditures that fund CTE programs (Smith & Edmunds, 1999).

Under the State Plan and in preparation for moving forward toward Perkins IV requirements, Mississippi is working to create a culture of data-driven decision making among CTE teachers and administrators. To address this concept of data-driven decision making, the Mississippi Department of Education (MDE) contracts with the Research and Curriculum Unit (RCU) at Mississippi State University to deliver customized training to CTE administrators, teachers, and counselors on how to use the MS-CPAS2 data to improve instruction, therefore increasing MS-CPAS2 test scores. This is a new approach to training for CTE educators in Mississippi and those districts struggling with student
achievement on the MS-CPAS2 have been targeted for the training. For this reason, CTE participation in these trainings was identified as a predictor of success on the dependent variable of MS-CPAS2 test scores.

According to the RCU’s Coordinator for Assessment and Accountability, Dr. Cindy Morgan (personal communication, November 16, 2007), the data retreats are focused customized training sessions provided to secondary and postsecondary CTE teachers, counselors, and administrators to assist them in making instructional decisions that lead to student improvement, particularly as measured by the MS-CPAS2. Participants in the retreats learn how to interpret assessment data and employ innovative instructional strategies to improve teaching and learning in their classrooms. Participants are provided their own MS-CPAS2 data reports to use in the training. The training begins with a 2-hour general session providing an overview of interpretation and use of student achievement data results actually using their own score reports. Interactive and collaborative activities are conducted throughout the general session to assist participants in determining their areas of instructional strength and weakness. The second half of the training includes a 2-hour smaller, breakout session according to CTE program area. These sessions are led by CTE curriculum and assessment specialists who guide participants through determining teaching and assessment strategies targeted on the areas of weakness they gleaned from their score reports. Participants in the training are charged to return to their schools and conduct similar workshops with faculty and staff to establish a culture of data-driven decision making. Follow-up and support to the data retreats is provided via online learning communities by CTE program area and onsite
technical assistance visits when needed. MDE has made a concentrated effort to provide this training in a valuable way for CTE. Looking at this professional development treatment as a predictor of student success on the MS-CPAS2 will assist state level decision makers on determining any changes that may need to be made in this training.

*Enrollment Numbers*

Academic and CTE studies found in the field examine the factor of enrollment and student achievement from the perspective of class size and school size. For example, the Okpala, Smith, Jones, & Ellis (2000) study mentioned previously also examines the relationship of class size and school size to fourth-grade reading and math achievement. The study’s results show a significant relationship between class and school size and explaining student achievement in reading, not math. In this study, enrollment as a predictor of student achievement on the MS-CPAS2 was examined at the CTE center/site level and individual CTE program level. This study provided a unique perspective on the variable of enrollment and its relationship to CTE student achievement.

*MAARS High School Performance Classification Level*

The current statewide compulsory accountability system for accreditation of public schools, initiated by Governor William Winter, is rooted in the Mississippi Education Reform Act of 1982 and aligned with the No Child Left Behind Act of 2001. The accountability system is structured to increase the level of accountability not only for school districts but also for individual schools and with the ultimate goal of improving...
student achievement. Originally reflecting accreditation at the district level, additional state legislation passed in 2000 requires that individual schools be assigned a school performance classification based on student achievement and growth. Individual school performance classifications began in 2003 and are made public (Mississippi Department of Education, 2007).

According to accreditation policy 3.0 School Performance Classification Policy (2007), school level performance classifications are determined by a combination of percentage of students performing at criterion levels on statewide assessments and the degree of growth in student performance over time. These values are combined to assign individual schools a performance classification level as follows:

<table>
<thead>
<tr>
<th>Level</th>
<th>Classification</th>
</tr>
</thead>
<tbody>
<tr>
<td>5</td>
<td>Superior-performing School</td>
</tr>
<tr>
<td>4</td>
<td>Exemplary School</td>
</tr>
<tr>
<td>3</td>
<td>Successful School</td>
</tr>
<tr>
<td>2</td>
<td>Under-performing School</td>
</tr>
<tr>
<td>1</td>
<td>Low-performing School</td>
</tr>
</tbody>
</table>

The Achievement Level Index (ALI) is a part of the overall accountability model. According to the Mississippi Public School Accountability Standards, ALI is the ordinal metric used to report the average school performance based on student achievement measured by academic standardized tests; higher ALI values represent overall school performance. For the purposes of this study, ALI values were used as a predictor of student achievement on the MS-CPAS2. The statewide assessment system that helps to determine the school performance classification level for high schools is the Subject Area Testing Program (SATP). These four assessments are aligned with a division of organized knowledge for which state curriculum guidelines have been designed.
Specifically, these assessments measure content knowledge in the subject areas of Algebra I, English II, Biology I, and U.S. History from 1877 (MDE, 2007).

Socio-economic Status

Mississippi is the most impoverished state in the nation and ranks 49th in per capita income (Southern Educational Foundation, 2006). According to the state profile for Mississippi published by the Southern Regional Education Board in 2006, the percentage of students in low-income households continues to rise. The board reports more than two thirds of Mississippi’s students are classified as low-income socio-economic status. A typical indicator for measuring socio-economic status is the percentage of free or reduced lunch eligible students in a school or district. This is the indicator that will be used in this study as a predictor of student achievement on the MS-CPAS2.

The Okpala, Smith, Jones, & Ellis (2000) study mentioned previously found that the percentage of students on free or reduced lunch was negatively correlated to reading and math achievement of fourth-grade students. The study conducted here expanded this study using the same variable in relationship to high school career and technical student achievement.

Herring’s (1997) Mississippi study mentioned previously reveals a statistically significant relationship between the percentage of students who receive free lunches to students who score lower on the Iowa Test of Basic Skills (ITBS) in language, math, and reading; therefore, districts that have more students classified as receiving free lunch
have experienced lower student achievement. Another Mississippi study by Langford (2002) used all statewide fourth-grade achievement results on the ITBS and Terra Nova tests over a 4-year period and determined socio-economic status as a predictor of negative impact on the standardized tests. In this study, the percentage of students who receive free and reduced lunch will be used as the socio-economic status predictor of CTE student achievement. Findings from the study conducted here will help inform CTE directors about needs that may be addressed through federal or state programming to assist in improving student achievement.

Summary

With the recent reauthorization of the law that funds CTE grants to states, the Carl D. Perkins Career and Technical Education Improvement Act of 2006, it is incumbent upon CTE leaders to examine ways to ensure student success on accountability measures (Hyslop, 2006). In spring 2007, the MS-CPAS2 accountability measure was a part of the State Plan’s state-level enforced goals. This was accomplished by the state department in preparation for impending Perkins reauthorization in 2006 that requires such measures to show meeting goals as a federal mandate. Now that federal sanctions will play a role in this particular measure of accountability beginning in the school year 2008—09, information on how to ensure student success on the MS-CPAS2 is critical. Hudson (2001) stresses the need for data in CTE to help state and local education leaders make informed decisions about their CTE programs, including budget allocations, training, and policies.
This review of literature in this chapter includes historical, philosophical, and theoretical information to demonstrate the uniqueness of CTE and establishes a need to study it in a focused way. The review of literature also includes an examination of previous studies related to the topic of student achievement and other variables of interest: years of teaching experience, degree(s) of attainment, NBC, data driven professional development experience, program enrollment, school performance classification level, and socio-economic status of the school. The purpose of this study is to examine the relationship between CTE student achievement and selected teacher attributes and school contextual variables in a way that will assist state and local decision makers regarding teacher recruitment, professional development, and student programming.
CHAPTER III
METHODOLOGY

This chapter provides detailed information regarding the research design and statistical procedures employed in this study. The chapter is organized into the following sections: research design, population and sample, definition of variables, data collection procedures, instrumentation, and data analysis. This study aimed to address the problem statement of: whether or not there is a relationship between secondary Career and Technical Education (CTE) teachers’ attributes of number of years of teaching experience, degree(s) of attainment, national board certification, and participation in the professional development experience related to using testing data for instructional improvement and secondary CTE student achievement. Furthermore, this study aimed to determine whether or not there is a relationship between school level contextual factors of enrollment, Mississippi Assessment and Accountability Reporting System (MAARS) school performance classification, and socio-economic status and CTE student achievement. This problem statement was the framework for the design of this study. Student achievement is measured by the spring 2007 administration of the statewide, standardized Mississippi Career Planning and Assessment System, 2nd edition (MS-CPAS2) test.
Research Design

A correlational research design was the driver for this predictive study. Correlational designs are about relationships among the variables of interest showing how a variable changes as another variable changes. Correlation coefficients are calculated as a way of determining relationships, not differences (McMillan & Werfin, 2006). According to Fraenkel and Wallen (2006), the main purpose of correlational research is to understand certain phenomena by better examining relationships among identified variables. Correlational studies provide results that permit the researcher to determine the strength and direction of the relationship between different sets of data or to predict scores on one variable based on the knowledge of scores on another. Researchers using correlational studies must be aware of alternative explanations for relationships found in the data; correlations do not necessarily mean causation (Bracey, 2006; Fraenkel & Wallen). For hypotheses 1, 2, and 3 the researcher used a multiple linear regression analysis (MLR); correlations were determined using mean scores by location of a CTE center and mean scores by CTE program area to student achievement on the MS-CPAS2. According to Field (2005) MLR is an appropriate analysis when multiple independent variables are used for the purpose of predicting a single dependent variable. For hypothesis 4, the researcher used an independent t-test using analysis of variance (ANOVA) to compare mean MS-CPAS2 scores of NBC CTE teachers to non-NBC CTE teachers by individual course levels to determine statistical differences in student achievement.
Definition of Variables

The researcher included one dependent variable (MS-CPAS2 scores) and seven independent variables in the study (years experience, degree level, professional development, national board certification, enrollment, socio-economic status, academic achievement). As described in Chapter II, seven relevant and theoretically-based independent variables were selected for this study about CTE student achievement. Table 3.1 below shows a summary of the variables.

