The achievement of business education students on high school core subjects

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THE ACHIEVEMENT OF BUSINESS EDUCATION STUDENTS ON HIGH SCHOOL CORE SUBJECTS

A Dissertation

Submitted to the Graduate Faculty of the Louisiana State University and Agricultural and Mechanical College in partial fulfillment of the requirements for the degree of Doctor of Philosophy

in

The School of Human Resource Education and Workforce Development

by

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B.A., University of Michigan, Ann Arbor, 1990
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August 2010
DEDICATION

I would like to dedicate this dissertation to my wife, Nor Hayati who has always been there for me and has undividedly supported my endeavors. I am grateful that you are part of my life. To my children, Mohamad Talhah, Seri Izati, Seri Irdina, and Mohamad Hamka, who never cease to amaze me, my prayers are always with you to succeed and excel in your life. To my parents Haji Jabor and Hajjah Abibah who have always prayed for my success and reminded me that completing my doctorate would set example for generations to come.
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friendly, accommodating and insightful throughout this process. Thank you all for serving on my committee and for giving encouragement, sharing ideas and providing valuable input.

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ABSTRACT

The importance of academic courses taken during high school has been well documented. It could determine the students’ achievement in high school, affect the students’ ability to transition to postsecondary education and expand the students’ choice of postsecondary majors and degree options (Laird, Chen, & Levesque, 2006). This study examined whether enrollment in business education is related to achievements in high school core subjects. The rationale for the study is to determine if business education contributes to the academic achievement of high school students.

This study used the data from the National Assessment of Educational Progress (NAEP) High School Transcript Study (HSTS) collected in 2005. Nationally representative samples of over 26,000 public and private school students were assessed. The study described the graduating high school students by age, gender, ethnicity, the highest level of parental education, public or private school students, and whether or not they are business education students. The study also described the performance of the students on the mathematics, English, social studies, and science as measured by their GPAs in these respective subjects. The study compared academic achievement of business education students with that of non business education students in these core subjects. The study determined if differences exist in student academic achievement based on students’ personal demographic characteristics. These comparisons revealed that although there were statistically significant differences in GPA scores in all core subjects, the effect size of each of these areas was either small or moderate.

Several selected variables explained statistically significant portions of the variance in high school student achievement as measured by GPA scores in the mathematics, English, social studies, and science. These variables were age, gender, ethnicity, socioeconomic status, public or private school status and business or non business education status. Demographic factors played
important role in determining students’ academic achievement. The multiple regression models had either small or moderate effect sizes. Overall, non business education students had a statistically significant superior academic achievement than business education students’ academic achievement. However, the statistically significant differences only translated into small effect sizes.
CHAPTER 1
INTRODUCTION

The type of courses that students undertake during high school plays a vital role in their achievement in high school. It also could determine the students’ ability to transition to postsecondary education and pursue a range of postsecondary majors and degree options (Laird, Chen, & Levesque, 2006). Several researchers have documented the importance of academic courses taken during high school (Adelman 2004, 1999; Adelman, Daniel, & Berkovits 2003; Horn & Kojaku 2001).

Various studies have indicated that participation in career and technical education programs increases earnings and improve employment outcomes, reduce dropout and absentee rates and improve postsecondary outcomes (NAEP, 2000). The National Business Education Association describes business education as a career and technical program that prepares students for college, employment, or both (Brantley & Davis, 1997). The conceptual view has been that business education curriculum encompasses the educational experiences of business students at all levels. Business education curriculum is relevant to everyday applications. As such, the curriculum as a whole, and the development of computation skills, in particular, are essential in helping students fulfill their future roles as responsible citizens, informed consumers, dedicated employees, caring employers, smart investors, productive inventors, and successful entrepreneurs (Rader & Meggison, 2007). Business education curricula cover a variety of programs, courses, units, course objectives, student competencies, assessments, and extracurricular activities that have evolved over the years. The Curricula have been determined and driven by numerous factors such as technological change, state and national legislation, state and national standards, funding, business and industry support, globalization, accreditation agencies, licensure/certification requirements, and local stakeholders (Rader & Meggison, 2007).
The purposes of this study were to describe and investigate the national business education and non business education students by some demographic characteristics and their performance in high school core subjects. This study examined whether enrollment in business education is related to achievements in high school core subjects. The rationale for the study was to determine if business education contributes to the academic achievement of high school students. The results of the study attempted to provide evidence for the value of business education since business education students acquires knowledge, skills, and experiences substantially beyond the academic content in the courses. For example, in comparative study for other subjects, research has shown that students who complete a higher level mathematics course in high school are more likely to enroll in a 4-year college, persist through postsecondary education, and earn a bachelor’s degree (Adelman, et al, 2003; Horn & Kojaku, 2001).

**Statement of the Problem**

The research problem of this study was “What is the achievement of business education high school students as measured by GPA in high school core subjects (mathematics, English, social studies, and science)?” So far, no research studies have been found specifically comparing the achievement of business education and the achievement of non business education utilizing GPA core subjects. This study sought to fill that void in the research.

**Purpose and Objectives of the Study**

Research and analysis regarding the performance of career technical education students in high school are growing in importance. Policy makers and educators are consistently and continuously confronted with the performance of the programs, the need to justify programs and funding and to provide evidence of the numbers and status of students graduated, obtaining employment, and continuing in post-secondary education. Thus, there are always the
importances to review, improve, and implement effective programs, and to serve the practical needs of all students, including those in targeted populations.

The purpose of this study was to compare academic achievement of high school students between business education students and non business education students. Specific objectives formulated to guide the researcher include:

1. To describe the graduating high school students in the U.S on the following characteristics: age, gender, ethnicity, socioeconomic status as measured by parent educational status, private school student or public school student status, and business education student or non business education student status.

2. To describe the academic achievement of graduating high school students in the U.S. as measured by their GPA in mathematics, English, social studies, and science.

3. To compare the academic achievement of graduating high school students in the U.S. based on whether or not they are identified as a business education student as measured by their GPAs in mathematics, English, social studies, and science.

4. To determine if differences exist in academic achievement of graduating high school students based on their personal demographic characteristics that is age, gender, ethnicity, parent educational status, and private school student or public school student status as measured by their GPA scores in mathematics, English, social studies and science.

5. To determine if selected variables explain significant portions of the variance in high school student achievement as measured by GPA scores in the mathematics, English, social studies, and science. The variables used as potential explanatory variables in these analyses were: age, gender, ethnicity, socioeconomic status as measured by parent educational status, private school student or public school
student status, and business education student or non business education student status.

The Significance of the Study

One of the key factors in developing and monitoring a successful career technical education programs is having current and accurate information regarding program outcomes. Data obtained in this study are beneficial in strengthening the measures that are used to assess the success and effectiveness of business education programs. The findings provide useful information for educators, administrators and policy makers to understand the extent to which performance goals are being achieved and some of the variables that are affecting performance in high school business education. It helps administrators to design professional development and other types of collaborative activities aimed at improving overall performance.

The study was conducted to contribute to the body of knowledge concerning the academic success of business education students in high schools especially in their core subjects, mathematics, English, social studies and science. By examining the selected demographic of the students, the researcher attempted to gain valuable insight into the relationship that may exists between business education courses and demographic characteristics that contribute to academic success to high school students.

The findings can be useful to business education teachers and guidance counselors as they tailor support services to meet the needs of their students who are making the choice of subjects to be taken during high schools and planning the postsecondary education.

The findings of the study can provide a baseline for future studies investigating business education completers’ education, employment and retention. For example, NAEP High School Transcript Study is conducted every five years. The data can be used to make comparison each time the study is conducted to monitor the progress of business education students.
**Definition of Terms**

**Business Education Student:** In this study, it is defined as high school students who have accumulated at least 2 standardized Carnegie units in business courses. One Carnegie Credit represents 120 instruction hours. For example, a student with 60 hours of business communication course for a semester will have 0.5 Carnegie units in business education.

**CTE:** Career and Technical Educations

**Grade Point Average (GPA):** The grade point average for high school core subjects was computed by NAEP based upon standardized Carnegie units and grading. It is based upon a 4.00 scale.

**High School Core Subjects:** The high school core subjects refer to mathematics, English, social studies and science. To receive a high school diploma in the United States students must take and obtain passing marks in a minimum number (varying from state to state) of full-year full-time these courses. The National Commission on Excellence in Education recommended in 1983 that all high school students take at least three full year courses (credits) each in mathematics, science and social studies, and four credits of English representing core academic courses required to get a diploma.

**HSTS:** The NAEP High School Transcript Study (HSTS) provides information about the types of courses that high school graduates take, how many credits they earn, their grade point averages, and the relationship between course taking patterns and achievement.

**IES:** Institute of Education Sciences, U.S. Department of Education

**NAEP:** The National Assessment of Educational Progress (NAEP) is nationally representative and continuing assessment of what students know and can do in various subject areas. NAEP is under the responsibility of National Center for Education Statistics in the U.S. Department of Education.
NCES: The National Center for Education Statistics (NCES) is the primary federal entity for collecting, analyzing, and reporting data related to education in the U.S. It fulfills a congressional mandate to conduct and publish reports and specialized analyses of the meaning and significance of such statistics.
CHAPTER 2

REVIEW OF THE LITERATURE

Review of the literature related to the evaluation of business education programs provides
the research base for this study. A literature review of the achievement of business education
students on high school core subjects was conducted through a search of the Academic Search
Complete, Business Search Complete, EbscoHost’s Databases, ERIC Abstracts, Google’s
Scholar, JSTOR, LSU’s Electronic Theses and Dissertation, Professional Development
Collection and ProQuest Digital Dissertation. The key words used in the literature search were
business education, academic achievement, demographic factors – age, gender, ethnicity, parent
educational status, public and private school students, high school core subjects, achievement in
mathematics, achievement in English, achievement in social studies, achievement in science,
career technical education, private school, public schools, NAEP’s studies, high school GPA,
High School Transcripts Study, conceptual and theoretical framework and the association of
business education with learning in mathematics, social studies, English and science. There were
also hand search of LSU’s library catalogues and shelves and communication and discussion
with professors and colleagues.

During the literature review, no articles and dissertations that specifically addressed the
achievement of business education students on high school core subjects have been found.
However, the objectives of the literature review were sought to answer the following questions:
(a) what research has been done on the achievement of business education students on high
school core subjects? (b) What does the literature tell us about the achievement of business
education students? (c) What does the literature tell us about the courses and the curricula of high
school business education? (d) What does the literature tell us about the influence of personal
demographic factors on students’ achievement? (e) What does the literature tell us about other
related studies using high school transcript data? (f) What does the literature tell us about the current issues in all the variables the researcher intend to study, business education, personal demographic characteristics, high school core subjects and student achievement?

The literature review provided a large literature base selected from multiple disciplines. It provided the theoretical foundation for the study. It introduced the problem being studied; explained why this problem is important to the author, the reader, and society; identified locations for the reader to research deeper on the topics being researched. It showed the gap of existing body of knowledge on high school business education and suggested which particular area of research may be needed on the subject.

**Business Education**

The public perceptions about career and technical education programs including business education have been that the programs were often targeted primarily to educationally disadvantaged or inferior students. The education context of CTE also is noted as not appropriate for students aspiring to a four-year college or university, and the technical education will limit rather than enhance students’ future career and educational choices (Catri, 1998; Innerst, 1999; Ries, 1997). For some, the term business education is still synonymous with the preparation of secondary school business students in the office and clerical areas, specifically in typewriting (keyboarding), shorthand, and bookkeeping, which lead to initial employment. This is a confining image. Today, business education courses have shifted to the teaching of economics, personal finance, management concepts, and business communications (Brantley & Davis, 1997).