Table 3.1
Summary of Variables in Study

<table>
<thead>
<tr>
<th>Variables</th>
<th>Description</th>
<th>Where Obtained</th>
</tr>
</thead>
<tbody>
<tr>
<td>MS-CPAS2 Scores</td>
<td>Percentage mean scores by CTE district, CTE program area and CTE course level</td>
<td>Research and Curriculum Unit</td>
</tr>
<tr>
<td>Average years of teaching experience</td>
<td>Average years experience of CTE teachers by CTE district and CTE program area</td>
<td>Mississippi Department of Education</td>
</tr>
<tr>
<td>Degree(s) of Attainment*</td>
<td>Percentage of CTE teachers with less than a Bachelor’s degree and percentage of CTE teachers with a Bachelor’s degree or more by CTE district and CTE program area</td>
<td>Mississippi Department of Education</td>
</tr>
<tr>
<td>Professional Development</td>
<td>Number of CTE educators who attended a data retreat training by CTE district level and CTE program level</td>
<td>Research and Curriculum Unit</td>
</tr>
<tr>
<td>National Board Certification</td>
<td>Number of CTE educators who are NBC in CTE by CTE district level and CTE program level</td>
<td>National Boards for Professional Teaching Standards Public Website</td>
</tr>
<tr>
<td>Enrollment*</td>
<td>Number of students who completed a 2-year occupational skills program and completed an MS-CPAS2 test by CTE district level and CTE program level</td>
<td>Research and Curriculum Unit</td>
</tr>
<tr>
<td>Socio-economic Status</td>
<td>Percentage of students who qualify for free and reduced lunch by CTE district level</td>
<td>Mississippi Department of Education</td>
</tr>
<tr>
<td>Achievement Level Index</td>
<td>Ordinal number representing academic achievement by CTE district level</td>
<td>Mississippi Department of Education</td>
</tr>
</tbody>
</table>

*These variables violated normality assumptions and were adjusted using a log transformation.
Dependent Variable

**MS-CPAS2 Test Scores:** The mean MS-CPAS2 scores from the spring 2007 administration were examined by school level and CTE program area level for the regression analysis and by CTE course level for the ANOVA. This variable is used to define CTE student achievement in this study; higher mean scores represent higher student achievement.

Independent Variables

All independent variables were collected for the teacher attributes and contextual factors relevant to the MS-CPAS2 spring 2007 administration.

**Achievement Level Index (ALI):** A component of the MA{318}ARS, the ordinal metric used to report the average school performance based on student achievement measured by academic standardized tests; higher ALI values represent overall performance.

**Average Years of Teaching Experience:** The average number of years of teaching experience a CTE teacher has on record with the Mississippi Department of Education. This average number of years teaching experience is examined at the school level and by CTE program area.

**Professional Development:** Data retreat participation is examined at the school level and the CTE program level as having at least one faculty member from the CTE center complete the data retreat training. For the analysis, attendance at the data retreat variable was dummy coded as “yes” attended or “no” did not attend.
**Degree(s) of Attainment:** The degree(s) of attainment for CTE teachers at the school level and the CTE program area level are examined as percentage with less than a bachelor’s degree and percentage with a bachelor’s degree or higher.

**Enrollment:** This is the number of students enrolled in a particular two-year occupational skills course who are classified as a completer and took the MS-CPAS2 end of course assessment in spring 2007.

**National Board Certification (NBC):** NBC is examined at the school level and the CTE program level as having at least one faculty member from the CTE center NBC. For the analysis, the NBC variable was dummy coded as “yes” NBC or “no” NBC.

**Socio-economic Status:** The percentage of students in the school district classified as free or reduced lunch status. This variable was examined at the school level and the CTE program area level.

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**Population and Sample**

The entire set of subjects that a researcher desires to study and about which generalizations are made is the population (Gravetter & Wallnau, 2004). The population of this study included the mean scores by CTE location in all 152 school districts in the state of Mississippi, mean scores by the seven CTE program areas, and mean scores by identified CTE individual courses. The smaller group of subjects selected from the population to participate in the study is referred to as the sample (Ary, Jacobs, & Razavieh, 1990). The researcher had access to the full population of test scores, teacher attributes, and school contextual factors; therefore, the full population was included in the
analysis. The participants were secondary CTE teachers and secondary CTE high school students in grades 10—12 by CTE location and program area. The participants in the study did not include those subjects in a secondary CTE program located at a postsecondary institution. Out of the 152 school districts in Mississippi, the 117 districts with secondary CTE centers or programs were used in this study.

Data Collection Procedures

The data needed to complete this study was all existing data routinely collected and securely stored by educational agencies or available via a public website database. First, the researcher submitted the Investigator’s Assurance application and a letter of support from the MDE (Appendix A) to the Mississippi State University Institutional Review Board (IRB) for approval to conduct the study. Approval for the study was granted by the IRB on December 18, 2007 (Appendix B).

The Research and Curriculum Unit (RCU) at Mississippi State University houses the testing data, enrollment data, and training variable data in a secure database for the information that was used for this study. The RCU is the entity contracted to develop, deliver, score, and report the MS-CPAS2 for Mississippi career and technical students at the secondary and postsecondary levels. The RCU also provides the data driven professional development training to CTE teachers, counselors, and administrators. Existing scores and training attendance data from these secure databases were requested and used to run the study. The RCU is an educational research center sponsored by the MDE.
Additionally, the MDE houses the secure data associated with socio-economic status, degree attainment of teachers, and years experience of teachers. The MDE public website provides the ALI for each school in the study, and the National Boards for Professional Teaching Standards® public data base provides the data regarding NBC CTE teachers in Mississippi. A data request was submitted to the RCU and the MDE to obtain all necessary data points related to the variables in question.

Instrumentation

Existing test scores from the spring 2007 administration of the MS-CPAS2 assessment were used as the dependent variable to determine student achievement in this study. According to the MDE (2006), the MS-CPAS2 instrument proposed to measure student achievement in this study is administered by the MDE Office of Student Assessment. According to the MDE, MS-CPAS2 is a statewide testing program for the secondary and postsecondary CTE system. As required by the State Plan, the purpose of the assessment is to evaluate local CTE program performance in regard to producing students with workplace readiness and technical skills attainment as well as a tool for measuring accountability for instruction.

Local secondary and postsecondary CTE programs are designed to produce students with proficiency in occupation-specific 2-year programs. The instrument includes both critical thinking and knowledge level test items. Assessments include either 35 or 70 multiple choice items, and most have illustrations. Students complete these tests on machine-scannable answer documents. According to the MS-CPAS2 technical manual...
(2003), the instrument ensures content validity by aligning test items with standardized curriculum content using a blueprint. The number of items on the test from a particular instructional cluster is determined by the percentage of time spent teaching that cluster. To ensure that results are reliable across raters and scoring occasions, the Kuder—Richardson Formula 20 or Cronbach’s Alpha in SPSS® is used. For the spring 2007 administration, a cut score of 60% on both the 35-item and 70-item tests was used to determine student achievement of technical skills (Mulvihill, personal correspondence November 7, 2007).

Data Analysis

Several steps were taken with the data a priori to help ensure the integrity of the study. Data was adequately inspected for any missing values with no problems noted. Eight cases were not included in the study due to their secondary CTE center’s location at a postsecondary institution. These cases did not share the same school setting contextual factors as those centers located in one of the 152 school districts.

The following assumptions, as recommended by Field (2005), were checked a priori: linearity of the phenomena measured, constant variance of the error terms, independence of the error terms, collinearity, and normality of the error term distribution. Collinearity, according to Hair (2006), refers to the fact that a predictor variable is highly correlated with another predictor variable. The variance inflation factor (VIF) was examined to ensure correlation models did not exceed a VIF value of 10. For the regression analysis, positively skewed normality violations with the enrollment and
degree(s) of attainment predictor variables were dealt with by using a log transformation, as recommended by Fields (2005).

Reported as Pearson’s $R^2$, correlation coefficients were produced using the simultaneous solution multiple linear regression analysis procedure. A simultaneous solution was used because the researcher wanted to predict the dependent variable based on all independent variables of interest. According to Hair (2006), multiple linear regression is a time-honored technique, first named by Karl Pearson in 1908, that allows a researcher to determine a correlation between a dependent variable and the best linear combination of two or more predictor or independent variables. The correlation coefficients indicate the strength of the correlation. An $F$ statistic from an ANOVA tests the significance of the $R^2$. The threshold for determining significance was set a priori at an alpha level of 0.05. Beta weights of the standardized coefficients will be examined to determine the unique importance of independent variables in the model.

An additional analysis examining test scores by CTE courses within program areas was conducted using an independent t-test comparing mean MS-CPAS2 scores of NBC CTE teachers and non-NBC CTE teachers. Field’s (2005) recommended assumptions of normality and homogeneity for the ANOVA were examined a priori and were satisfied. According to Fraenkel and Wallen (2006), when comparing only two groups, the $F$ statistic is satisfactory to reveal whether a level of significance exists between the comparisons. An alpha level of 0.05 was set a priori for the ANOVA. The multiple linear regression analysis, ANOVA, and descriptive statistics were run using the Statistical Package for Social Sciences 15.0® (SPSS, 2007).
Summary

Defining methodology for a study provides a relevant framework for conducting the tasks of the research (Fraenkel & Wallen, 2006). In this chapter, the researcher discussed the basis for the research design, study population used, definition of the variables, data collection procedures, instrumentation, and data analyses. The information outlined in this chapter provided the protocol used by the researcher in obtaining results from the data.
CHAPTER IV
RESULTS

This chapter presents results addressing the first three hypotheses to determine if the predictor model of Career and Technical Education (CTE) student achievement established in this study is statistically significant at the district and CTE program area levels. Furthermore, the chapter presents results addressing the fourth hypothesis to determine if a statistically significant difference between mean Mississippi Career Planning and Assessment System (MS-CPAS2) scores of national board certified (NBC) CTE teachers and non-NBC CTE teachers by CTE course exists. This study aimed to address the problem statement of: whether or not there is a relationship between secondary CTE teachers’ attributes of number of years of teaching experience, degree(s) of attainment, national board certification, and participation in the professional development experience related to using testing data for instructional improvement and secondary CTE student achievement. Furthermore, this study aims to determine whether or not there is a relationship between school level contextual factors of enrollment, Mississippi Assessment and Accountability Reporting System (MAARS) school performance classification, and socio-economic status and CTE student achievement.

The multiple linear regression (MLR) analysis began by creating descriptive statistics and separate predictive models for hypothesis 1 and hypothesis 2 that included a
model with only teacher attributes and a model with only school contextual factors. The researcher then ran a full model that included both the teacher attributes and school contextual factors. The full model provided a higher percentage of variation explained; therefore, the researcher used the full model in the analysis at the district level and the CTE program area level. The results for each hypothesis are provided below.