According to Rader and Meggison (2007), the business education curricula at high school level have moved rapidly and in continuous change since the 1980s. They said that in the past 25 years, the business education curricula have experienced the decline and demise of office
education programs and courses such as shorthand and office procedures, the growth of word processing and personal computers in the 1980s and 1990s, and the advent of curricular innovations such as Web design and speech recognition. (Rader and Meggison, 2007)

The National Business Education Association describes business education as the career and technical program that prepares students for today's business environment (Brantley & Davis, 1997). The business education programs, which are part of CTE, were steadily offered in four program areas to serve a diverse population of students, ranging from elementary students to adults. These areas are elementary and middle schools; junior and senior high schools; postsecondary settings, such as two-year and four-year colleges and universities; and adult education centers (Zirkle, Norris, Winegardner, & Frustaci, 2006). Business education is a broad, comprehensive curriculum that includes 22 courses that teach business skills and techniques, business economics, and business attitudes (McEwen, 2004).

Today, the curriculum in the American high school is typically categorized into at least three major programs of study: academic (ACA), career and technical education (CTE), and general (Gray, 2002). In high schools, business education is an elective program. Students can take a single course or a sequence of related courses. Students who take a sequence of three or more such courses in one occupational area are classified as Career and Technical Educations (CTE) concentrators. Most (83%) CTE concentrators also complete an Academics (ACA) concentration as well (NCES, 2001; Gray, 2002). Approximately 20% of all high school course work is in CTE (Gray, 2002). The business education curriculum at high school level has included the educational experiences of business students at all levels. Business education curricula have covered a variety of programs, courses, units, course objectives, student competencies, assessments, and extracurricular activities that have evolved over the years (Rader & Meggison, 2007). Curricula are determined and driven by numerous factors such as
technological change, state and national legislation, state and national standards, funding, business and industry support, globalization, accreditation agencies, licensure/certification requirements, and local stakeholders (Rader & Meggison, 2007). Table 1 outlines business education courses that are generally offered at the high school level (Fortier, Albrecht, Grady, & Loock, 1998; Zirkle, et. al., 2006).

Table 1. The type courses and course descriptions of business education curricula offered in high schools in the U.S.

<table>
<thead>
<tr>
<th>Course</th>
<th>Course Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Accounting</td>
<td>Concentrates on teaching students the basic accounting principles and procedures, including topics such as accounting equations, the accounting cycle, posting to journals, and preparing end of statement reports</td>
</tr>
<tr>
<td>Business Communications</td>
<td>Teaches students to organize ideas logically and sequentially; interpret visual materials such as charts, graphs, pictures, and maps, and translate the information into textual form.</td>
</tr>
<tr>
<td>Business Law</td>
<td>Introduces the basic legal principles relevant to students’ lives as consumers, citizens, and employers</td>
</tr>
<tr>
<td>Business Mathematics</td>
<td>Provides the basic concepts and usage of basic business math, consumer math, and practical applied mathematics</td>
</tr>
<tr>
<td>Business Writing</td>
<td>Introduces the concepts of business letters, business reports, business proposals, business plans, business forms, and more. Uses proper grammar, punctuation, spelling, and typing skills to create successful business documents and correspondence</td>
</tr>
<tr>
<td>Computer Applications</td>
<td>Provides students with knowledge to gain skills in internet usage, word processing, database management, and spreadsheet applications.</td>
</tr>
<tr>
<td>Economics</td>
<td>Enables students to gain knowledge of economic principles in order to be competent citizens in a capitalistic society</td>
</tr>
<tr>
<td>Entrepreneurship</td>
<td>Introduces the concepts of entrepreneurial process, business development, resourcing, financial planning, management, and marketing.</td>
</tr>
<tr>
<td>Financial Literacy</td>
<td>Provides action-oriented lessons where students make decisions about earning an income, saving and spending, using credit, and budgeting.</td>
</tr>
<tr>
<td>International Business</td>
<td>Provides students with information on the global marketplace</td>
</tr>
<tr>
<td>Introduction to Business</td>
<td>Designed to give students knowledge of how business operates in today’s society</td>
</tr>
<tr>
<td>Keyboard Applications</td>
<td>Enables students to develop and enhance their skills in entering alphabetic, numeric, and symbolic information on a keyboard</td>
</tr>
<tr>
<td>Marketing Education</td>
<td>Prepares students for marketing competencies in the areas of personal selling, advertising, visual merchandising, physical distribution, purchasing, market planning, product/service technology, and marketing mathematics.</td>
</tr>
</tbody>
</table>
One of the objectives of business education programs is to prepare the students to be able to function as economically literate individuals through the development of personal finance skills and an understanding of business operations. The curricula were designed such that business education students should be able to work effectively in a multicultural team environment through the development of communication, leadership, and interpersonal skills; apply technology to solve personal and business problems; and demonstrate a desire to actively and perpetually acquire knowledge in order to solve personal and business problems (Missouri Department of Elementary and Secondary Education, Division of Vocational and Adult Education, 2000).

Business education has been a vital part of the American educational system and has provided a solid foundation of knowledge and skills for over a century. Most business education classes focus on career-building skills, entrepreneurial concepts, and economic principles. *The National Standards for Business Education* is based on the conviction that business education competencies are essential for all students (National Business Education Association, 2007). The standard states that:

- All students need to be literate in business and economics, because they will participate in the economic system.
- All students need to practice the interpersonal, teamwork, and leadership skills that will help them function successfully in that environment, because they will encounter a business environment that is characterized by diversity both domestically and internationally.
- All students need to hone the lifelong learning skills that foster flexible career paths and confidence in adapting to a workplace that demands constant retooling, because they will use technology as a tool for managing information.
• All students need to learn and keep up with the technology. Technology has accelerated the pace and frequency of change not only in business but also in life. Today, life and work activities tend to overlap. This trend is likely to continue and will require more sophisticated decision-making in all spheres.

The business education concepts as described in these national standards can contribute to the development of the students that will fulfill the industry needs. Business education offers students the opportunity to master the fundamental knowledge and skills needed to succeed in business and more importantly, an equal opportunity to succeed in life (Association for Career and Technical Education, 2006).

**High School Transcript Study**

The National Center for Education Statistics (NCES) through the NAEP High School Transcript Study (HSTS), periodically surveys the curricula being followed in our nation's high schools and the course taking patterns of high school students through a collection of transcripts. The first High School Transcript Study was first conducted by NCES in 1982. It captured baseline information on high school students' course taking patterns at a time when major curriculum changes were being implemented. Conducted in conjunction with the National Assessment of Educational Progress (NAEP), HSTS also offers information on the relationship of student course taking patterns to achievement at grade 12 as measured by NAEP. With the most recently reported 2005 study, HSTS provides over a decade of valuable findings to the education community (NAEP, 2005).

The High School Transcript Study (HSTS) collects and analyzes transcripts from a representative sample of America’s public and private high school graduates. The study is designed to inform the public about the types of courses that graduates take during high school, how many credits they earn, and their grade point averages. The HSTS also explores the
relationship between course taking patterns and student achievement, as measured by the National Assessment of Educational Progress (NAEP). High school transcript studies have been conducted periodically for nearly two decades, permitting the reporting of trends in course taking and GPA as well as providing information about recent high school graduates. In addition to collecting transcripts, the HSTS collects student information such as gender, graduation status, and race/ethnicity and information about the schools studied (NEAP, 2005). Since similar studies were conducted over the years, changes of these patterns can be studied.

For NAEP HSTS 2005, complete transcripts for over 26,000 high school graduates from public and private high schools in 2005 were collected from a national representative sample of school from May to October 2005.

**High School GPA**

A substantial component of any education program is assessment, aimed at measuring student performance. A common measure of the nation's high school students' academic achievement is the grade point average (GPA). High school subject GPA provides the status of student performance and provides documentation for course competency, mastery and gains. Their purpose is to indicate how effectively educational programs are meeting their goals for student learning. McEwen (2004) simplified that the results of assessments should indicate how effectively educational programs are achieving their goals for student learning. As such, they should inform the educator and should lead to improvements in the teaching/learning environment.

High school subject GPA is also important as predictors of performance at other levels of education (Kuncel, Credé, & Thomas, 2005). Two studies conducted during the 1960's were early evidence of the importance of high school grades as predictors of academic success. Irvine (1966), who conducted a five-year study of University of Georgia students, concluded that high
school grade point average was the best single predictor of persistence. Ivey (1966) highlighted that high school rank was the most effective predictor of success in college. Although there has been considerable variability among studies with regard to the predictive value of variables that relate to college success, there is enough consistency to warrant that high school scholarship has been found to be the best *single* predictor of college success (Thomas & Stanley, 1969). Studies on high school GPA by Ramist (1984) and Willingham and Breland (1982) concluded that GPA is one of the best predictors of college grades. Based on these findings, this study used subjects’ GPAs to determine the achievement of business education high school students.

Table 2. Numeric grade and standard grade conversion to Grade Point Average used in the NAEP High School Transcript Study 2005

<table>
<thead>
<tr>
<th>Numeric Grade</th>
<th>Standard Letter Grade</th>
<th>Grade Point Average</th>
</tr>
</thead>
<tbody>
<tr>
<td>90–100</td>
<td>A</td>
<td>4.0</td>
</tr>
<tr>
<td>80–89</td>
<td>B</td>
<td>3.0</td>
</tr>
<tr>
<td>70–79</td>
<td>C</td>
<td>2.0</td>
</tr>
<tr>
<td>60–69</td>
<td>D</td>
<td>1.0</td>
</tr>
<tr>
<td>Less than 60</td>
<td>F</td>
<td>0.0</td>
</tr>
</tbody>
</table>


Calculating GPA requires both grade information and course credit information. Since credit and grade information reported on transcripts vary considerably among schools, districts and states, it is necessary to standardize this information so that valid student and school level comparisons can be made. In HSTS studies, standardized credit information is based on the Carnegie unit, which is defined as a course with 120 hours of instruction. The factor for converting credits reported on a transcript to the standard Carnegie unit is verified by the curriculum specialist and then entered for each school by data entry personnel (NAEP, 2005). Numeric grades are converted to standardized grades as shown in the Table 2 unless the school
documents specify other letter grade equivalents for numeric grades. Table 2 outlines numeric grade and standard letter grade to Grade Point Average (GPA) conversion

Demographic Characteristics

There have been many studies conducted to determine the affect of several demographic variables on student achievement. These studies looked specifically at age, gender, ethnicity, parent educational status and private or public school student status.

Age

The results from prior studies about the effect of age on academic achievement are mixed. Coleman, Campbell, Hobson, McParland, Mood, Weinfeld, York (1966) and White's (1982) studies showed that as students become older, the correlation between age and school achievement diminishes. According to White (1982) schools provide equalizing experiences, and thus the longer students stay in the schooling process, the more the impact of age on student achievement is diminished. In addition, as the students move up the age there would more students drop out of school, thus reducing the magnitude of the correlation.

On the other hand, results from longitudinal studies have contradicted White's results, by demonstrating that there is a gap in student achievements as students get older (Duncan, Brooks-Gunn, & Klebanov, 1994; Walker, Greenwood, Hart, & Carta, 1994), if not widen (Pungello, Kupersmidt, Burchinal, & Patterson, 1996).

Gender

Significant researches have indicated that gender plays a part in the student academic achievement. For example, researchers have found significant differences between male and female students in science achievement. In a meta-analysis of 77 studies conducted between 1980 and 1991 among middle and high school students, DeBaz (1994) found a significant gender effect favoring males in overall science achievement. In an analysis of data from the National
Educational Longitudinal Study (NELS: 88), Lee & Burkam (1996) found a large advantage for males on the physical science subtest and a modest advantage for females on the life science subtest. Using data from the National Assessment of Educational Progress (NAEP) for students in grades seven and 11, Blosser (1990) concluded that male students were more likely than female students to report having attempted to fix electrical or mechanical devices. Conversely, females were more likely than males to have attempted diagnosing problems with an unhealthy plant or animal.

However, certain studies indicated that gender differences generally are small or non-existent. Hedges and Newell (1995) found that in science, boys outperform girls, but in reading and writing girls have the advantage. A study by Meece and Jones (1996) which examined the fifth-and sixth-grade students enrolled in a science class revealed that no gender differences in students’ standardized test scores.

Coley (2001) studied gender differences within ethnic groups of varying ages and it revealed more similarities than differences. On most measures, gender differences did not vary much from one ethnic group to another. Coley’s (2001) found that 1) females scored higher than males in reading and writing across all ethnic and age groups. This gap widened for most groups as the students progressed through school; 2) there was no gender gap for any group of 8th and 12th graders in math achievement; and 3) twelfth grade Hispanic females outscored like aged Hispanic males in social studies achievement. The other groups demonstrated no gender difference in social studies achievement.

**Ethnicity**

Since the 1960’s social scientists have devoted much attention to the academic achievement of students of various races due to the transformation in the past four decades
caused by economic, social, and demographic changes (Perna, 2000). In order to meet this challenge effectively and appropriately, students from all segments of society were studied.

Previous researches have shown that African-American and Latino students are more likely to have lower standardized test scores than their Caucasian counterparts (Lareau, 2002; Stanton-Salazar, 2001). Walker and Satterwhite’s (2002) research was consistent with findings of previous studies that show African Americans perform academically below Caucasian students (Garibaldi, 1997; Mannan, Charleston, & Saghafi, 1986). It must be noted that recent research shows that the gap in achievement levels between different ethnic groups is narrowing (Campbell, Hombo, & Mazzeo, 2000; Cook & Evans, 2000; Hedges & Newell, 1999). The achievement gap between ethnic groups varies across tests, grades and subject areas. Kane (1998) estimated that the academic performance gap between African American and White college students to be approximately a third of a letter grade. Jensen (1998) reported similar differences on standardized achievement and intelligence tests. Examining prior research reveals the achievement gap between African-Americans and Caucasian students ranges between 0.75 and 0.90 of a standard deviation (Berends & Koretz, 1996). The achievement gap between Latinos and Caucasians is about 0.60 of a standard deviation (Berends, Sullivan, & Lucas, 1999; Hedges & Newell, 1999). Ethnicity is not the only variable to be considered. When Berends and Koretz (1996) controlled for family, socioeconomic, and school factors the achievement gap between African-American and Caucasian students was reduced by about 0.40 of a standard deviation. The gap between Latinos and Caucasian students dropped to 0.25 of a standard deviation.

**Socio Economic Status**

Some studies suggested that socioeconomic status is one of the best predictors of student achievement (Coleman, et al., 1966; Lee, Bryk, & Smith, 1993). Darkenwald and Merriam
(1982) described how the two time periods in life, pre-adulthood and adulthood interplay with socioeconomic status. In pre adult life, the model depicts how and socioeconomic status (SES), strongly influence subsequent experiences in school (p. 142).

Parent educational status is considered one of the most stable aspects of Socio Economic Status (SES) because it is typically established at an early age and tends to remain the same over time (Sirin, 2005). It has been well documented that family plays a meaningful role in a child's academic performance and development (Cornell & Grossberg, 1987; Thompson, Alexander, & Entwisle, 1988; Tucker, Harris, Brady, & Herman, 1996). Mothers' levels of education and family incomes influence adolescent educational outcome expectancy beliefs (Rhea & Otto, 2001). A study by Campbell, Hombo, and Mazzeo (1999) using NAEP data indicated that students who reported higher parental education levels tended to have higher average scores.

Parent educational status as an indicator of SES reflects the potential for social and economic resources such as household incomes that are available to the student. Income and education are highly correlated in the United States (Hauser & Warren, 1997). When income is examined as a separate variable the research shows a consistent positive relationship between family income and student achievement. Hill and O’Neil (1994) found that increasing family income by $10,000 per year is associated with an increase in student achievement of 2.4 percentile points. Grissmer, Kirby, Berends, and Williamson (1994) had similar findings on the relationships between income and mathematics as well as income and reading achievement.

**Private and Public Schools**

Public schools are schools that are provided by state and federal funding. Ninety percent of the children today in America attend public school. Private schools include both parochial schools and non-parochial schools. According to a special report published by the National Center for Education Statistics (NCES) in 2002, in 1999–2000, approximately 27,000 private
schools accounted for 24 percent of all schools in the US and 12 percent of all full-time-equivalent teachers. Clearly, there are many more public schools that provide education to
American students than private schools.

According to NAEP 2000 study, academic performance plays a big role when considering private versus public schools. School systems vary greatly in their academic reputation. For as many wonderful public schools that exist, there are also those that perform under the bar. However, private schools usually have a more rigorous academic reputation. Private school students generally perform higher than their public school counterparts on standardized achievement tests. As with earlier results from the National Assessment of Educational Progress (NAEP), private school students performed higher than public school students on the NAEP 2000 tests (NAEP, 2000).

**Conceptual and Theoretical Framework**

The theoretical based for this study is cognitive learning. Cognitive learning is defined as “the acquisition of knowledge and skill by mental or cognitive processes – the procedures we have for manipulating information in our minds. Cognitive processes include creating mental representations of physical objects and events, and other forms of information processing” (Think Quest Team, 2009). Cognitive learning is a powerful mechanism that provides the means of knowledge, and goes well beyond simple imitation of others (Tennyson & Rasch, 1988). According to Tennyson, Elmore, and Snyder (1992) changes in methods of curricular and instructional design can strongly affect educational practice. These advancements extend the predominately applied behaviorally-oriented learning paradigm of instructional design and management (Gagne & Glaser, 1987).

Most high school instruction is still based on the behaviorist assumption that knowledge can be taught independent of context and that such learning can be evaluated using non-
authentic/non-performance methods (Berrymen, 1991). Modern cognitive science research finds the opposite. As Grabinger (1996) points out, “knowledge learned but not explicitly related to relevant problem solving situations remains mostly inert, meaning the learner is unable to use it for anything practical when the opportunity arises and thus such knowledge quickly disappears.” Algebra, for example, is a mathematical procedure for solving many practical problems but is taught and evaluated in a non-contextual abstract form.

A Statement by the Policies Commission for Business and Economic Education (Statement No. 81, 2007) elaborated that

“When knowledge and skills such as reading, writing, mathematics, problem solving, critical thinking, research, and technology are taught in isolation, the content may become fragmented and limit the transfer of knowledge and skills. To be more meaningful, education should provide a connection between real life and knowledge and skills. For example, interdisciplinary teaching enables students to experience authentic applications that make their knowledge and skills relevant. As an example, teams of students might study the viability of building a summer lodge in a rural area. Team proposals might require that a marsh be drained before construction begins. Students might research the science of draining the marsh, environmental effects, legal implications, and the impact on local business, government, and community. This project integrates knowledge and skills from business, economics, math, science, social studies, and language arts (p. 1).”

The integration of curricular objectives between business education with social studies, English, and mathematics can provide rich opportunities for enhanced student outcomes, retention, and achievement. Likewise, soft skills such as business communications, presentation
techniques, and personal business practices should be included as survival skills and integrated with other disciplines and subject matter (Martinez, 2007).

This study has a set of principles based on cognitive learning construct to defend practices and policies should they be called into question. Camp and Johnson (2005) noted the following regarding Career and Technical Education (CTE),

“… CTE programs are becoming more academically rigorous and less directly tied to single occupations. CTE is no longer just a training program for workers; today CTE also prepares students for postsecondary work including college as well as lifelong learning. CTE does not replace academic subjects, but rather reinforces academic instruction by incorporating basic academic instruction in a purposeful way into CTE courses. CTE provides meaningful contexts in which students can apply the concepts they learn in academic classrooms in settings that help them to see the real-world relevance of what might otherwise be abstract concepts … what this discussion does not address is a set of guiding principles … (p. 55-56).”

Business Education and Mathematics

Computation skills, as defined in these standards, are more than just the skills needed to make quantitative and precise calculations. Rather, these skills encompass the ability to solve mathematical problems, analyze and interpret data, and apply sound decision-making skills.

The business education curriculum offers multiple computation skills to be developed, used, and integrated into consumer education, economics, personal finance, marketing, management, accounting, career development, basic business, and entrepreneurship. In addition, specific courses in business and consumer mathematics help students develop the computation skills needed to solve business- and consumer-related problems (Fortier, et al., 1998).
The standards in business education demonstrate a developmental approach to the acquisition of computation skills. The first five standards address the development of general mathematical skills. In the sixth standard, these skills are utilized in problem-solving applications. Bay (2000) recommended teaching mathematics using problem solving techniques. Bay went on to say that students can learn mathematics concepts by working through a concrete problem and then move on to abstraction, where the same concept can be applied in a similar situation. Warmbrod (1969) described the problem solving approach as “...student-centered rather than subject-centered” (p. 231).

In addition, business mathematics is the math used by business, industry, and financial institutions. It involves problem solving and decision making as well as calculations and computations. Teaching business math involves applying basic concepts to real-world situations. Some researchers in mathematics education have found that mathematics education is moving toward more practical, meaningful methods of teaching with real world context connecting mathematics to students’ lives (Parnell, 1995; Romberg & Kaput, 1999). This suggests that students will learn best when they can see how concepts fit into their lives, including the workplace.

**Business Education and English**

The communication curriculum in business education encourages mastery of the oral and written skills essential for interacting effectively with people in the workplace and in society. Of equal importance is the development of technology and processing skills critical for acquiring, interpreting, evaluating, and managing information (Fortier, et al., 1998).

According to Baron (2003), “The ACT reported recently that college professors rank grammar as the most important skill for students entering college. Students in a business communication course who use strategies-oriented review materials perform better than those
who use the rules-oriented review materials on a series of grammar and punctuation quizzes (Quible, 2008).

Honl & Pagel (1992) revealed that business and industry were devoting two thirds of their almost $50 billion training budget to improve communication skills. The specific communication skills that businesses are developing include interpersonal and listening skills, word processing, speaking, writing, and conducting business meetings. While basic principles of communication remain fairly consistent, certain facets of it—such as international communication—are constantly evolve. As the world continues to change politically, economically, and geographically, new communication strategies will evolve. Educators must study and integrate these into the curriculum if students are to function effectively in a global society.

**Business Education and Social Studies**

The components of high schools social studies include economics, history, cultures and political system. Economics, traditionally part of the core Social Studies curriculum, is now included, at least to some extent, in the educational standards of all states. In history class, students learn about the Federal Reserve's control of inflation rates. International business is an area of the business education curriculum that commands center stage in today's global economy (Fortier, et al., 1998). The international business standards focus on

- Raising awareness of the interrelatedness of one country's political policies and economic practices on another.
- Learning to improve international business relations through appropriate communication strategies.
- Understanding the global business environment—that is, the interconnected-ness of cultural, political, legal, economic, and ethical systems.
• Exploring basic concepts underlying international finance, management, marketing, and trade relations.

• Identifying forms of business ownership and international business opportunities.

Students may find this discipline complex and confusing if political and business events are presented as separate and random occurrences. A more effective approach is to help students see how one phenomenon creates another, and how one event starts a confounding effect throughout the world. In this way, students gain the ability to analyze world economic trends and their impact on financial decisions with a reasonable degree of accuracy (Fortier, et al., 1998).

**Business Education and Science**

Currently, there is no research to determine business education’s impact on student achievement in science. The researcher included this variable in this study on an exploratory basis.