Analysis for Hypothesis 1

There will be no statistically significant correlation in the relationship between the achievement of secondary career and technical students and attributes of secondary career and technical teachers based on number of years of teaching experience, degree(s) of attainment, national board certification, and participation in the professional development experience by district location.

The population (\(N = 117\)) of secondary CTE centers or programs within the 152 school districts was examined. Descriptive statistics for the dependent variable of MS-CPAS2 test scores by district location are (\(M = 62.95, SD = 6.80, N = 117\)). The descriptive statistics for the district location independent variables for teacher attributes are shown in Table 4.1.
Table 4.1
Descriptive Statistics of CTE Teacher Attributes at the District Location Level

<table>
<thead>
<tr>
<th>Teacher Attribute</th>
<th>N</th>
<th>M</th>
<th>SD</th>
</tr>
</thead>
<tbody>
<tr>
<td>Average years experience</td>
<td>117</td>
<td>13.33</td>
<td>5.22</td>
</tr>
<tr>
<td>% Teachers with less than a Bachelor’s degree</td>
<td>117</td>
<td>25.29</td>
<td>21.78</td>
</tr>
<tr>
<td>% Teachers with a Bachelor’s degree or higher</td>
<td>117</td>
<td>74.71</td>
<td>21.78</td>
</tr>
<tr>
<td>% Attended professional development</td>
<td>117</td>
<td>18.80</td>
<td>39.20</td>
</tr>
<tr>
<td>% National Board Certified</td>
<td>117</td>
<td>36.80</td>
<td>48.40</td>
</tr>
</tbody>
</table>

An MLR analysis was conducted to determine which of the CTE teacher attributes at the district location level accounted for a statistically significant amount of the variation in the dependent variable, the MS-CPAS2 test score. The analysis revealed an R-squared value indicating 19.5% of the variation in student achievement at the district level can be predicted on the basis of the teacher attributes of average years experience, degree(s) of attainment, national board certification, and completion of the professional development.

The ANOVA results at an alpha level of .05 were statistically significant, $F(5, 111) = 5.394, p < .05$. The researcher rejected the null hypothesis due to the fact that predictions on the MS-CPAS2 test scores can be made on a better than chance level when these teacher attributes are simultaneously entered into the model. The Pearson’s $R = .442$, indicating a moderate correlation between the dependent variable and the best linear combination of the predictor variables. The $t$-tests determined whether any of the Beta coefficients of individual teacher attribute variables were statistically significant. As
shown in the Table 4.2 below, the predictor of attended professional development ($M = 18.80, SD = 39.20, N = 117$) had a statistically significant negative impact on student achievement, meaning that on average the school districts who had a faculty member from a CTE center attend the professional development had an MS-CPAS2 score of 3.20% lower than those districts who did not have a faculty member attend the professional development. Additionally, the predictor of NBC ($M = 36.80, SD = 48.40, N = 117$) had a statistically significant positive impact on student achievement, meaning that on average the school districts with at least one NBC CTE teacher at a vocational center had an MS-CPAS2 score of 5.32% greater than those districts who did not have an NBC CTE teacher at a vocational center. No other teacher attributes were statistically significant in the teacher attribute model.

Table 4.2

Summary of Multiple Linear Regression Model Analysis for Teacher Attributes Variables Predicting Student Achievement

<table>
<thead>
<tr>
<th>Predictor Variables</th>
<th>Beta</th>
<th>t</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td>Constant</td>
<td>57.91</td>
<td>8.58</td>
<td>.000</td>
</tr>
<tr>
<td>Average years of experience</td>
<td>-.162</td>
<td>-1.43</td>
<td>.156</td>
</tr>
<tr>
<td>Less than a Bachelor’s degree</td>
<td>.032a</td>
<td>2.90</td>
<td>.772</td>
</tr>
<tr>
<td>Bachelor’s degree or higher</td>
<td>.098a</td>
<td>.909</td>
<td>.365</td>
</tr>
<tr>
<td>Attended professional development</td>
<td>-3.20</td>
<td>-2.09</td>
<td>.039*</td>
</tr>
<tr>
<td>National Board Certified</td>
<td>5.32</td>
<td>4.39</td>
<td>.000**</td>
</tr>
<tr>
<td>R-square: .195</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Adjusted R-square: .159</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*p<.05

**p<.001

*Standardized Beta coefficients reported for log transformed variables.
Analysis for Hypothesis 2

There will be no statistically significant correlation in the relationship between the achievement of secondary career and technical students and district level contextual factors including enrollment, MAARS school performance classification, and socio-economic status by district location.

The population (N = 117) of secondary CTE centers or programs within the 152 school districts was examined. Descriptive statistics for the dependent variable of MS-CPAS2 test scores by district location are (M = 62.95, SD = 6.80, N = 117). The descriptive statistics for the district location independent variables for contextual factors are shown in Table 4.3.

Table 4.3

Descriptive Statistics of School Contextual Factors at the District Location Level

<table>
<thead>
<tr>
<th>School Contextual Factor</th>
<th>N</th>
<th>M</th>
<th>SD</th>
</tr>
</thead>
<tbody>
<tr>
<td>Enrollment</td>
<td>117</td>
<td>250.27</td>
<td>141.31</td>
</tr>
<tr>
<td>Socio-economic Status</td>
<td>117</td>
<td>73.58</td>
<td>18.27</td>
</tr>
<tr>
<td>Achievement Level Index</td>
<td>117</td>
<td>387.68</td>
<td>92.44</td>
</tr>
</tbody>
</table>

An MLR analysis was conducted to determine which of the CTE school contextual factors at the district location level accounted for a statistically significant amount of the variation in the dependent variable, the MS-CPAS2 test score. The analysis revealed an R-squared value indicating 21% of the variation in student achievement at the
district level can be predicted on the basis of the school contextual factors of enrollment, socio-economic status, and the achievement level index.

The ANOVA results with an alpha level of .05 were statistically significant, \( F(3,113) = 10.03, p < .05 \). The researcher rejected the null hypothesis due to the fact that predictions on the MS-CPAS2 test scores can be made on a better than chance level when these school contextual factors are simultaneously entered into the model. The Pearson’s \( R = .459 \), indicating a moderate correlation between the dependent variable and the best linear combination of the predictor variables. The \( t \)-tests determined whether any of the \textit{Beta} coefficients of school contextual factor independent variables were statistically significant. As shown in the Table 4.4 below, the predictor of socio-economic status (\( M = 73.58, SD = 18.27, N = 117 \)) had a statistically significant negative impact on student achievement, meaning that for every 1% increase in free and reduced lunch at the district level, the average district score on the MS-CPAS2 decreased .14%. No other school contextual factors were statistically significant in the model.
Due to the nature of all of the predictor variables being so closely related in an educational environment and with the purpose of explaining a higher percentage of variation in student achievement, the researcher combined the teacher attributes and school contextual factors into one predictive model.

A multiple linear regression analysis was conducted to determine which of the combined predictor variables by district location level accounted for a statistically significant amount of the variation in the dependent variable, the MS-CPAS2 test score. The analysis revealed an R-squared value indicating 28.5% of the variation in student achievement at the district level can be predicted on the basis of the combined teacher attributes of average years experience, degree attainment, attended professional development, national board certification, and school contextual factors of enrollment, socio-economic status, and the achievement level index.
The ANOVA results with an alpha level of .05 were statistically significant, \( F(8,108) = 5.38, p < .05 \). The researcher rejected the null hypotheses 1 and 2 due to the fact that predictions on the MS-CPAS2 test scores can be made on a better than chance level when these teacher attributes and school contextual factors are simultaneously entered into the model. The Pearson’s \( R = .534 \), indicates a moderate correlation between the dependent variable and the best linear combination of the predictor variables. The \( t \)-tests determined whether any of the \( Beta \) coefficients of teacher attributes and school contextual factor independent variables were statistically significant. As shown in the Table 5 below, the predictor of national board certification \( (M = 36.8, SD = 48.40, N = 117) \) had a statistically significant positive impact on student achievement, meaning that on average, school districts with at least one NBC CTE teacher at a vocational center had a 3.71% higher mean MS-CPAS2 score than those school districts without and NBC CTE teacher at a vocational center. No other predictors were statistically significant in the model.

Due to a stronger correlation with all predictors in the model and a greater explanation of variation being predicted using all independent variables, the researcher determined that the full model of all predictors (teacher attributes and school contextual factors) would be used in the additional analyses for hypothesis 3, concerning student achievement by CTE program area. Furthermore, since NBC showed significance in both the separate and full models, the researcher determined the need to establish hypothesis 4 to more closely examine differences in NBC CTE and non-NBC CTE teachers at the individual course level within each of the seven CTE program areas.
Table 4.5
Summary of Multiple Linear Regression Model Analysis for Full Model Predicting Student Achievement

<table>
<thead>
<tr>
<th>Predictor Variables</th>
<th>Beta</th>
<th>t</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td>Constant</td>
<td>67.29</td>
<td>6.39</td>
<td>.000</td>
</tr>
<tr>
<td>Average years experience</td>
<td>-.137</td>
<td>-.125</td>
<td>.214</td>
</tr>
<tr>
<td>Less than a Bachelor’s</td>
<td>.126a</td>
<td>1.14</td>
<td>.257</td>
</tr>
<tr>
<td>Bachelor’s or higher</td>
<td>.103a</td>
<td>.992</td>
<td>.323</td>
</tr>
<tr>
<td>Attend professional development</td>
<td>-1.59</td>
<td>-1.05</td>
<td>.296</td>
</tr>
<tr>
<td>National Board Certification</td>
<td>3.71</td>
<td>2.81</td>
<td>.006**</td>
</tr>
<tr>
<td>Enrollment</td>
<td>-.116a</td>
<td>-1.20</td>
<td>.233</td>
</tr>
<tr>
<td>Socio-economic Status</td>
<td>-.098</td>
<td>-1.95</td>
<td>.054</td>
</tr>
<tr>
<td>Achievement level index</td>
<td>.009</td>
<td>1.03</td>
<td>.306</td>
</tr>
</tbody>
</table>

R-square: .285
Adjusted R-square: .232

*p<.05
**p<.01

*aStandardized Beta coefficients reported for log transformed variables.