**Summary**

Business education which is part of career and technical education provides meaningful contexts in which students can apply the concepts they learn in academic classrooms in settings that help them to see the real-world relevance of what might otherwise be abstract concepts (Martinez, 2007). This study aimed for a better understanding of the relationships, if any, of outcome taking business education courses as they relate to GPA in mathematics, English, social studies and science.

Prior researches suggested that personal demographic characteristics could explain significantly on students’ achievement. This study selected the personal demographic variables of age, gender, ethnicity, parent educational status and public or private school student status as predictive variables to students’ achievement. However, there was a minimal amount of literature that relates these variables and high school business education programs.
Personal demographic characteristic status may not be the only determinant to student achievement. Studies have shown that what and how students are taught has an effect on their achievement (Britton, et al., 1999; Conroy, et al., 1999; Hoachlander, 1999; National Research Council, 1996; Shelley-Tolbert et al., 2000). Studies done by (Balschweid, 2001; Hoachlander, 1999; Imel, 2000; Lynch, 2000; Maurer, 2000b; Shelley-Tolbert et al., 2000) have come to the conclusion that students should be provided sufficient context for what they are learning. It is believed that cognitive learning is the key for improving a student’s ability to synthesize information from numerous sources, to increase understanding of new and often contradictory information, for assisting in making meaning, and for enhancing the ability of students to think critically and transfer their learning to real-life experiences. The National Research Council (1996) supports this theme in their conclusion that integrated and thematic approaches to curriculum can be very powerful.
CHAPTER 3

METHOD

This study used NAEP High School Transcript Study (HSTS) 2005 data to examine the performance of business education graduating high school students. This study used descriptive statistics and employed a causal comparative design in which data collected as it naturally occurred, without manipulation from the researchers (Gall, Gall, & Borg, 2003). This design allowed for confirmation of relationships between variables but did not allow for a determination of cause and effect. The rest of the chapter explains the population and sample, instrumentation, data collection, and data analysis.

Population and Sample

The target population for this study is all public and private high school students in the U.S. The frame for this study is defined as all students enrolled in public and private high schools in the U.S. All public and private high schools in the United States with one or more graduates in 2005 were eligible for HSTS 2005. The accessible population is defined as all graduating high school students enrolled in public and private high schools in the U.S in 2005 and had valid scores in the database of NAEP. The subjects for this study were the samples of the defined accessible population. Students with disability were eliminated from this study to have appropriate comparison groups in the event that one group of handicapped students enrolled in them that may skew results.

The NAEP High School Transcript Study (HSTS) 2005 consisted transcripts from about 640 public schools and 80 private schools. These transcripts constituted a nationally representative sample of 26,000 high school graduates, representing approximately 2.7 million 2005 high school graduates. Ary, Jacobs, and Razavieh, (2006) explained that research sample as
the portion of the defined accessible population from whom data is collected for the study to estimate parameters applied to all members of the population. The following information regarding the sampling of schools and graduates, stratification, and selection of substitute schools were retrieved from *The 2005 High School Transcript Study User's Guide and Technical Report*.

**Sampling of Schools and Graduates for HSTS**

The sample for High School Transcript Study (HSTS) was designed to achieve a nationally representative sample of public and private school high school graduates in the class of 2005. The target population for the 2005 national assessments included all graduates in public and private schools who were enrolled in 12th grade in 2004-2005, and who graduated in 2005. The samples were selected based on a two-stage sample design: selection of schools and selection of graduates within schools. All public and private high schools in the U.S. with one or more graduates were eligible for NAEP HSTS 2005.

**Stratification**

This study incorporated a stratified sampling plan. When the sample is divided into homogeneous units, it is called a stratified sampling plan (Freund & Wilson, 2003). Sampling was done separately for public and private schools. The 12th grade public school samples had an implicit stratification, using a hierarchy of stratifiers and a serpentine sort. The top of the hierarchy was census division, which had 9 implicit strata. The 9 census divisions were New England, Northeast, East North Central, West North Central, South Atlantic, East South Central, West South Central, Mountain and West. The next stratifier in the hierarchy was type of location, which had 8 categories. Of the 72 (9 x 8 = 72) potential type-of-location strata nested within census divisions, several were collapsed with neighboring type-of-location cells, always within census division, giving a total of 55 to 60 census division-location type strata.
The private schools were explicitly stratified by type of private school (Catholic, Lutheran, Conservative Christian, and Other Private). Within each school type, stratification was by census division, (9 categories), type of location (8 categories), and by proportion of minority enrollment, used as a continuous sorting variable.

**Sampling of Schools**

The high school graduate sample was a two-stage probability-based sample of students. This was a national sample in which schools were the first-stage sampling units selected probability proportional to a measure of size based on the estimated grade-specific enrollment in the schools. Probabilities of selection were determined for each school before the school sample was selected. Table 3 illustrates the probability sampling for public and private schools in NAEP HSTS 2005.

Table 3. School and student sample size for NAEP High School Transcript Study 2005 by school type in the U.S.

<table>
<thead>
<tr>
<th>School Type</th>
<th>National estimated of 12th grade enrollment</th>
<th>Percent of estimated of 12th grade enrollment</th>
<th>Proportional student sample size</th>
<th>Percent subsampled (school) to obtain sample size</th>
<th>NAEP HSTS 2005 school sample size</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total</td>
<td>3,325,080</td>
<td>100.0</td>
<td>21,454</td>
<td></td>
<td>1,024</td>
</tr>
<tr>
<td>Public</td>
<td>3,037,705</td>
<td>91.4</td>
<td>19,600</td>
<td>100.0</td>
<td>829</td>
</tr>
<tr>
<td>Catholic</td>
<td>143,025</td>
<td>4.3</td>
<td>924</td>
<td>37.7</td>
<td>30</td>
</tr>
<tr>
<td>Lutheran</td>
<td>5,583</td>
<td>0.2</td>
<td>36</td>
<td>14.7</td>
<td>2</td>
</tr>
<tr>
<td>Conservative Christian</td>
<td>36,085</td>
<td>1.1</td>
<td>233</td>
<td>31.7</td>
<td>42</td>
</tr>
<tr>
<td>Other private</td>
<td>102,502</td>
<td>3.1</td>
<td>661</td>
<td>45.0</td>
<td>110</td>
</tr>
<tr>
<td>Unknown</td>
<td>–</td>
<td>–</td>
<td>–</td>
<td>45.0</td>
<td>11</td>
</tr>
</tbody>
</table>

Sampling of Graduates

The second stage involved selection of students within schools. For those HSTS sample school that incorporated in the NAEP assessment, all graduates who were assessed and also graduated in 2005 were included in the HSTS sample of graduates within the school. Both public and private school students were selected in proportion to their prevalence in the general 12th grade student population. For HSTS sample school that did not cooperate in the NAEP assessment but cooperate in HSTS, a subsample of 50 graduates was typically drawn from their 12th grader who graduated in 2005. If the list contained 50 or fewer graduates, all graduated were selected.

Selection of Substitute Schools

It was anticipated that not all schools selected would choose to participate. Therefore, as each school was selected in the sample, NAEP would designate two neighboring schools in the sampling frame as replacement schools. If an original school refused to participate, the first replacement was then contacted. If that school also refused to participate, the second school was then contacted. One sampled school was not allowed to substitute for another. (NAEP, 2005)

Instrumentation

The instrument used for this research was a disc containing data sets from NAEP HSTS 2005. This CD-ROM contains data from the NAEP 2005 High School Transcript Study (HSTS), which was conducted in conjunction with the National Assessment of Educational Progress (NAEP). An Electronic Code Book (ECB); restricted-use data on high school courses; student and school demographics; and technical information for using, analyzing and interpreting the data, are included on the CD-ROM. The variables of the investigation were copied directly from the data sets into SPSS. The variables retrieved from this archival database were: age, gender, ethnicity, highest parent educational status, private school student or public school student status,
business education student or non-business education student status, GPA in mathematics, GPA in English, GPA in social studies and GPA in science.

**Data Collection**

Data for this study were collected from an archival data source, developed by IES. Permission was sought to acquire a copy of the information needed to accomplish the objectives of the study by contacting the IES (see APPENDIX B). The Institutional Review Board approved exemption for the study (see APPENDIX A).

**Data Collection Procedures for NAEP HSTS 2005**

State coordinators in each state were informed about HSTS and were responsible for telling the public school districts in their states about the study. The home office provided them with a summary of school activities. The summary provided information about participating in NAEP HSTS 2005, including the amount and nature of school staff and time required for participation and procedures that would ensure the confidentiality of the data.

For NAEP HSTS 2005, graduates transcripts were collected by field workers from schools. Parent consent is not needed in HSTS, and the schools are provided with information about Family Educational Rights and Privacy Act (FERPA) that authorizes collection of transcript data without parental consent. Generally, schools do not require parental or graduate notification or consent for HSTS because there is no burden placed on the graduate.

The restricted-use NAEP HSTS 2005 data files do not contain the graduates’ names or other variables that directly identify the sampled graduates. Data files do contain the graduates’ NAEP IDs, which enable researchers to link the transcript data to the NAEP data. Eligible graduates with incomplete transcripts were considered non-respondents.

Student and School Response Rates found in the NAEP HSTS 2005. Non-response is a serious concern in any probability sample, as differential response rates within important may
generate biases that are difficult to measure and control through adjustment. NAEP HSTS 2005 had generally very high response rate. Table 4 illustrates response rates for all eligible NAEP HSTS schools and school enrollment.

Table 4. Response rate for NAEP High School Transcript Study 2005 for all eligible schools and school enrollments in the U.S.

<table>
<thead>
<tr>
<th>School Type</th>
<th>Unweighted number of schools selected</th>
<th>Unweighted percent of schools selected</th>
<th>Weighted number of schools selected</th>
<th>Weighted percent of schools selected</th>
<th>Unweighted enrollment at selected schools</th>
<th>Weighted percent of enrollment at selected schools</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total</td>
<td>891</td>
<td>100.0</td>
<td>24,731</td>
<td>100.0</td>
<td>3,177,283</td>
<td>100.0</td>
</tr>
<tr>
<td>Respondent</td>
<td>726</td>
<td>81.5</td>
<td>19,120</td>
<td>77.3</td>
<td>2,675,008</td>
<td>84.2</td>
</tr>
<tr>
<td>Eligible non respondent</td>
<td>165</td>
<td>18.5</td>
<td>5,610</td>
<td>22.7</td>
<td>502,274</td>
<td>15.8</td>
</tr>
</tbody>
</table>


**Data Analysis**

The researcher has attended and completed the trainings to use NAEP HSTS 2005 restricted database conducted by U.S Department of education’s Institute of Education Sciences. Please refer to APPENDIX C and D for certificates of completion of the trainings. During the trainings, the researcher has been exposed to the actual datasets and the variables available for studies. The researcher also has been trained on how to analyze a large database with the probability random sampling procedure. In order to get more accurate point of estimates and standard error of the estimates, the researcher has been advised and explained about the variance estimation, replication method, replicate weights, and the appropriate statistical software to be used to analyze NAEP HSTS 2005 dataset. The following information regarding the variance
estimation, replication method, replicate weights, and the appropriate statistical software were retrieved from The 2005 High School Transcript Study User's Guide and Technical Report.

**Variance Estimation**

Graduates estimates based on NAEP HSTS 2005 are subject to sampling error because they are derived from a sample, rather than from the whole population. The variance is a measure of sampling error, and for most part, determines the reliability of an estimate. Sampling variance indicates how much a population estimate for a given statistic would be likely to change if it were based on another equivalent sample of individuals drawn exactly the same manner as the actual sample. Since NAEP HSTS 2005 used a complex sample design with several stages of sampling, unequal selection probabilities, and complex weighting procedures, use of standard textbook formulas or standard routines in software packages such as SPSS and SAS generally would underestimate the true variance of survey estimate. For NAEP HSTS 2005 replicate weights have been provided for each set of sample weights to allow users to compute variances estimates.

**Calculating Replicate Weights**

Replicate weights for a given NAEP HSTS 2005 sample were created by generating random samples of the original sample. In all, 62 replicate weights were created on each graduate record in NAEP HSTS 2005 data sets. Thirty six replicates were designed to reflect the variance contribution arising from sampling PSUs. The remaining 26 replicates were designed to reflect the variance contribution arising from sampled schools within the 22 uncertainty PSUs.

**Jackknife (JK2) Replication Method**

The stratified jackknife replication method used for NAEP HSTS 2005, known also as JK2 replication method, assumes that the population of PSUs, the first stage units, is grouped in $L$ variance strata with two PSUs (or variance units) selected from each stratum. It assumes two
primary sampling units (PSUs) per stratum (Krewski & Rao, 1981). The basic idea behind replication is to select subsamples repeatedly from the whole sample, calculate the statistic of interest for each subsample, and then use the variability among the subsample or replicate statistics to estimate the variance of the full sample statistic.

**Statistical Software Used with HSTS 2005**

Specialized software is required to produce the appropriate statistics from the NAEP HSTS 2005 data due to the complex sample design reflected in the jackknife replicate weights, unequal selection probabilities, and complex weighting procedures. Standard SPSS and SAS software can produce accurate point estimates but may not produce correct standard error. For this study, the researcher used SPSS 17 to retrieve the NAEP HSTS data sets from the disc. After that AM software was used to import and analyze the data from SPSS format (syntax). The AM software can incorporate jackknife replication method and replicate weight for analyzing the NAEP HSTS 2005 data. The software is publicly available online and can be downloaded for free from the American Institute for Research website. The remainder of this chapter focused on the procedures that were utilized to analyze the data collected. The procedures were discussed by research objectives.

**Research Objective 1**

To describe graduating high school students in the U.S by the following characteristics: age, gender, ethnicity, socioeconomic status as, measured by parent educational status, private school student or public school student status, and business education student or non-business education student status. The data for research objective 1 were analyzed using descriptive statistics to describe the subjects on the selected demographic and educational characteristics. The statistical procedures used were (1) frequency distributions; (2) measure of central tendency; and (3) percentages.
Research Objective 2

To describe academic achievement of high school students as measured by GPA in mathematics, social studies, English, and science. The data were analyzed using descriptive statistics to describe the subjects’ achievement level based on the following scores: GPA in mathematics, GPA in English, GPA in social studies, and GPA in science. The statistical procedures used were (1) frequency distributions; (2) measure of central tendency; and (3) percentages.

Research Objective 3

To compare academic achievement of graduating high school students based on whether or not they are identified as a business education student in the areas of mathematics, English, social studies, and science as measured by their GPAs in these subjects. The data were analyzed using comparative statistics to compare the business education student GPA scores to the non-business education student GPA scores. These comparisons utilized t-test procedures with an alpha level set a’ priori at 0.05. The t-test is appropriate since the independent variable has only two categories.

Cohen’s (1988) effect size was computed on all outcomes that had statistically significant differences. This is because “…statistical significance testing does not imply meaningfulness” (Olejnik & Algina, 2000, p. 241). According to Fan (2001) statistical significance testing evaluates the probability of obtaining the sampling outcome by chance, while effect size provides some indication of practical meaningfulness. Kirk (2001) explained that statistical significance relies heavily on sample size, while effect size assists in the interpretation of results and makes trivial effects harder to ignore, further assisting researchers to decide whether results are practically significant.
Cohen’s (1988) effect size standards for two independent groups are as follows: Cohen’s $d = .20$ corresponds to small effect size, Cohen’s $d = .50$ corresponds to moderate effect size and Cohen’s $d = .80$ corresponds to large effect size. Kotrlik and Williams (2003) said that if Cohen’s $d$ does not meet the standard of even a small effect size then any differences found would have low practical significance. Thus, if Cohen’s $d < .20$, the researcher considered the effect size to be of low practical significance.

**Research Objective 4**

To determine if differences existed in academic achievement of graduating high school students based on their personal demographic characteristics that is age, gender, ethnicity, parent educational status, and private school student or public school student status as measured by their GPAs in mathematics, English, social studies and science.

The variables age, gender, ethnicity, parents educational status, public or private school and business education status were each measured on a dichotomous scale and the $t$-test with an alpha level set a’ priori at 0.05 was used to measure the difference in the core subject GPAs (Mertler & Vannatta, 2005). Initially, the variables of age, ethnicity and parent educational status were independent variables with more than two levels of categories but were collapsed and recoded into two levels of categories. This maneuver was performed in an effort to reduce the danger of achieving spurious results after descriptive statistics revealed that the other group categories in age group, ethnicity and parent educational status had much lesser respondents.

Cohen’s $d$ was computed on all outcomes that had statistically significant differences. Cohen’s $d$ measures the effect size and was interpreted using Cohen’s (1988) effect size descriptors.
Research Objective 5

To determine if a model existed which explained a significant portion of the variance in high school student achievement as measured by GPA in mathematics, social studies, English, and science using the following variables: age, gender, ethnicity, socioeconomic status as measured by highest parent educational status, private school student or public school student status, and business education student or non-business education student status.

Multiple regression analysis (MRA) was used to achieve this objective. Multiple regression is a statistical procedure that involves predicting criterion values from examining the relationships between the predictor values (Hinkle et al., 2003).

“Multiple regression identifies the best combination of predictors (independent variables) of the dependent variable. Consequently, it is used when there are several independent quantitative variables and one dependent quantitative variable. To produce the best combination of predictors of the dependent variable, a sequential multiple regression selects independent variables, one at a time, by their ability to account for the most variance in the dependent variable. As a variable is selected and entered into the group of predictors, the relationship between the group of predictors and the dependent variable is reassessed. When no more variables are left that explain a significant amount of variance in the dependent variable, and then the regression model is complete.” (Mertler & Vannatta, 2005, p. 14)

This procedure explored the amount of variance in the dependent variables (GPA scores) explained by the independent variables entered into the model. Five potential explanatory variables were identified for use in this analysis. The potential explanatory variables were age, gender, ethnicity, highest parent educational status, private school student or public school student status and business education or non-business education student status. The dependent
variable will be the student GPAs on each subject. Pearson product-moment correlation coefficients were used to measure the relationship between the potential explanatory variables and the dependent variable. Potential explanatory variables with an $r$ value at or above the 0.05 level were entered into the regression.

The *alpha* level will be set a’ priori at 0.05. The researcher will follow the standards developed by Cohen (1988) for interpreting effect size in multiple regression analysis. Cohen’s effect size standards for regression analysis are as follows: $R^2 > 0.02$ - small effect size, $R^2 > 0.13$ - moderate effect size and $R^2 > 0.26$ - large effect size. Kotrlik and Williams (2003) said that if the $R^2$ does not meet the standard of even a small effect size, then it would have low practical significance. Thus, if the $R^2 < 0.02$, the researcher considered the effect size to be of low practical significance.
CHAPTER 4
FINDINGS

The purpose of this chapter is to present the data and explain the findings of the study. Initially, there were 29,898 samples in the data. However, only 26,565 samples were considered “meeting the requirement” after considering factors such as student’s graduation status, student’s transcript availability and student’s personal data and student’s school data completeness. Students with disability were filtered for this study. Their scores were eliminated to have appropriate comparison groups in the event that one group of students had certain type of handicapped students enrolled in them and may skew results. Previous studies have shown that academically disadvantaged students score lower on standardized tests and are disproportionately found in Career and Technical Education (CTE) programs (Elliot, Foster, & Franklin, 2005). After the data for students with disability were removed, there were 23,938 valid scores in the database.

The researcher defined business education student as the student who has accumulated at least two Carnegie units in business education subjects. One Carnegie Credit represents 120 instruction hours. For example, a student with 60 hours of business communication course will have 0.5 Carnegie units in business education. Thus, a student may have to take at least 3 business education subjects in three different semesters to accumulate two Carnegie units and be identified as a business education student. Students who take a sequence of three or more such courses in one occupational area are classified as Career and Technical Educations (CTE) concentrators (Gray, 2002; NCES, 2001).

Research Objective 1

Research Objective 1 was to describe the graduating high school students in the U.S by the following characteristics: age, gender, ethnicity, highest parental education status, private or
public school, and business education student or non-business education student. The demographic information analyzed was derived from the student file in the data set.

**Age**

The data available to compute age were the month and year of the respondents’ birth and the month and year of respondents’ graduated. Thus, the age measurements were computed to the nearest years by subtracting their birth dates from the date of their graduation. The mean age of the graduating students was 18.41 years of age. The youngest student was 15.75 years and the oldest was 28.5 years of age.

Table 5. Description of age distribution for high school seniors for NAEP High School Transcript Study 2005 in the U.S.

<table>
<thead>
<tr>
<th>Age Group in Years</th>
<th>Min</th>
<th>Max</th>
<th>Mean</th>
<th>Frequency</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Student Age</td>
<td>15.75</td>
<td>28.5</td>
<td>18.41</td>
<td></td>
<td></td>
</tr>
<tr>
<td>15 – 16</td>
<td></td>
<td></td>
<td></td>
<td>96</td>
<td>0.4</td>
</tr>
<tr>
<td>17 – 18</td>
<td></td>
<td></td>
<td></td>
<td>21,951</td>
<td>91.7</td>
</tr>
<tr>
<td>19 – 20</td>
<td></td>
<td></td>
<td></td>
<td>1,460</td>
<td>6.1</td>
</tr>
<tr>
<td>21 and above</td>
<td></td>
<td></td>
<td></td>
<td>431</td>
<td>1.8</td>
</tr>
</tbody>
</table>

Note. \( n = 23,938 \).


For further analysis, the researcher divided the respondents into four age groups. These categories were selected by the researcher and included: 15 – 16 years, 17 – 18 years, 19 – 20 years, and 21 years and above. Table 5 illustrates the data regarding the respondents’ age distribution. The largest number of respondents were in the age group of 17 - 18 years \( (n = 21,951, 91.7\%) \). The second largest group was the 19 - 20 age group, with \( (n = 1,460, 6.1\%) \) of the respondents indicating their age in this group. The smallest number of respondents were in the age group of 21 years and above \( (n = 431, 1.8\%) \).
Gender

There were $(n = 12,591, 52.6\%)$ females compared to $(n = 11,347, 47.4\%)$ males drawn from the samples. Table 6 illustrates the data regarding gender of the respondents.

Table 6. Description of gender distribution for high school seniors for NAEP High School Transcript Study 2005 in the U.S.

<table>
<thead>
<tr>
<th>Gender</th>
<th>Frequency</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Female</td>
<td>12,591</td>
<td>52.6</td>
</tr>
<tr>
<td>Male</td>
<td>11,347</td>
<td>47.4</td>
</tr>
</tbody>
</table>

Note, $n = 23,938$.

Ethnicity

A total of five ethnic groups were represented from the samples. The largest group by ethnicity was White $(n = 16,685, 69.7\%)$ and the second largest was African-Americans $(n = 3,040, 12.7\%)$, followed by Hispanic $(n = 2,749, 11.4\%)$, Asian $(n = 1,125, 4.7\%)$ and American Indian $(n = 192, 0.8\%)$. There were 167 respondents (.07\%) categorized as Other, who either refused to provide information regarding their ethnicity, their ethnicity could not be determined, or the system did not recognize their ethnicity. Table 7 illustrates the data regarding ethnicity of the respondents.