Analysis for Hypothesis 3

There will be no statistically significant correlation in the relationship between the achievement of secondary career and technical students and attributes of secondary career and technical teachers including number of years of teaching experience, degree(s) of attainment, national board certification, and participation in the professional development experience and the contextual factors of enrollment, socio-economic status, and the achievement level index by the seven individual career and technical program areas.
The first two hypotheses in the study examined district level data. For hypothesis 3, the same independent variables were used in a full model to predict MS-CPAS2 scores by each of the seven individual CTE programs area classifications for CTE in Mississippi: Agriculture Sciences, Business and Computer Technology, Cooperative Education and Marketing, Family and Consumer Sciences, Health Sciences Technology, Technology Applications, and Trade and Industrial Technology. Table 4.6 on the following page shows the descriptive statistics for all program areas.
Table 4.6
Descriptive Statistics for Teacher Attributes and School Contextual Factors
At the CTE Program Area Level

<table>
<thead>
<tr>
<th>Variables</th>
<th>Agriculture Sciences</th>
<th>Business &amp; Computer Technology</th>
<th>Cooperative Education &amp; Mktg</th>
<th>Family and Consumer Sciences</th>
<th>Health Sciences Technology</th>
<th>Technology Applications</th>
<th>Trade &amp; Industrial Technology</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>N=70</td>
<td>N=95</td>
<td>N=67</td>
<td>N=61</td>
<td>N=84</td>
<td>N=38</td>
<td>N=91</td>
</tr>
<tr>
<td>MS-CPAS2 Scores</td>
<td>M=53.98</td>
<td>M=64.70</td>
<td>M=70.99</td>
<td>M=71.07</td>
<td>M=72.14</td>
<td>M=66.34</td>
<td>M=59.65</td>
</tr>
<tr>
<td></td>
<td>SD=6.68</td>
<td>SD=7.87</td>
<td>SD=8.65</td>
<td>SD=10.32</td>
<td>SD=8.93</td>
<td>SD=7.96</td>
<td>SD=7.61</td>
</tr>
<tr>
<td></td>
<td>SD=5.32</td>
<td>SD=4.20</td>
<td>SD=4.78</td>
<td>SD=4.61</td>
<td>SD=4.40</td>
<td>SD=4.29</td>
<td>SD=4.25</td>
</tr>
<tr>
<td>% Less than a Bachelor’s Degree</td>
<td>M=22.82</td>
<td>M=29.41</td>
<td>M=22.37</td>
<td>M=25.06</td>
<td>M=28.89</td>
<td>M=27.57</td>
<td>M=29.67</td>
</tr>
<tr>
<td></td>
<td>SD=21.61</td>
<td>SD=20.89</td>
<td>SD=19.91</td>
<td>SD=18.92</td>
<td>SD=20.49</td>
<td>SD=19.11</td>
<td>SD=20.33</td>
</tr>
<tr>
<td>% With a Bachelor’s Degree or Higher</td>
<td>M=77.18</td>
<td>M=70.59</td>
<td>M=77.63</td>
<td>M=74.94</td>
<td>M=71.11</td>
<td>M=72.43</td>
<td>M=70.33</td>
</tr>
<tr>
<td></td>
<td>SD=21.61</td>
<td>SD=20.89</td>
<td>SD=19.91</td>
<td>SD=18.92</td>
<td>SD=20.49</td>
<td>SD=19.11</td>
<td>SD=20.33</td>
</tr>
<tr>
<td>Attended Professional development</td>
<td>M=15.70</td>
<td>M=20.0</td>
<td>M=17.9</td>
<td>M=19.7</td>
<td>M=19.0</td>
<td>M=10.5</td>
<td>M=22.0</td>
</tr>
<tr>
<td></td>
<td>SD=36.70</td>
<td>SD=40.20</td>
<td>SD=38.90</td>
<td>SD=40.10</td>
<td>SD=39.50</td>
<td>SD=31.10</td>
<td>SD=41.60</td>
</tr>
<tr>
<td>National Board Certification</td>
<td>M=40.0</td>
<td>M=40.0</td>
<td>M=52.2</td>
<td>M=71.07</td>
<td>M=47.60</td>
<td>M=66.34</td>
<td>M=42.9</td>
</tr>
<tr>
<td></td>
<td>SD=49.30</td>
<td>SD=49.20</td>
<td>SD=50.30</td>
<td>SD=50.40</td>
<td>SD=20.20</td>
<td>SD=50.60</td>
<td>SD=49.80</td>
</tr>
<tr>
<td>Enrollment</td>
<td>M=92.11</td>
<td>M=36.28</td>
<td>M=48.75</td>
<td>M=47.69</td>
<td>M=39.05</td>
<td>M=22.34</td>
<td>M=82.43</td>
</tr>
<tr>
<td></td>
<td>SD=59.82</td>
<td>SD=27.54</td>
<td>SD=36.34</td>
<td>SD=43.44</td>
<td>SD=21.91</td>
<td>SD=10.81</td>
<td>SD=45.09</td>
</tr>
<tr>
<td>Socio-economic Status</td>
<td>M=69.45</td>
<td>M=74.48</td>
<td>M=68.53</td>
<td>M=73.72</td>
<td>M=72.30</td>
<td>M=70.96</td>
<td>M=74.92</td>
</tr>
<tr>
<td></td>
<td>SD=16.50</td>
<td>SD=17.71</td>
<td>SD=16.09</td>
<td>SD=17.66</td>
<td>SD=17.90</td>
<td>SD=17.32</td>
<td>SD=18.20</td>
</tr>
<tr>
<td>Achievement Level Index</td>
<td>M=402.82</td>
<td>M=381.93</td>
<td>M=411.09</td>
<td>M=388.53</td>
<td>M=390.27</td>
<td>M=392.79</td>
<td>M=378.29</td>
</tr>
<tr>
<td></td>
<td>SD=84.80</td>
<td>SD=93.79</td>
<td>SD=78.28</td>
<td>SD=92.26</td>
<td>SD=88.30</td>
<td>SD=793.08</td>
<td>SD=93.87</td>
</tr>
</tbody>
</table>
An MLR analysis was conducted to determine which of the predictor variables by CTE program area accounted for a statistically significant amount of the variation in the dependent variable, the MS-CPAS2 test score. For the agriculture sciences program area, the analysis revealed an R-squared value indicating 30.5% of the variation in student achievement can be predicted on the basis of the teacher attributes of average years experience, degree attainment, attended professional development, national board certification, and school contextual factors of enrollment, socio-economic status, and the achievement level index.

The ANOVA results for the agriculture sciences program area at an alpha level of .05 were statistically significant, $F(8, 61) = 3.344, p = .003$. The researcher rejected the null hypotheses due to the fact that predictions of the MS-CPAS2 test scores can be made on a better than chance level when these teacher attributes and school contextual factors are simultaneously entered into the model. The Pearson’s $R = .552$, indicates a moderate correlation between the dependent variable and the best linear combination of the predictor variables. The $t$-tests determined whether any of the $Beta$ coefficients of teacher attributes and school contextual factor independent variables were statistically significant. As shown in the Table 4.7 below, the predictor of socio-economic status ($M = 69.45, SD = 16.50, N = 70$) had a statistically significant negative impact on student achievement in agriculture sciences, meaning that for every 1% increase in school district’s free and reduced lunch, the average agriculture sciences MS-CPAS2 scores decreased by .16%. No other predictors were statistically significant in the model.
For the business and computer technology program area, the analysis revealed an R-squared value indicating 26.3% of the variation in student achievement can be predicted on the basis of the teacher attributes of average years experience, degree attainment, attended professional development, national board certification, and school contextual factors of enrollment, socio-economic status, and the achievement level index.

The ANOVA results for the business and computer technology program area at an alpha level of .05 were statistically significant, $F (8,86) = 3.839, p = .001$. The researcher rejected the null hypotheses due to the fact that predictions on the MS-CPAS2 test scores can be made on a better than chance level when these teacher attributes and school contextual factors are simultaneously entered into the model. The Pearson’s $R = .513$, indicates a moderate correlation between the dependent variable and the best linear combination of the predictor variables. The $t$-tests determined whether any of the Beta coefficients of teacher attributes and school contextual factor independent variables were statistically significant. As shown in the Table 4.7 below, the predictor of average years experience ($M = 13.34, SD = 4.20, N = 95$) had a statistically significant negative impact on student achievement in business and computer technology, meaning that for every 1% increase in average years of teaching experience, the average business and computer technology MS-CPAS2 scores decrease by .38%. The predictor of enrollment ($M = 36.28, SD = 27.54, N = 95$) had a statistically significant negative impact on student achievement in business and computer technology, meaning that for every 1 standard deviation increase in enrollment, the average business and computer technology MS-CPAS2 scores decrease by .27 standard deviations. The predictor of socio-economic
status ($M = 74.56, SD = 17.71, N = 95$) had a statistically significant negative impact on student achievement in business and computer technology, meaning that for every 1% increase in free and reduced lunch, the average business and computer technology MS-CPAS2 scores decrease by .13%. No other predictors were statistically significant in the model.

For the cooperative education and marketing program area, the analysis revealed an R-squared value indicating 33.6% of the variation in student achievement can be predicted on the basis of the teacher attributes of average years experience, degree attainment, attended professional development, national board certification, and school contextual factors of enrollment, socio-economic status, and the achievement level index.

The ANOVA results for the cooperative education and marketing program area at an alpha level of .05 were statistically significant, $F (8, 57) = 3.61, p = .002$. The researcher rejected the null hypotheses due to the fact that predictions on the MS-CPAS2 test scores can be made on a better than chance level when these teacher attributes and school contextual factors are simultaneously entered into the model. The Pearson’s $R = .580$, indicates a moderate correlation between the dependent variable and the best linear combination of the predictor variables. The $t$-tests determined whether any of the Beta coefficients of teacher attributes and school contextual factor independent variables were statistically significant. As shown in the Table 4.7 below, the predictor of NBC ($M = 52.20, SD = 50.30, N = 67$) had a statistically significant positive impact on student achievement in cooperative education and marketing, meaning that on average, districts with cooperative education and marketing programs with at least one NBC CTE teacher
had a 4.5% higher mean MS-CPAS2 score than those districts with cooperative education and marketing programs without an NBC CTE teacher. The predictor of enrollment \( (M = 48.75, SD = 36.34, N = 67) \) had a statistically significant negative impact on student achievement in cooperative education and marketing, meaning that for every 1 standard deviation increase in enrollment, the average cooperative education and marketing MS-CPAS2 score decrease by .28 standard deviations. The predictor of achievement level index \( (M = 411.10, SD = 78.28, N = 67) \) had a statistically significant positive impact on student achievement in cooperative education and marketing, meaning that for every 1% increase in the achievement level index in districts with a cooperative education and marketing program, the average program area MS-CPAS2 score increased by .04%. No other predictors were statistically significant in the model.