Table 7. Description of ethnicity distribution for high school seniors for NAEP High School Transcript Study 2005 in the U.S.

<table>
<thead>
<tr>
<th>Ethnicity</th>
<th>Frequency</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>African American</td>
<td>3,040</td>
<td>12.7</td>
</tr>
<tr>
<td>American Indian</td>
<td>192</td>
<td>0.8</td>
</tr>
<tr>
<td>Asian</td>
<td>1,125</td>
<td>4.7</td>
</tr>
<tr>
<td>Hispanic</td>
<td>2,749</td>
<td>11.4</td>
</tr>
</tbody>
</table>

(Table Continued)
White 16,685 69.7
Other 167 0.7

Note. \( n = 23,938 \).

Parent Educational Status

Students were also described by the variable socioeconomic status. This variable was measured by parent educational status. Respondents were asked to identify highest level of education of their mothers and their fathers. The information was derived from the student file. Table 8 illustrates the data with regards to their parental highest educational status.

The largest group of respondent (\( n = 7,739, 50.1 \% \)) has either parent who graduated from college. The second largest group has either parent graduated from high school and with some college education (\( n = 6,657, 43.1 \% \)). The third largest group has neither parent graduated from high school (\( n = 1,050, 6.8 \% \)). There were 8,492 respondents whose parent educational status was unknown. The results should be read with caution as there were 8,492 respondents whose parent educational statuses were unknown.

Table 8. Description of parent educational status for high school seniors for NAEP High School Transcript Study 2005 in the U.S.

<table>
<thead>
<tr>
<th>Variables</th>
<th>Frequency</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Did not graduate high school</td>
<td>1,050</td>
<td>6.8</td>
</tr>
<tr>
<td>Graduated high school, and some college education</td>
<td>6,657</td>
<td>43.1</td>
</tr>
<tr>
<td>Graduated College</td>
<td>7,739</td>
<td>50.1</td>
</tr>
</tbody>
</table>

Note. \( n = 15,446 \); Unknown = 8,492.

Private or Public Schools Student

There were (\( n = 21,448, 89.6 \% \)) students attended public schools compared to (\( n = 2,490, 10.4 \% \)) students attended private schools. Table 9 illustrates the data regarding the number of students enrolled in private schools and public schools.
Table 9. Description of public and private school student distribution for high school seniors for NAEP High School Transcript Study 2005 in the U.S.

<table>
<thead>
<tr>
<th>Variables</th>
<th>Frequency</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Public School Student</td>
<td>21,448</td>
<td>89.6</td>
</tr>
<tr>
<td>Private School Student</td>
<td>2,490</td>
<td>10.4</td>
</tr>
</tbody>
</table>

Note. $n = 23,938$.

Business Education or Non-Business Student Status

The students were categorized whether or not students were identified as a business education student or non-business education student. Students who have accumulated at least two Carnegie units in business subjects were defined as a business education student. This information was available from students’ transcript. Table 10 illustrates the data regarding the number of students identified as business education and non-business education. There were ($n = 4,189, 17.5\%$) students who were identified as business education students while ($n = 19,749, 82.5\%$) students were identified as non-business education students.

Table 10. Description of business education and non-business education student distribution for high school seniors for NAEP High School Transcript Study 2005 in the U.S.

<table>
<thead>
<tr>
<th>Variable</th>
<th>Frequency</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Business Education Student</td>
<td>4,189</td>
<td>17.5</td>
</tr>
<tr>
<td>Non-Business Education Student</td>
<td>19,749</td>
<td>82.5</td>
</tr>
</tbody>
</table>

Note. $n = 23,938$.

Research Objective 2

Research objective 2 was to describe academic achievement of graduating high school students in 2005 as measured by GPA in mathematics, social studies, English, and science. The data were analyzed using descriptive statistics to describe the subjects’ achievement level based
on the following scores: GPA in mathematics, GPA in English, GPA in social studies, and GPA in science. For further analysis, the researcher divided the GPA into three categories. These categories were selected by the researcher and included: Below C (0.00 – 1.999), Between C and B (2.00 – 2.999) and B or Better (3.00 – 4.000).

Calculating GPA requires both grade information and course credit information. Since credit and grade information reported on transcripts vary considerably among schools, districts and states, it is necessary to standardize this information so that valid student– and school–level comparisons can be made. In HSTS studies, standardized credit information is based on the Carnegie unit, which is defined as a course with 120 hours of instruction (NAEP, 2005). The factor for converting credits reported on a transcript to the standard Carnegie unit is verified by the curriculum specialist and then entered for each school by data entry personnel. Numeric grades are converted to standardized grades as follows: A = 4.00, B = 3.00, C = 2.00 and D = 1.00. The statistics used were mean, standard deviation, minimum, maximum, frequency and percentage. (NAEP, 2005)

Mathematics Achievement

Table 11. Description of student achievement on mathematics as measured by mathematics GPA score for high school seniors for NAEP High School Transcript Study 2005 in the U.S.

<table>
<thead>
<tr>
<th>Achievement Level (GPA)</th>
<th>Min</th>
<th>Max</th>
<th>Mean</th>
<th>Frequency</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mathematics GPA Score</td>
<td>0.330</td>
<td>4.000</td>
<td>2.655</td>
<td></td>
<td></td>
</tr>
<tr>
<td>B or Better (3.00 – 4.000)</td>
<td></td>
<td></td>
<td></td>
<td>8,902</td>
<td>37.2</td>
</tr>
<tr>
<td>Between C and B (2.00 – 2.999)</td>
<td></td>
<td></td>
<td></td>
<td>10.864</td>
<td>45.4</td>
</tr>
<tr>
<td>Below C (0.00 – 1.999)</td>
<td></td>
<td></td>
<td></td>
<td>4,164</td>
<td>17.4</td>
</tr>
</tbody>
</table>

Note. n = 23,930.

The first scores examined in the data analysis were the GPA for mathematics. There were 23,930 valid mathematic GPA scores in the data set. Table 11 illustrates the data regarding
the achievement of all students on mathematics as measured by their GPA. The highest possible GPA on mathematics was 4.00. The lowest possible scaled score was 0.330. The mean GPA score of all students on mathematics was 2.655. Students with GPA less than 2.000 accounted for (n = 4,164, 17.4%) of respondents. There were (n = 10,864, 45.4%) students who had GPA between 2.000 to 2.999 and (n = 8,902, 37.2%) students who had GPA 3.000 or greater. There were 8 missing values.

English Achievement

The next scores examined in the data analysis were the GPA for English. There were 23,933 valid English GPA scores in the data set. Table 12 illustrates the data regarding the achievement of all students on English as measured by their GPA. The highest GPA score on English was 4.000. The lowest GPA score was 0.560. The mean GPA score of all students on English was 2.856. Students with GPA less than 2.000 accounted for (n = 2,848, 11.9%) of respondents. There were (n = 9,454, 39.5%) students who had GPA between 2.000 to 2.999 and (n = 11,631, 48.6%) students who had GPA 3.000 or greater. There were 5 missing values.

Table 12. Description of student achievement on English as measured by English GPA score for high school seniors for NAEP High School Transcript Study 2005 in the U.S.

<table>
<thead>
<tr>
<th>Achievement Level (GPA)</th>
<th>Min</th>
<th>Max</th>
<th>Mean</th>
<th>Frequency</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>English GPA Score</td>
<td>0.560</td>
<td>4.000</td>
<td>2.856</td>
<td>11,631</td>
<td>48.6</td>
</tr>
<tr>
<td>B or Better (3.000 – 4.000)</td>
<td></td>
<td></td>
<td></td>
<td>9,454</td>
<td>39.5</td>
</tr>
<tr>
<td>Between C and B (2.000 – 2.999)</td>
<td></td>
<td></td>
<td></td>
<td>2,848</td>
<td>11.9</td>
</tr>
<tr>
<td>Below C (0.000 – 1.999)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Note. n = 23,933.

Social Studies Achievement

The third set of scores examined in the data analysis was the GPA for social studies. There were 23,935 valid social studies GPA scores in the data set. Table 13 illustrates the data
regarding the achievement of all students on social studies as measured by their GPA. The highest possible GPA on social studies was 4.00. The lowest possible scaled score was 0.500. The mean GPA score of all students on social studies was 2.921. Students with GPA less than 2.00 accounted for \((n = 2,537, 10.6\%)\) of respondents. There were \((n = 8,904, 37.2\%)\) students who had GPA between 2.00 to 2.999 and \((n = 12,494, 52.2\%)\) students who had GPA 3.00 or greater. There were 3 missing values.

Table 13. Description of student achievement on social studies as measured by social studies GPA score for high school seniors for NAEP High School Transcript Study 2005 in the U.S.

<table>
<thead>
<tr>
<th>Achievement Level (GPA)</th>
<th>Min</th>
<th>Max</th>
<th>Mean</th>
<th>Frequency</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Social Studies GPA Score</td>
<td>0.500</td>
<td>4.000</td>
<td>2.921</td>
<td></td>
<td></td>
</tr>
<tr>
<td>B or Better (3.000 – 4.000)</td>
<td></td>
<td></td>
<td></td>
<td>12,494</td>
<td>52.2</td>
</tr>
<tr>
<td>Between C and B (2.000 – 2.999)</td>
<td></td>
<td></td>
<td></td>
<td>8,904</td>
<td>37.2</td>
</tr>
<tr>
<td>Below C (0.000 – 1.999)</td>
<td></td>
<td></td>
<td></td>
<td>2,537</td>
<td>10.6</td>
</tr>
</tbody>
</table>

Note. \(n = 23,935\).

**Science Achievement**

The final set of scores examined in the data analysis was the GPA for science. There were 23,914 valid science GPA scores in the data set. Table 14 illustrates the data regarding the achievement of all students on science as measured by their GPA.

Table 14. Description of student achievement on science as measured by science GPA score for high school seniors for NAEP High School Transcript Study 2005 in the U.S.

<table>
<thead>
<tr>
<th>Achievement Level (GPA)</th>
<th>Min</th>
<th>Max</th>
<th>Mean</th>
<th>Frequency</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Science GPA Score</td>
<td>0.250</td>
<td>4.000</td>
<td>2.722</td>
<td></td>
<td></td>
</tr>
<tr>
<td>B or Better (3.000 – 4.000)</td>
<td></td>
<td></td>
<td></td>
<td>10,044</td>
<td>42.0</td>
</tr>
<tr>
<td>Between C and B (2.000 – 2.999)</td>
<td></td>
<td></td>
<td></td>
<td>10,259</td>
<td>42.9</td>
</tr>
<tr>
<td>Below C (0.000 – 1.999)</td>
<td></td>
<td></td>
<td></td>
<td>3,611</td>
<td>15.1</td>
</tr>
</tbody>
</table>

Note. \(n = 23,914\).
The highest possible GPA on science was 4.00. The lowest possible scaled score was 0.250. The mean GPA score of all students on science was 2.722. Students with GPA less than 2.00 accounted for \( (n = 3,611, 15.1\%) \) of respondents. There were \( (n = 10,259, 42.9\%) \) students who had GPA between 2.00 to 2.999 and \( (n = 10,044, 42.0\%) \) students who had GPA 3.000 or greater. There were 24 missing values.

**Research Objective 3**

The third research objective was to compare academic achievement of graduating high school students based on whether or not they are identified as a business education student in the areas of mathematics, English, social studies, and science as measured by their GPAs in these subjects.

Table 15. Comparison of mean GPA scores between business education student and non business education student on high school core subjects for high school seniors for NAEP High School Transcript Study 2005 in the U.S.