For the family and consumer sciences program area, the analysis revealed an R-squared value indicating 32.8% of the variation in student achievement can be explained on the basis of the teacher attributes of average years experience, degree attainment, attended professional development, national board certification, and school contextual factors of enrollment, socio-economic status, and the achievement level index.

The ANOVA results for the family and consumer sciences program area at an alpha level of .05 were statistically significant, \( F(8, 52) = 3.17, p = .005 \). The researcher rejected the null hypotheses due to the fact that predictions on the MS-CPAS2 test scores can be made on a better than chance level when these teacher attributes and school contextual factors are simultaneously entered into the model. The Pearson’s \( R = .572 \), indicates a moderate correlation between the dependent variable and the best linear
combination of the predictor variables. The $t$-tests determined whether any of the Beta coefficients of teacher attributes and school contextual factor independent variables were statistically significant. As shown in the Table 4.7 below, the predictor of achievement level index ($M = 388.53$, $SD = 92.26$, $N = 61$) had a statistically significant positive impact on student achievement in family and consumer sciences, meaning that for every 1% increase in the achievement level index in districts with a family and consumer sciences program, the average program area MS-CPAS2 score increased by .06%. No other predictors were statistically significant in the model.

For the health sciences program area, the analysis revealed an R-squared value indicating 31.3% of the variation in student achievement can be predicted on the basis of the teacher attributes of average years experience, degree attainment, attended professional development, national board certification, and school contextual factors of enrollment, socio-economic status, and the achievement level index.

The ANOVA results for the health sciences program area at an alpha level of .05 were statistically significant, $F (8,75) = 4.26, p < .05$. The researcher rejected the null hypotheses due to the fact that predictions on the MS-CPAS2 test scores can be made on a better than chance level when these teacher attributes and school contextual factors are simultaneously entered into the model. The Pearson’s $R = .559$, indicates a moderate correlation between the dependent variable and the best linear combination of the predictor variables. The $t$-tests determined whether any of the Beta coefficients of teacher attributes and school contextual factor independent variables were statistically significant. As shown in the Table 4.7 below, the predictor of percentage of teachers with a
bachelor’s degree or higher ($M = 71.11, SD = 20.49, N = 84$) had a statistically significant positive impact on student achievement in health sciences, meaning that for every 1 standard deviation increase in health sciences teachers with a bachelor’s degree or higher, the average program area MS-CPAS2 score increased by .25 standard deviations. No other predictors were statistically significant in the model.

For the technology applications program area, the analysis revealed an R-squared value indicating 44.1% of the variation in student achievement can be predicted on the basis of the teacher attributes of average years experience, degree attainment, attended professional development, national board certification, and school contextual factors of enrollment, socio-economic status, and the achievement level index. 

The ANOVA results for the technology applications program area at an alpha level of .05 were statistically significant, $F(8, 29) = 2.86, p = .018$. The researcher rejected the null hypotheses due to the fact that predictions on the MS-CPAS2 test scores can be made on a better than chance level when these teacher attributes and school contextual factors are simultaneously entered into the model. The Pearson’s $R = .664$, indicates a moderate correlation between the dependent variable and the best linear combination of the predictor variables. The $t$-tests determined whether any of the $Beta$ coefficients of teacher attributes and school contextual factor independent variables were statistically significant. As shown in the Table 4.7 below, the predictor of attended professional development ($M = 10.5, SD = 31.10, N = 38$) had a statistically significant negative impact on student achievement in technology applications, meaning that on average districts with technology applications programs with at least one CTE faculty
member who attended the professional development had a 12.30% lower MS-CPAS2 score than those districts with technology applications programs who did not attend the professional development. No other predictors were statistically significant in the model.

For the trade and industrial technology program area, the analysis revealed an R-squared value indicating 37.3% of the variation in student achievement can be predicted on the basis of the teacher attributes of average years experience, degree attainment, attended professional development, national board certification, and school contextual factors of enrollment, socio-economic status, and the achievement level index.

The ANOVA results for the trade and industrial technology program area at an alpha level of .05 were statistically significant, \( F(8, 82) = 6.09, p < .05 \). The researcher rejected the null hypotheses due to the fact that predictions on the MS-CPAS2 test scores can be made on a better than chance level when these teacher attributes and school contextual factors are simultaneously entered into the model. The Pearson’s \( R = .610, \) indicates a moderate correlation between the dependent variable and the best linear combination of the predictor variables. The \( t \)-tests determined whether any of the \( \text{Beta} \) coefficients of teacher attributes and school contextual factor independent variables were statistically significant. As shown in the Table 4.7 below, the predictor of percentage with less than a bachelor’s degree \( (M = 29.67, SD = 20.33, N = 91) \) had a statistically significant positive impact on student achievement in trade and industrial technology, meaning that for every 1 standard deviation increase in trade and industrial technology teachers with less than a bachelor’s degree average program area MS-CPAS2 scores increased .23 standard deviations. The predictor of socio-economic status
(M = 74.92, SD = 18.20, N = 91) had a statistically significant negative impact on student achievement in trade and industrial technology, meaning for every 1% increase in free and reduced lunch average program area MS-CPAS2 scores decreased .25%. No other predictors were statistically significant in the model.
**Table 4.7**

Summary of Multiple Linear Regression Model Analysis for Predicting Student Achievement at the CTE Program Level

<table>
<thead>
<tr>
<th>Variables</th>
<th>Agriculture Sciences</th>
<th>Business &amp; Computer Technology</th>
<th>Cooperative Education &amp; Marketing</th>
<th>Family and Consumer Sciences</th>
<th>Health Sciences Technology</th>
<th>Technology Applications</th>
<th>Trade &amp; Industrial Technology</th>
</tr>
</thead>
<tbody>
<tr>
<td>Constant</td>
<td>B=.69.49</td>
<td>B=.81.79</td>
<td>B=.65.10</td>
<td>B=.19.08</td>
<td>B=.49.55</td>
<td>B=.50.94</td>
<td>B=.80.03</td>
</tr>
<tr>
<td></td>
<td>t=.05.08</td>
<td>t=.6.89</td>
<td>t=.3.99</td>
<td>t=.5.58</td>
<td>t=.3.10</td>
<td>t=.1.84</td>
<td>t=.7.14</td>
</tr>
<tr>
<td></td>
<td>p&lt;.000</td>
<td>p&lt;.000</td>
<td>p&lt;.000</td>
<td>p&lt;.579</td>
<td>p&lt;.003</td>
<td>p&lt;.149</td>
<td>p&lt;.000</td>
</tr>
<tr>
<td>Average</td>
<td>B=.141</td>
<td>B=.380</td>
<td>B=.249</td>
<td>B=.182</td>
<td>B=.206</td>
<td>B=.038</td>
<td>B=.225</td>
</tr>
<tr>
<td>Years</td>
<td>t=.989</td>
<td>t=.2.05</td>
<td>t=.1.19</td>
<td>t=.6.56</td>
<td>t=.970</td>
<td>t=.133</td>
<td>t=.1.34</td>
</tr>
<tr>
<td>% Less than a Bachelor's</td>
<td>B=.024*</td>
<td>B=.054*</td>
<td>B=.114*</td>
<td>B=.138*</td>
<td>B=.028*</td>
<td>B=.468*</td>
<td>B=.227*</td>
</tr>
<tr>
<td>Degree</td>
<td>t=.176</td>
<td>t=.461</td>
<td>t=.838</td>
<td>t=.718</td>
<td>t=.215</td>
<td>t=.856</td>
<td>t=.1.99</td>
</tr>
<tr>
<td>% with a Bachelor's</td>
<td>B=.110*</td>
<td>B=.196*</td>
<td>B=.047*</td>
<td>B=.335*</td>
<td>B=.254*</td>
<td>B=.158*</td>
<td>B=.067*</td>
</tr>
<tr>
<td>Degree or Higher</td>
<td>t=.852</td>
<td>t=.1.69</td>
<td>t=.372</td>
<td>t=.1.699</td>
<td>t=.2.161</td>
<td>t=.645</td>
<td>t=.627</td>
</tr>
<tr>
<td>Enrollment</td>
<td>B=.013*</td>
<td>B=.270*</td>
<td>B=.278*</td>
<td>B=.051*</td>
<td>B=.039*</td>
<td>B=.087*</td>
<td>B=.089*</td>
</tr>
<tr>
<td></td>
<td>t=.112</td>
<td>t=.2.81</td>
<td>t=.2.50</td>
<td>t=.396</td>
<td>t=.374</td>
<td>t=.571</td>
<td>t=.918</td>
</tr>
<tr>
<td>Socio-economic Status</td>
<td>B=.162</td>
<td>B=.130</td>
<td>B=.004</td>
<td>B=.152</td>
<td>B=.047</td>
<td>B=.181</td>
<td>B=.253</td>
</tr>
<tr>
<td></td>
<td>t=.2.13</td>
<td>t=.2.01</td>
<td>t=.039</td>
<td>t=.1.29</td>
<td>t=.544</td>
<td>t=.1.82</td>
<td>t=.4.26</td>
</tr>
<tr>
<td></td>
<td>p&lt;.037*</td>
<td>p&lt;.048*</td>
<td>p&lt;.969</td>
<td>p&lt;.203</td>
<td>p&lt;.588</td>
<td>p&lt;.079</td>
<td>p&lt;.000***</td>
</tr>
<tr>
<td>Achievement Level Index</td>
<td>B=.008</td>
<td>B=.007</td>
<td>B=.040</td>
<td>B=.061</td>
<td>B=.032</td>
<td>B=.005</td>
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<td></td>
<td>t=.583</td>
<td>t=.573</td>
<td>t=.2.12</td>
<td>t=.2.87</td>
<td>t=.1.95</td>
<td>t=.2.82</td>
<td>t=.3.45</td>
</tr>
<tr>
<td>R-square</td>
<td>.305</td>
<td>.263</td>
<td>.336</td>
<td>.328</td>
<td>.313</td>
<td>.441</td>
<td>.373</td>
</tr>
<tr>
<td>Adjusted R-square</td>
<td>.214</td>
<td>.195</td>
<td>.243</td>
<td>.224</td>
<td>.239</td>
<td>.286</td>
<td>.311</td>
</tr>
</tbody>
</table>

* p<.05  
** p<.01  
*** p<.001  

*aStandardized Beta coefficients reported for log transformed variables.
Analysis for Hypothesis 4

There will be no statistically significant difference in student achievement of secondary career and technical students between the groups of national board certified career and technical teachers and non-national board certified career and technical teachers by individual career and technical course.

For hypothesis 4, a one-way ANOVA comparing the mean MS-CPAS2 scores was conducted to examine statistically significant differences between NBC CTE teachers compared to non-NBC CTE teachers at the individual CTE course level within each program area. Twenty-one CTE courses were identified as having at least one NBC CTE teacher statewide. Table 4.8 below shows the descriptive statistics.

Table 4.8

Descriptive Statistics for NBC and Non-NBC CTE Teachers’ MS-CPAS2 Test Scores at the CTE Course Level

<table>
<thead>
<tr>
<th>CTE Course</th>
<th>NBC CTE Teachers</th>
<th>Non-NBC CTE Teachers</th>
</tr>
</thead>
<tbody>
<tr>
<td>Agriculture Power and Machinery</td>
<td>18 n 63.10 M 10.68</td>
<td>131 n 59.69 M 11.34</td>
</tr>
<tr>
<td>Agriculture Production</td>
<td>5 n 61.43 M 10.55</td>
<td>228 n 56.22 M 12.25</td>
</tr>
<tr>
<td>Agriscience</td>
<td>13 n 67.03 M 9.39</td>
<td>140 n 61.18 M 13.39</td>
</tr>
<tr>
<td>Allied Health</td>
<td>97 n 80.38 M 13.26</td>
<td>1263 n 72.38 M 12.77</td>
</tr>
<tr>
<td>Automotive Service Technology</td>
<td>10 n 69.14 M 12.24</td>
<td>568 n 58.84 M 13.43</td>
</tr>
<tr>
<td>Business and Computer Technology</td>
<td>87 n 67.21 M 12.65</td>
<td>871 n 63.61 M 12.62</td>
</tr>
<tr>
<td>Design and Merchandise Technology for Fashions</td>
<td>4 n 53.57 M 17.08</td>
<td>115 n 55.07 M 10.92</td>
</tr>
<tr>
<td>Computer Systems and Program Technology</td>
<td>30 n 68.95 M 11.59</td>
<td>61 n 65.22 M 16.75</td>
</tr>
<tr>
<td>Cooperative Education</td>
<td>108 n 76.12 M 8.72</td>
<td>384 n 74.69 M 9.31</td>
</tr>
<tr>
<td>Culinary and Related Foods Technology</td>
<td>31 n 78.11 M 6.62</td>
<td>292 n 75.13 M 11.33</td>
</tr>
<tr>
<td>Early Childhood Services and Education</td>
<td>40 n 82.18 M 8.40</td>
<td>341 n 75.53 M 12.50</td>
</tr>
<tr>
<td>Horticulture</td>
<td>20 n 62.21 M 11.77</td>
<td>31 n 54.19 M 11.13</td>
</tr>
<tr>
<td>Hotel, Restaurant, and Tourism Management</td>
<td>11 n 57.14 M 6.76</td>
<td>21 n 60.00 M 8.76</td>
</tr>
<tr>
<td>Marketing Management Technology</td>
<td>18 n 67.38 M 9.64</td>
<td>368 n 61.14 M 14.24</td>
</tr>
<tr>
<td>Plastics and Polymer Science Applications</td>
<td>2 n 71.43 M 12.12</td>
<td>13 n 72.31 M 13.37</td>
</tr>
<tr>
<td>Technology Applications</td>
<td>12 n 69.64 M 9.48</td>
<td>278 n 66.19 M 13.32</td>
</tr>
<tr>
<td>Agribusiness and Entrepreneurship</td>
<td>19 n 48.57 M 10.52</td>
<td>223 n 48.72 M 12.77</td>
</tr>
<tr>
<td>Science of Agricultural Animals</td>
<td>33 n 53.59 M 10.33</td>
<td>178 n 53.93 M 10.20</td>
</tr>
<tr>
<td>Science of Agricultural Environment</td>
<td>19 n 53.53 M 10.38</td>
<td>138 n 59.01 M 13.97</td>
</tr>
<tr>
<td>Science of Agricultural Mechanization</td>
<td>16 n 56.79 M 9.84</td>
<td>128 n 59.78 M 13.75</td>
</tr>
<tr>
<td>Science of Agricultural Plants</td>
<td>21 n 48.57 M 15.23</td>
<td>334 n 48.01 M 12.37</td>
</tr>
</tbody>
</table>

CTE Program Areas: Agriculture Sciences * Business and Computer Technology * Cooperative Education and Marketing * Family and Consumer Sciences * Health Sciences Technology * Technology Applications * Trade and Industrial Technology
At the .05 alpha level, statistically significant differences in the two groups of MS-CPAS2 scores was found in five of the twenty-one identified CTE courses; therefore, the researcher rejected the null hypothesis. For the allied health course the ANOVA results showed $(1, 1358) F = 35.17, p < .05$, meaning NBC teachers $(M = 80.38, SD = 13.26, n = 97)$ had statistically significant higher mean MS-CPAS2 scores than those non NBC teachers $(M = 72.38, SD = 12.77, n = 1263)$. For the automotive service technology course, the ANOVA results showed $(1,576) F = 4.73, p = .03$, meaning NBC teachers $(M = 69.14, SD = 12.24, n = 10)$ had statistically significant higher mean MS-CPAS2 scores than those non NBC teachers $(M = 59.84, SD = 13.43, n = 568)$. For the business computer and technology course, the ANOVA results showed $(1,956) F= 6.42, p = .01$, meaning NBC teachers $(M = 67.21, SD = 12.65, n = 87)$ had statistically significant higher mean MS-CPAS2 scores than those non NBC teachers $(M = 63.61, SD = 12.62, n = 871)$. For the early childhood services and education course, the ANOVA results showed $(1,379) F = 10.72, p = .001$, meaning NBC teachers $(M = 82.18, SD = 8.40, n = 40)$ had statistically significant higher mean MS-CPAS2 scores than those non NBC teachers $(M = 75.53, SD = 12.50, n = 341)$. Finally, for the horticulture course, the ANOVA results showed $(1, 49) F = 6.04, p = .018$, meaning NBC teachers $(M = 62.21, SD = 11.77, n = 20)$ had statistically significant higher mean MS-CPAS2 scores than those non NBC teachers $(M = 54.19, SD = 11.13, n = 31)$. Summary results from the ANOVA are shown below in Table 4.9.
Summary ANOVA table for the Comparison of NBC CTE Teachers’ and Non-NBC CTE Teachers’ MS-CPAS2 Test Scores at the CTE Course Level

<table>
<thead>
<tr>
<th>CTE Course</th>
<th>F-ratio</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td>Agriculture Power and Machinery</td>
<td>1.44</td>
<td>.232</td>
</tr>
<tr>
<td>Agriculture Production</td>
<td>.89</td>
<td>.347</td>
</tr>
<tr>
<td>Agriscience</td>
<td>2.37</td>
<td>.126</td>
</tr>
<tr>
<td>Allied Health</td>
<td>35.17</td>
<td>.000***</td>
</tr>
<tr>
<td>Automotive Service Technology</td>
<td>4.73</td>
<td>.030*</td>
</tr>
<tr>
<td>Business and Computer Technology</td>
<td>6.42</td>
<td>.011*</td>
</tr>
<tr>
<td>Design and Merchandise Technology for Fashions</td>
<td>.070</td>
<td>.792</td>
</tr>
<tr>
<td>Computer Systems and Program Technology</td>
<td>1.20</td>
<td>.276</td>
</tr>
<tr>
<td>Cooperative Education</td>
<td>2.06</td>
<td>.151</td>
</tr>
<tr>
<td>Culinary and Related Foods Technology</td>
<td>2.07</td>
<td>.151</td>
</tr>
<tr>
<td>Early Childhood Services and Education</td>
<td>10.72</td>
<td>.001**</td>
</tr>
<tr>
<td>Horticulture</td>
<td>6.04</td>
<td>.018*</td>
</tr>
<tr>
<td>Hotel, Restaurant, and Tourism Management</td>
<td>.89</td>
<td>.354</td>
</tr>
<tr>
<td>Marketing Management Technology</td>
<td>3.38</td>
<td>.067</td>
</tr>
<tr>
<td>Plastics and Polymer Science Applications</td>
<td>.008</td>
<td>.932</td>
</tr>
<tr>
<td>Technology Applications</td>
<td>.787</td>
<td>.376</td>
</tr>
<tr>
<td>Agribusiness and Entrepreneurship</td>
<td>.003</td>
<td>.956</td>
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<tr>
<td>Science of Agricultural Animals</td>
<td>.031</td>
<td>.861</td>
</tr>
<tr>
<td>Science of Agricultural Environment</td>
<td>2.70</td>
<td>.102</td>
</tr>
<tr>
<td>Science of Agricultural Mechanization</td>
<td>.71</td>
<td>.401</td>
</tr>
<tr>
<td>Science of Agricultural Plans</td>
<td>.04</td>
<td>.842</td>
</tr>
</tbody>
</table>

* p < .05  
** p < .01  
*** p < .001

Summary

In this chapter, the researcher presented results from the multiple linear regression analyses used in the first three hypotheses and the ANOVA analysis used in the fourth hypothesis. The first three hypotheses aimed to determine the strength of relationship among the linear combination of predictors and the dependent variable. The fourth hypothesis aimed to address any differences in scores between NBC CTE teachers and non-NBC CTE teachers. The findings showed that the separate and full predictor models from the regression analyses were statistically significant. Furthermore, the ANOVA results showed five of the twenty-one CTE courses identified showed statistical
significance. This type of data is helpful in making decisions regarding the State Plan for CTE since it is the guiding framework for delivery of CTE in Mississippi.
CHAPTER V

CONCLUSIONS, IMPLICATIONS, AND RECOMMENDATIONS

This chapter includes a review of the problem that served as the driver for this study and established the need to pursue investigations related to testing and Career and Technical Education (CTE). The chapter is organized providing conclusions drawn by the researcher from each of the four hypotheses, the implications to the field, and recommendations for further study.