<table>
<thead>
<tr>
<th>Subjects</th>
<th>Non-Business education Students</th>
<th>Business education Students</th>
<th>( t )</th>
<th>( p &gt; t )</th>
<th>Cohen’s ( d )</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>( Mean ) (m)</td>
<td>( SD )</td>
<td>( Mean ) (m)</td>
<td>( SD )</td>
<td></td>
</tr>
<tr>
<td>Mathematics</td>
<td>2.673</td>
<td>0.747</td>
<td>2.569</td>
<td>0.728</td>
<td>6.55</td>
</tr>
<tr>
<td>English</td>
<td>2.869</td>
<td>0.733</td>
<td>2.791</td>
<td>0.699</td>
<td>4.59</td>
</tr>
<tr>
<td>Social Studies</td>
<td>2.932</td>
<td>0.732</td>
<td>2.866</td>
<td>0.697</td>
<td>4.03</td>
</tr>
<tr>
<td>Science</td>
<td>2.740</td>
<td>0.761</td>
<td>2.638</td>
<td>0.742</td>
<td>6.47</td>
</tr>
</tbody>
</table>

Note. Business education \( n = 4,189 \). Non-Business education \( n = 19,749 \).

The statistical test for this objective was an independent \( t \)-test for comparisons. The variable business education student or non business education student was measured on a dichotomous scale, thus the \( t \)-test was appropriate statistical procedure to measure the difference
in the mean GPA scores for mathematics, English, social studies and science. Table 15 illustrates that an independent $t$-test analysis revealed non-business education students had higher GPA scores on all four subjects than their business education counterparts.

**Comparison of Achievement on the Mathematics GPA**

For mathematics, non business education students had a statistically significantly $t$-test ($t = 6.55$) for higher mean GPA score ($m = 2.673$) than business education students ($m = 2.569$). Although statistical differences existed between the GPAs of non business education students and business education students, Cohen’s $d (d = 0.14)$ revealed a small effect size.

**Comparison of Achievement on the English GPA**

For English, non business education students had a statistically significantly $t$-test ($t = 4.59$) for higher mean GPA score ($m = 2.869$) than business education students ($m = 2.791$). Although statistical differences existed between the GPAs of non business education students and business education students, Cohen’s $d (d = 0.11)$ revealed a small effect size.

**Comparison of Achievement on the Social Studies GPA**

For social studies, non business education students had a statistically significantly $t$-test ($t = 4.03$) for higher mean GPA score ($m = 2.932$) than business education students ($m = 2.866$). Although statistical differences existed between the GPAs of non business education students and business education students, Cohen’s $d (d = 0.09)$ revealed a small effect size.

**Comparison of Achievement on the Science GPA**

For science, non business education students had a statistically significantly $t$-test ($t = 6.47$) for higher mean GPA score ($m = 2.740$) than business education students ($m = 2.638$). Although statistical differences existed between the GPAs of non business education students and business education students, Cohen’s $d (d = 0.13)$ revealed a small effect size.
Research Objective 4

The fourth research objective was to determine if differences exist in academic achievement of graduating high school students based on their personal demographic characteristics that was age, gender, ethnicity, parental education status, and private or public school status as measured by their GPAs in mathematics, English, social studies and science.

The statistical test for this objective was an independent t-test for comparisons. The variables gender, and public or private student status were each measured on a dichotomous scale and the t-test was appropriate statistical procedure to measure the difference in the mean GPA scores for mathematics, English, social studies and science. The variables of age group, ethnicity, and parent educational status, were collapsed and recoded to become two levels of categories and the t-test was also used to measure the difference in the mean GPA scores for mathematics, English, social studies and science.

Comparison of Achievement Based on Age

Comparisons for differences in the mean GPA scores and the variable age were made following collapse and recoding of the levels of age group into “Below 19” and “19 and above ” categories.

Table 16. Age groups collapsed into two categories for high school seniors for NAEP High School Transcript Study 2005 in the U.S.

<table>
<thead>
<tr>
<th>Age Group in Years</th>
<th>Frequency</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Below 19</td>
<td>22,047</td>
<td>92.1</td>
</tr>
<tr>
<td>19 and above</td>
<td>1,891</td>
<td>7.9</td>
</tr>
</tbody>
</table>

Note. n = 23,938.

This maneuver was performed in an effort to reduce the danger of achieving spurious results after descriptive statistics revealed that the other age group categories “15.00 – 16.99” (n
= 96, 0.4%) and “21 and above” (n = 431, 1.8%) had much lesser respondents as compared with “17.00 – 18.99” age group (n = 21,951, 91.7%). Table 16 illustrates the age groups were collapsed into two categories. There were (n = 22,047, 92.1%) students who were in the age group “below 19” and (n = 1,891, 7.9%) students were in the age group “19 and above”.

Table 17 illustrates that an independent t-test analysis revealed “Below 19” age group students had higher GPA scores on all four subjects than the scores of “19 and above” age group students. For mathematics, “Below 19” students had a statistically significantly t-test (t = 15.37) for higher mean GPA score (m = 2.679) than “19 and above” age group students (m = 2.375). The statistical differences existed between the GPAs of “Below 19” students and “19 and above” students revealed an effect size Cohen’s d (d = 0.41) which represents small effect size. For English, “Below 19” students had a statistically significantly t-test (t = 16.47) for higher mean GPA score (m = 2.886) than “19 and above” age group students (m = 2.503). The statistical differences existed between the GPAs of “Below 19” students and “19 and above” students revealed an effect size Cohen’s d (d = 0.53) which corresponds to moderate effect size.

Table 17. Comparison of mean GPA scores between age groups on high school core subjects for high school seniors for NAEP High School Transcript Study 2005 in the U.S.

<table>
<thead>
<tr>
<th>Subjects</th>
<th>Below 19</th>
<th>19 and above</th>
<th>t</th>
<th>p &gt; t</th>
<th>Cohen's d</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Mean (m)</td>
<td>SD</td>
<td>Mean (m)</td>
<td>SD</td>
<td></td>
</tr>
<tr>
<td>Mathematics</td>
<td>2.679</td>
<td>0.744</td>
<td>2.375</td>
<td>0.695</td>
<td>15.37</td>
</tr>
<tr>
<td>English</td>
<td>2.886</td>
<td>0.721</td>
<td>2.503</td>
<td>0.709</td>
<td>16.47</td>
</tr>
<tr>
<td>Social Studies</td>
<td>2.952</td>
<td>0.718</td>
<td>2.549</td>
<td>0.718</td>
<td>14.99</td>
</tr>
<tr>
<td>Science</td>
<td>2.751</td>
<td>0.755</td>
<td>2.389</td>
<td>0.729</td>
<td>14.51</td>
</tr>
</tbody>
</table>

Note. Below 19: n = 22,049; 19 and above: n = 1,891.
For social studies, “Below 19” students had a statistically significantly $t$-test ($t = 14.99$) for higher mean GPA score ($m = 2.952$) than “19 and above” age group students ($m = 2.549$). The statistical differences existed between the GPAs of “Below 19” students and “19 and above” students revealed an effect size Cohen’s $d$ ($d = 0.56$) which corresponds to moderate effect size. For science, “Below 19” students had a statistically significantly $t$-test ($t = 14.51$) for higher mean GPA score ($m = 2.751$) than “19 and above” students ($m = 2.389$). The statistical differences existed between the GPAs of “Below 19” students and “19 and above” students revealed an effect size Cohen’s $d$ ($d = 0.48$) which corresponds to small effect size.

**Comparison of Achievement Based on Gender**

Table 18 illustrates that an independent $t$-test analysis revealed female students had higher GPA scores on all four subjects than their male counterparts. For mathematics, female students had a statistically significantly $t$-test ($t = 15.06$) for higher mean GPA score ($m = 2.740$) than male students ($m = 2.561$). Although statistical differences existed between the GPAs of female students and male students, Cohen’s $d$ ($d = 0.24$) revealed a small effect size. For English, female students had a statistically significantly $t$-test ($t = 36.71$) for higher mean GPA score ($m = 3.023$) than male students ($m = 2.670$). The statistical differences existed between the GPAs of female students and male students revealed an effect size Cohen’s $d$ ($d = 0.52$) which corresponds to moderate effect size.

For social studies, female students had a statistically significantly $t$-test ($t = 21.63$) for higher mean GPA score ($m = 3.030$) than male students ($m = 2.670$). The statistical differences existed between the GPAs of female students and male students revealed an effect size Cohen’s $d$ ($d = 0.33$) which corresponds to small effect size. For science, female students had a statistically significantly $t$-test ($t = 17.09$) for higher mean GPA score ($m = 2.813$) than male...
students \( (m = 2.622) \). Although statistical differences existed between the GPAs of female students and male students, Cohen’s \( d \) \( (d = 0.26) \) revealed a small effect.

Table 18. Comparison of mean GPA scores between gender on high school core subjects for high school seniors for NAEP High School Transcript Study 2005 in the U.S.

<table>
<thead>
<tr>
<th>Subjects</th>
<th>Female Mean (m)</th>
<th>Female SD</th>
<th>Male Mean (m)</th>
<th>Male SD</th>
<th>( t )</th>
<th>( p &gt; t )</th>
<th>Cohen's d</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mathematics</td>
<td>2.740</td>
<td>0.743</td>
<td>2.561</td>
<td>0.735</td>
<td>15.06</td>
<td>&lt;.001</td>
<td>0.24</td>
</tr>
<tr>
<td>English</td>
<td>3.023</td>
<td>0.683</td>
<td>2.670</td>
<td>0.731</td>
<td>36.71</td>
<td>&lt;.001</td>
<td>0.52</td>
</tr>
<tr>
<td>Social Studies</td>
<td>3.030</td>
<td>0.698</td>
<td>2.799</td>
<td>0.739</td>
<td>21.63</td>
<td>&lt;.001</td>
<td>0.33</td>
</tr>
<tr>
<td>Science</td>
<td>2.813</td>
<td>0.746</td>
<td>2.622</td>
<td>0.760</td>
<td>17.09</td>
<td>&lt;.001</td>
<td>0.26</td>
</tr>
</tbody>
</table>

Note. Female: \( n = 12,591 \); Male: \( n = 11,347 \).

**Comparison of Achievement Based on Ethnicity**

Table 19 illustrates the data regarding the achievement of all students based on their ethnicity as measured by their GPAs in mathematics, English, social studies and science. White students \( (n = 16,685) \) had the mean GPA in mathematics \( m = 2.728 \), in English \( m = 2.930 \), in social studies \( m = 3.004 \) and in science \( m = 2.810 \). African American students \( (n = 3,040) \) had the mean GPA in mathematics \( m = 2.324 \), in English \( m = 2.571 \), in social studies \( m = 2.616 \) and in science \( m = 2.381 \). Hispanic students \( (n = 2,749) \) had the mean GPA in mathematics \( m = 2.485 \), in English \( m = 2.652 \), in social studies \( m = 2.685 \) and in science \( m = 2.506 \). Asian students \( (n = 1,125) \) had the mean GPA in mathematics \( m = 2.899 \), in English \( m = 3.055 \), in social studies \( m = 3.076 \) and in science \( m = 2.890 \). American Indian students \( (n = 192) \) had the mean GPA in mathematics \( m = 2.477 \), in English \( m = 2.671 \), in social studies \( m = 2.866 \) and in science \( m = 2.587 \).

Comparisons for differences in the mean GPA scores and the variable ethnicity were made following collapse and recoding of the levels of ethnic background into “White” and “Non-
White” categories. This maneuver was performed in an effort to reduce the danger of achieving spurious results after descriptive statistics revealed that the other ethnic variable categories “Asian,” and “American Indian” had much lesser respondents as compared with “White.”

Table 19. Comparison of mean GPA scores among ethnicity groups on high school core subjects for high school seniors for NAEP High School Transcript Study 2005 in the U.S.