Review of the Problem Statement

The field of education has brought about a regimen of testing among students to show attainment toward established goals in order to sustain funding for programs at the local district level. An increase in standardized testing has brought the focus of education on the end product of student scores (Cruickshank & Haefele, 2001). Savage, Savage, and Armstrong (2006) speak of the lack of confidence in teachers today and the enforcement of accountability measures as one way of making teachers responsible for the outcomes of their teaching. They support the standardized test result as a fair and effective way to hold teachers accountable. Examination of factors that may be related to the outcomes of standardized assessments used for accountability measures provides critical information for state and local level decision makers. The review of literature
related to student achievement shows numerous investigations conducted as qualitative or case study designs. Some of the same variables in this study have been included in other studies, such as enrollment and teacher’s level of educational attainment. However, studies have not quantitatively looked at the combination of CTE teacher and school contextual factors in relationship to CTE student achievement. Furthermore, CTE student achievement measured in terms of a statewide, standardized technical skills assessment and the quantitative correlation to CTE teacher attributes and CTE center or high school contextual factors have not been examined.

The purpose of this study was to determine whether or not there is a relationship between secondary CTE teachers’ attributes of number of years of teaching experience, degree(s) of attainment, national board certification, and participation in the professional development experience and secondary CTE student achievement. Furthermore, this study aims to determine whether or not there is a relationship between school level contextual factors of enrollment, Mississippi Assessment and Accountability Reporting System (MAARS) school performance classification, and socio-economic status and CTE student achievement.

Conclusions for the Hypotheses

Hypothesis 1

There will be no statistically significant correlation in the relationship between the achievement of secondary career and technical students and attributes of secondary career

85
and technical teachers based on number of years of teaching experience, degree(s) of attainment, national board certification, and participation in the professional development experience by district location.

At the district level, the predictor model including only the CTE teacher attributes resulted in statistical significance, meaning that the model provided predictions of CTE student achievement on the Mississippi Career Planning and Assessment System (MS-CPAS2) at a better than chance level. Specifically, the model identified the attributes of national board certified (NBC) as statistically significant. Those districts with at least one NBC CTE teacher in a CTE center showed higher MS-CPAS2 scores than those who did not have an NBC CTE teacher. This finding echoes the Mississippi studies conducted by Holland (2006) and Benigno (2005) that determined NBC teachers have a positive impact on statewide standardized tests. The finding of the researcher’s study may be attributed to NBC representing accomplished teachers dedicated to high quality teaching. Teachers who attain NBC require the support of local school leaders and colleagues to dedicate the time and energy necessary to be successful in the process. Local districts recognizing the value of NBC and supporting teachers to accomplish it likely have an established educational culture of success that resonates throughout the district and CTE center. The impact of having just one NBC CTE teacher in a vocational center makes an impact on the average MS-CPAS2 scores for a district.

Additionally, the model identified attendance at the professional development as having a negative impact on MS-CPAS2 test scores at the district level. This result shows that those districts that had at least one CTE educator attend the professional
development had lower scores than those who did not have at least one CTE educator attend the professional development. The researcher concludes that this result may indicate issues with the format of the professional development, a weakness in the follow-up to training, or the fact that the struggling districts were the targeted participants of the training and have more growth to show in an increase in MS-CPAS2 test scores than those districts not targeted for the training.

Hypothesis 2

There will be no statistically significant correlation in the relationship between the achievement of secondary career and technical students and district level contextual factors including enrollment, MAARS school performance classification, and socio-economic status by district location.

At the district level, the predictor model including only the school contextual factors resulted in statistical significance, meaning that the model provided predictions of CTE student achievement on the MS-CPAS2 at a better than chance level. Specifically, the model identified the factor of socio-economic status as statistically significant. The higher the percentage of a district’s free and reduced lunch students, the lower the MS-CPAS2 test scores. These results support the findings of other Mississippi studies, Herring (1997) and Langford (2002), showing the negative impact low socio-economic status of students can have on student achievement on standardized tests. The researcher concludes that this result in the area of CTE may be due to the sheer large number of poor families in Mississippi (Southern Educational Foundation, 2006) classified as
economically disadvantaged as well as a culture of low expectations Mississippians foster for education and career planning (Mississippi Department of Education, 2006).

When the researcher entered all of the teacher attributes combined with the contextual factors into the model at the district level, it resulted in statistical significance, meaning that the full model provided predictions of CTE student achievement on the MS-CPAS2 at a better than chance level as well as helped to explain more of the variation in MS-CPAS2 scores. Specifically, the full model identified the teacher attribute of NBC as statistically significant. Again, the researcher concludes that this result at the district level may indicate an educational environment with high expectations and a strong support system for NBC CTE teachers that extend to those CTE teachers that are non-NBC.

**Hypothesis 3**

There will be no statistically significant correlation in the relationship between the achievement of secondary career and technical students and attributes of secondary career and technical teachers including number of years of teaching experience, degree(s) of attainment, national board certification, and participation in the professional development experience and the contextual factors of enrollment by the seven individual career and technical program areas.

The first two hypotheses in the study examined district level data. For hypothesis 3, the same independent variables were used in a full model to predict MS-CPAS2 scores by each of the seven individual CTE programs area classifications for CTE in Mississippi: Agriculture Sciences, Business and Computer Technology, Cooperative
Education and Marketing, Family and Consumer Sciences, Health Sciences Technology, Technology Applications, and Trade and Industrial Technology.

At the CTE program area level, the predictor model for each program including both the teacher attributes and the school contextual factors resulted in statistical significance, meaning that the model provided predictions of CTE student achievement on the MS-CPAS2 at a better than chance level for each of the seven program areas. Some variables had a negative impact (lower score) on the MS-CPAS2, and some variables had a positive impact (higher score) on the MS-CPAS2.

Specifically in agriculture sciences, the model found the factor of socio-economic status to be statistically significant. This factor negatively impacted MS-CPAS2 scores in agriculture education. The researcher concluded districts with lower socio-economic status have lower MS-CPAS2 scores in agriculture sciences. This is consistent with previous findings on this factor in other contexts and could be a result specifically for agriculture sciences due to those programs’ location in the more impoverished areas of the state.

In business and computer technology (BCT), average years of teaching experience, enrollment, and socio-economic status were all found to be statistically significant. All three factors negatively impacted MS-CPAS2 scores in BCT. The researcher concluded that BCT programs with teachers having more experience have lower scores than those who do not. This supports Rosenthal’s (2007) results showing longer tenure in the classroom does not necessarily make a person a better teacher. Specifically in this program, this teacher attribute may be attributed to the highly
technical nature of this program area and the reluctance of experienced BCT teachers to embrace new technologies. The researcher concluded that the higher the enrollment in the BCT program the lower the MS-CPAS2 scores. The BCT program has the highest number of CTE programs statewide ($N = 95$) making it challenging to monitor with technical assistance visits from the state department of education as well as provide other systems of support for such a large group of teachers. Finally, the lower socio-economic status of the students the lower the MS-CPAS2 scores in BCT. This factor has had the same results in other contexts and may be a factor in this program area due to the entry-level preparedness this program provides for the administrative assistant and related support staff jobs in the workforce. More disadvantaged students may be enrolling in this program that leads to lower level jobs in the field of business.

In cooperative education and marketing, NBC, enrollment, and achievement level index were all found to be statistically significant. NBC and achievement level index positively impacted MS-CPAS2 scores and enrollment negatively impacted MS-CPAS2 scores in the cooperative education and marketing program. The researcher concluded that when at least one NBC CTE educator is located in a CTE center, cooperative education and marketing scores are higher. This is consistent with other findings on this attribute at the district level and may be specifically significant to the cooperative education and marketing program for the same reason of the culture of high expectations that is set in districts that support NBC. Furthermore, students from all CTE program areas may be involved in cooperative education. The higher the achievement level index the higher the MS-CPAS2 scores in cooperative education and marketing. This may be
attributed to the integration of academics in this program area. Finally, the higher the enrollment the lower the MS-CPAS2 score in cooperative education and marketing. This result is consistent with this factor in other contexts and may be significant to this program due to the nature of managing a large group of students offsite in cooperative education work programs.

In family and consumer sciences (FCS), achievement level index was found to be statistically significant. Achievement level index positively impacted MS-CPAS2 scores in the FCS program. The researcher concluded the higher the achievement level index the higher the MS-CPAS2 scores in FCS. This may be attributed to the integration of academics in this program area.

In health sciences technology, teachers with a bachelor’s degree or higher was found to be statistically significant. A bachelor’s degree or higher positively impacted MS-CPAS2 scores in the health sciences program. The researcher concluded the higher the percentage of teachers with a bachelor’s degree or more the higher the MS-CPAS2 scores in health sciences. This may be attributed to the high degree of math and science integration into this program area curriculum and a teacher with a bachelor’s degree or higher demonstrating greater expertise in teaching the curriculum. This finding is consistent with Rosenthal’s (2007) report showing advanced degrees are significant in high school math and science courses.

In technology applications, attendance at the professional development was found to be statistically significant. Attendance at the professional development negatively impacted MS-CPAS2 scores in the technology applications program. The researcher
concluded that those CTE centers that had at least one CTE educator attend the professional development had lower MS-CPAS2 scores in technology applications than those CTE centers that did not have a CTE educator attend the professional development. This result is consistent with this factor in the context of the district level analysis. Specifically significant to the technology applications program area, this factor may be due to the format of the training or lack of follow-up to the training.

In trade and industrial technology, teachers with a less than a bachelor’s degree and the predictor of socio-economic status were found to be statistically significant. Less than a bachelor’s degree positively impacted MS-CPAS2 scores and socio-economic status negatively impacted MS-CPAS2 scores in the trade and industrial technology program. The researcher concluded the higher the percentage of teachers with less than a bachelor’s degree the higher the MS-CPAS2 scores in trade and industrial technology. This may be attributed to this program having a high number of teachers without a bachelor’s degree; however, they are considered master’s of the trade in which they are teaching and have real world experience in the specific jobs for which they are preparing students. The lower the socio-economic status of students, the lower the MS-CPAS2 scores in trade and industrial technology. This factor has been found to have the same impact in other contexts. Specifically to trade and industrial technology, this may be due to a recruitment and placement process that attracts disadvantaged students to this program area.
Hypothesis 4

There will be no statistically significant difference in student achievement of secondary career and technical students between the groups of national board certified career and technical teachers and non-national board certified career and technical teachers by individual career and technical course.

The results show five individual CTE courses with statistically significant different mean MS-CPAS2 scores when comparing NBC CTE teachers to non-NBC CTE teachers. All significant differences showed a positive impact on the scores. The researcher concluded that the mean MS-CPAS2 scores were significantly higher for allied health, automotive service technology, business and computer technology, early childhood services and education, and horticulture for NBC teachers than non-NBC teachers.

Implications and Discussion

Due to the current culture of accountability in the field of education and the Mississippi Department of Education’s recent focus on redesigning high school with a focus on career pathways (Mississippi Department of Education, 2006), this study has wide and far reaching implications for state level leaders making policy and local decision makers making programming and hiring decisions. Results and conclusions from this study can be used at both levels to make more informed decisions that will improve student achievement in CTE. Furthermore, these decisions about student
achievement ultimately impact the overall workforce and economic development in Mississippi.

First, in an effort to recruit and retain quality teachers, decision makers may examine the role of years teaching experience and its impact on student achievement. This is important at the local level as CTE directors make hiring decisions, especially in those CTE program area curricula that rely heavily on the most current and emerging technologies in the field. Teachers considered having more years experience may be reluctant to embrace new technologies included in updated and revised CTE curricula, especially in the business and computer technology program. This information will also impact the funding and delivery of professional development specific to the needs of those teachers considered to have a greater number of years experience.

Secondly, as the push to ensure highly qualified educators continues to be at the forefront of educational initiatives, CTE teachers may be more heavily scrutinized for their degree attainment and training for teacher licensure. Findings that showed the trade and industrial technology educators with less than a bachelor’s degree having higher student achievement may impact policy makers on decisions regarding minimum requirements for CTE or specifically licensure for teachers in the trade and industrial technology program. Furthermore, the finding showing higher student achievement in health sciences for those with CTE teachers with a bachelor’s degree or higher may impact policy makers in making decisions about licensure for those CTE courses that have a strong integration of math and science or teach a health science course that counts toward a science credit for high school graduation. This information is helpful for those
CTE leaders involved in informing and influencing the Mississippi Commission on Teacher and Administrator Education, Certification, and Licensure and Development in the revision and addition of teacher licenses for CTE.

Thirdly, the professional development’s negative impact on MS-CPAS2 scores at the district level may impact decisions regarding the format and delivery of the training, methods of follow-up to the training, and the focus of targeting those low performing program areas for participation. These decisions regarding professional development impact funding for professional development and technical assistance.

Fourth, the results showing NBC has a positive impact on CTE student achievement will impact state and local decision makers in continuing the funding and support of the NBC incentive program for Mississippi teachers. It may also impact local CTE directors in identifying that these teachers may be considered leaders in the field and that their contributions to the environment can have an impact on the culture of high expectations that is desired in all CTE centers and should be recognized and used effectively for improving student achievement.

Fifth, the factor of enrollment having a negative statewide impact on the larger CTE programs’ student achievement will impact decisions made at the state level regarding technical assistance and support to these identified teachers. Funding decisions for positions and programming at the state level to provide monitoring, technical assistance, coaching, and support will be impacted.

Sixth, socio-economic status having a negative impact on CTE student achievement will influence state and local decision makers regarding special
programming and incentives for disadvantaged students. CTE’s legacy of being an education venue for disadvantaged students is no longer the case. However with Mississippi’s high poverty, information from this study indicates that funding and delivery decisions about guidance, mentoring, tutoring, and other student support programming may be impacted by these findings.

Finally, the achievement level index showing a positive impact on CTE student achievement will impact CTE curricula decisions at the state and local levels. Information from this study can be used in establishing the need to more fully integrate academics into the CTE curriculum; therefore, impacting funding for curriculum writing teams and professional development for teachers.

Overall, the results of this study can be used by decision makers to employ informed decisions regarding the improvement of CTE student achievement. Ultimately, the areas of licensure, professional development, national board certification issues, enrollment, disadvantaged student programming, and integration of academics are all potentially impacted by the results of this study.

Recommendations

This quantitative study brought forth several useful nuggets of information for making decisions about CTE in Mississippi. However, the researcher recognizes the need to extend the research to gather more explanatory information about CTE student achievement. The following recommendations are suggested:
1. The researcher conducted this study within the snapshot of one school year testing period. It is recommended that future studies include a period of school years in the analysis.

2. It is recommended that future study using qualitative techniques to capture more information about the educational and professional environment in which these findings came to light. The environmental factors may provide more insight into the variance in student achievement.

3. Qualitative studies involving those CTE centers with at least one NBC CTE teacher are recommended for determining the level of support from the district and the level high expectations established for student achievement within the CTE center.

4. Qualitative studies interviewing CTE teachers with more teaching experience in those program areas that rely heavily on new technologies, such as BCT, are recommended to find out more about specific issues related to teaching with technology.

5. Studies should be conducted after intervention programs for disadvantaged youth have been implemented to determine if any improvement is made in CTE student achievement.

6. Participant survey results from the professional development should be examined closely for making changes in the delivery and follow-up support to training. Consideration should be given to the inclusion of high performing CTE teachers.
in the professional development to impact student outcomes in the low performing program areas.

7. A multi-year study that includes the professional development as a factor and at the individual teacher level is recommended.
BIBLIOGRAPHY


Mississippi Department of Education. (2006). MDE Brief, I(1). Mississippi State, MS: Research and Curriculum Unit.


APPENDIX A

MISSISSIPPI DEPARTMENT OF EDUCATION LETTER OF SUPPORT
MEMORANDUM # 08.183

TO: Katherine Crowley
   Institutional Review Board for the Protection of Human Subject in Research
   70 Morgan Avenue
   Campus Mailstop 9563
   Mississippi State, MS 39762-9563

FROM: Mike Mulvihill, Director
       Bureau of Compliance and Reporting
       Mississippi Department of Education

DATE: November 15, 2007

RE: MS-CPAS Data and Research Study

The Mississippi Department of Education (MDE) contracts with the Research and Curriculum Unit (RCU) to collect achievement data from students in career and technical programs at the secondary and postsecondary levels. This data is used to evaluate program proficiency as required by the Carl D. Perkins Career and Technical Education Improvement Act of 2006. The data is collected using the Mississippi Career Planning Assessment System (MS-CPAS), which includes occupational specific assessments.

I grant Shelley H. Bock permission to use 2006-07 MS-CPAS data for her dissertation research project titled Predictors of Secondary Career and Technical Student Achievement Measured by the Mississippi Career Planning and Assessment System (MS-CPAS). Dr. Cindy Morgan, Coordinator of Assessment and Accountability at the RCU, will provide Shelley Bock MS-CPAS data for secondary programs. Dr. Morgan will also provide to Ms. Bock a listing of career and technical program teachers of these students. Characteristics of teachers provided include academic degree, years of experience, and professional development experience. These items are routinely collected on our teachers.

If you have any questions concerning this matter, please do not hesitate to contact me at mmulvihill@mdoe.ms.us or 601-325-3086.

cc: Patti Abraham  Cindy Morgan  Shelley H. Bock
    James E. Sardin  J. Martez Hill  Janie Jones
APPENDIX B

MISSISSIPPI STATE UNIVERSITY INSTITUTIONAL REVIEW BOARD

LETTER OF SUPPORT
December 18, 2007

Shelley Bock
Research and Curriculum Unit
Mail Stop 9636

RE: IRB Study #07-360: Predictors of Secondary Career and Technical Student Achievement Measured by the Mississippi Career Planning and Assessment System (MS-CPAS)

Dear Ms. Bock:

The above referenced project was reviewed and approved via administrative review on 12/18/2007 in accordance with 45 CFR 46.101(b)(4). Continuing review is not necessary for this project. However, any modification to the project must be reviewed and approved by the IRB prior to implementation. Any failure to adhere to the approved protocol could result in suspension or termination of your project. The IRB reserves the right, at anytime during the project period, to observe you and the additional researchers on this project.

Please refer to your IRB number (#07-360) when contacting our office regarding this application.

Thank you for your cooperation and good luck to you in conducting this research project. If you have questions or concerns, please contact me at kcrowley@research.msstate.edu or 325-8543.

Sincerely,

Katherine Crowley
Assistant IRB Compliance Administrator

cc: Dr. Jerry Mathews
APPENDIX C

MISSISSIPPI SECONDARY CAREER AND TECHNICAL EDUCATION

PROGRAM AREAS
MISSISSIPPI SECONDARY CAREER AND TECHNICAL EDUCATION

PROGRAM AREAS

Agriculture Sciences: The courses in this program area propose to meet the educational, food, and fiber requirements of a global community. Courses provide instruction in technology, production, environmental stewardship, agricultural literacy, and leadership to our clients.

Business and Computer Technology: The courses in this program are dedicated to the education of individuals to lead and contribute to a business community that is ethical, diverse, inclusive, prosperous, and responsible; the advancement of business education at all educational levels; and the development of individuals who embrace high ethical standards and personal and professional excellence to ensure that students and adults are afforded equal opportunity to fundamental business and computer technology knowledge and skills and, therefore, equal opportunity success in life.

Cooperative Education and Marketing: The courses in this program area provide instruction in marketing skills and related sales operations as well as ensure that all students are provided opportunities to learn, apply, and integrate marketing principles in a dynamic, global economy through the delivery of a quality marketing-based curriculum. Courses provide a foundation of skills and knowledge related to basic principles of marketing and related economic fundamentals, management, merchandising, and human relations. The cooperative experiences combine work-readiness preparation, related classroom instruction, and worksite training to prepare individuals for the job market.

Family and Consumer Sciences: The courses in this program area encompass prepare students for adult roles, family responsibilities, and careers related to family and consumer sciences content. Preparing individuals for the work of the family is basic and necessary for building strong families and a productive work force.

Health Sciences Technology: The courses in this program area provide individuals the opportunity to grow in knowledge and skills in the health care areas of interest to them. With the knowledge and skills learned an individual can feel a sense of accomplishment in serving mankind.

Technology Applications: The course in this program area provides a means to develop broad-based technological literacy among Mississippi's students. Students develop an understanding of technological resources, processes, and consequences through learning experiences which include research, simulation, design, problem solving, and modeling.

Trade and Industrial Technology: The courses in this program area provide individuals with the academic and technical knowledge and skills they need to prepare for further education and for careers (other than careers requiring a baccalaureate, master’s, or doctoral degree) in current or emerging trade and industrial employment sectors.