<table>
<thead>
<tr>
<th>Ethnicity</th>
<th>Mathematics</th>
<th>English</th>
<th>Social Studies</th>
<th>Science</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Mean</td>
<td>SD</td>
<td>Mean</td>
<td>SD</td>
</tr>
<tr>
<td>White</td>
<td>2.728</td>
<td>0.753</td>
<td>2.930</td>
<td>0.731</td>
</tr>
<tr>
<td>African American</td>
<td>2.324</td>
<td>0.654</td>
<td>2.571</td>
<td>0.666</td>
</tr>
<tr>
<td>Hispanic</td>
<td>2.485</td>
<td>0.668</td>
<td>2.652</td>
<td>0.672</td>
</tr>
<tr>
<td>Asian</td>
<td>2.899</td>
<td>0.696</td>
<td>3.055</td>
<td>0.670</td>
</tr>
<tr>
<td>American Indian</td>
<td>2.477</td>
<td>0.671</td>
<td>2.671</td>
<td>0.703</td>
</tr>
</tbody>
</table>

Note. White: n = 16,685; African American: n = 3,040; Hispanic: n = 2,749; Asian: n = 1,125; American Indian: n = 192.

Table 20 illustrates the ethnicity groups were collapsed into two categories. There were (n = 16,685, 69.7%) “White” students and (n = 7,253, 30.3%) “Non White” students.

Table 20. Ethnicity groups collapsed into two categories for the high school seniors for high school seniors for NAEP High School Transcript Study 2005 in the U.S.

<table>
<thead>
<tr>
<th>Ethnicity</th>
<th>Frequency</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>White</td>
<td>16,685</td>
<td>69.7</td>
</tr>
<tr>
<td>Non White</td>
<td>7,253</td>
<td>30.3</td>
</tr>
</tbody>
</table>

Note. n = 23,938.
Table 21 illustrates that an independent t-test analysis revealed “White” students had higher GPA scores on all four subjects than the scores of “Non White” students. For mathematics, “White” students had a statistically significantly t-test ($t = 15.03$) for higher mean GPA score ($m = 2.728$) than “Non White” students ($m = 2.485$). The statistical differences existed between the GPAs of “White” students and “Non White” students revealed an effect size Cohen’s $d$ ($d = 0.32$) which corresponds to small effect size. For English, “White” students had a statistically significantly t-test ($t = 17.82$) for higher mean GPA score ($m = 2.930$) than “Non White” students ($m = 2.684$). The statistical differences existed between the GPAs of “White” students and “Non White” students revealed an effect size Cohen’s $d$ ($d = 0.34$) which corresponds to small effect size.

<table>
<thead>
<tr>
<th>Subjects</th>
<th>White</th>
<th>Non White</th>
<th>$t$</th>
<th>$p &gt; t$</th>
<th>Cohen’s $d$</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>$Mean (m)$</td>
<td>$SD$</td>
<td>$Mean (m)$</td>
<td>$SD$</td>
<td></td>
</tr>
<tr>
<td>Mathematics</td>
<td>2.728</td>
<td>0.753</td>
<td>2.485</td>
<td>0.696</td>
<td>15.03</td>
</tr>
<tr>
<td>English</td>
<td>2.930</td>
<td>0.731</td>
<td>2.684</td>
<td>0.690</td>
<td>17.82</td>
</tr>
<tr>
<td>Social Studies</td>
<td>3.004</td>
<td>0.722</td>
<td>2.728</td>
<td>0.699</td>
<td>20.09</td>
</tr>
<tr>
<td>Science</td>
<td>2.810</td>
<td>0.760</td>
<td>2.520</td>
<td>0.716</td>
<td>17.96</td>
</tr>
</tbody>
</table>


For social studies, “White” students had a statistically significantly t-test ($t = 20.09$) for higher mean GPA score ($m = 3.004$) than “Non White” students ($m = 2.728$). The statistical differences existed between the GPAs of “White” students and “Non White” students revealed an effect size Cohen’s $d$ ($d = 0.38$) which corresponds to small effect size. For science, “White”
students had a statistically significantly t-test \((t = 17.96)\) for higher mean GPA score \((m = 2.810)\) than “Non White” students \((m = 2.520)\). The statistical differences existed between the GPAs of “White” students and “Non White” students revealed an effect size Cohen’s \(d (d = 0.38)\) which corresponds to small effect size.

**Comparison of Achievement Based on Parent Educational Status**

The educational status of respondents’ parents was examined. Respondents were asked to identify the educational status of their parents by choosing one of three categories for both the mothers’ educational status and the fathers’ educational status: “did not complete high school,” “completed high school or/and some college but no degree,” and “earned a bachelor’s degree.” These categories were collapsed and recoded into the dichotomy of “Either Parent College Graduate” and “Neither Parent College Graduate,” which included the other already mentioned categories. Table 22 illustrates the parent educational statuses were collapsed into two categories. There were \((n = 7,738, 50.1\%)\) students who had either parent college graduate and \((n = 7,708, 49.9\%)\) students who had neither parent college graduate.

**Table 22. Parent educational status collapsed into two categories for high school seniors for NAEP High School Transcript Study 2005 in the U.S.**

<table>
<thead>
<tr>
<th>Parent Educational Status</th>
<th>Frequency</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Either parent college graduate</td>
<td>7,738</td>
<td>50.1</td>
</tr>
<tr>
<td>Neither parent college graduate</td>
<td>7,708</td>
<td>49.9</td>
</tr>
</tbody>
</table>

Note. \(n = 15,446\).

Table 23 illustrates that an independent \(t\)-test analysis revealed “Either Parent College Graduate” students had higher GPA scores on all four subjects than the scores of “Neither Parent College Graduate.” For mathematics, “Either Parent College Graduate” students had a
statistically significantly $t$-test ($t = 16.38$) for higher mean GPA score ($m = 2.806$) than “Neither Parent College Graduate” students ($m = 2.558$). The statistical differences existed between the GPAs of “Either Parent College Graduate” students and “Neither Parent College Graduate” students revealed an effect size Cohen’s $d$ ($d = 0.34$) which corresponds to small effect size.

Table 23. Comparison of mean GPA scores between parent educational status on high school core subjects for high school seniors for NAEP High School Transcript Study 2005 in the U.S.

<table>
<thead>
<tr>
<th>Subjects</th>
<th>Either parent college graduate</th>
<th>Neither parent college graduate</th>
<th>$t$</th>
<th>$p &gt; t$</th>
<th>Cohen’s $d$</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>$Mean (m)$</td>
<td>$SD$</td>
<td>$Mean (m)$</td>
<td>$SD$</td>
<td></td>
</tr>
<tr>
<td>Mathematics</td>
<td>2.806</td>
<td>0.749</td>
<td>2.558</td>
<td>0.722</td>
<td>16.38</td>
</tr>
<tr>
<td>English</td>
<td>3.015</td>
<td>0.711</td>
<td>2.736</td>
<td>0.722</td>
<td>19.70</td>
</tr>
<tr>
<td>Social Studies</td>
<td>3.093</td>
<td>0.694</td>
<td>2.818</td>
<td>0.723</td>
<td>19.47</td>
</tr>
<tr>
<td>Science</td>
<td>2.893</td>
<td>0.741</td>
<td>2.603</td>
<td>0.745</td>
<td>16.93</td>
</tr>
</tbody>
</table>

Note. Either Parent College Graduate: $n = 7,738$; Neither Parent College Graduate: $n = 7,708$


For English, “Either Parent College Graduate” students had a statistically significantly $t$-test ($t = 19.70$) for higher mean GPA score ($m = 3.015$) than “Neither Parent College Graduate” students ($m = 2.736$). The statistical differences existed between the GPAs of “Either Parent College Graduate” students and “Neither Parent College Graduate” students revealed an effect size Cohen’s $d$ ($d = 0.39$) which corresponds to small effect size.

For social studies, “Either Parent College Graduate” students had a statistically significantly $t$-test ($t = 19.47$) for higher mean GPA score ($m = 3.093$) than “Neither Parent College Graduate” students ($m = 2.818$). The statistical differences existed between the GPAs of “Either Parent College Graduate” students and “Neither Parent College Graduate” students revealed an effect size Cohen’s $d$ ($d = 0.38$) which corresponds to small effect size. For science,
“Either Parent College Graduate” students had a statistically significantly $t$-test ($t = 16.93$) for higher mean GPA score ($m = 2.893$) than “Neither Parent College Graduate” students ($m = 2.603$). The statistical differences existed between the GPAs of “Either Parent College Graduate” students and “Neither Parent College Graduate” students revealed an effect size Cohen’s $d$ ($d = 0.39$) which corresponds to small effect size.

**Comparison of Achievement Based on Private or Public School Status**

Table 24 illustrates that an independent $t$-test analysis revealed private students had higher GPA scores on all four subjects than their public counterparts. For mathematics, private school students had a statistically significantly $t$-test ($t = 6.23$) for higher mean GPA score ($m = 2.875$) than public students ($m = 2.629$). The statistical differences existed between the GPAs of private school students and public school students, Cohen’s $d$ ($d = 0.33$) which corresponds to small effect size. For English, private students had a statistically significantly $t$-test ($t = 5.19$) for higher mean GPA score ($m = 3.028$) than public students ($m = 2.836$). The statistical differences existed between the GPAs of private school students and public school students, Cohen’s $d$ ($d = 0.30$) which corresponds to small effect size.

Table 24. Comparison of mean GPA scores between private school student and public school student on high school core subjects for high school seniors for NAEP High School Transcript Study 2005 in the U.S.

<table>
<thead>
<tr>
<th>Subjects</th>
<th>Private School Students</th>
<th>Public School Students</th>
<th>$t$</th>
<th>$p &gt; t$</th>
<th>Cohen's $d$</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>$Mean (m)$</td>
<td>$SD$</td>
<td>$Mean (m)$</td>
<td>$SD$</td>
<td></td>
</tr>
<tr>
<td>Mathematics</td>
<td>2.875</td>
<td>0.713</td>
<td>2.629</td>
<td>0.744</td>
<td>6.61</td>
</tr>
<tr>
<td>English</td>
<td>3.028</td>
<td>0.645</td>
<td>2.836</td>
<td>0.734</td>
<td>5.60</td>
</tr>
<tr>
<td>Social Studies</td>
<td>3.118</td>
<td>0.612</td>
<td>2.898</td>
<td>0.735</td>
<td>6.87</td>
</tr>
<tr>
<td>Science</td>
<td>2.928</td>
<td>0.703</td>
<td>2.699</td>
<td>0.762</td>
<td>5.58</td>
</tr>
</tbody>
</table>

Note: Private $n = 2,490$. Public $n = 21,448$.  
For social studies, private students had a statistically significantly $t$-test ($t = 6.64$) for higher mean GPA score ($m = 3.118$) than public students ($m = 2.898$). Although statistical differences existed between the GPAs of private students and public students, Cohen’s $d$ ($d = 0.26$) revealed a small effect size. For science, private students had a statistically significantly $t$-test ($t = 5.43$) for higher mean GPA score ($m = 2.928$) than public students ($m = 2.699$). The statistical differences existed between the GPAs of private school students and public school students, Cohen’s $d$ ($d = 0.30$) which corresponds to small effect size.

**Research Objective 5**

Research Objective 5 was to determine if a model existed which explained a significant portion of the variance in high school student achievement as measured by GPA in mathematics, social studies, English, and science from the following variables: age, gender, ethnicity, parental education status, private or public school student, and business education student or non-business education student. This objective was accomplished using multiple regression analysis with the subject GPAs as the dependent variables. The other variables, age, gender, ethnicity, parental education status, private or public school student, and business education student or non-business education student, were treated as independent variables. These variables were selected as independent variables in the multiple regression analysis by the researcher because they were found to be statistically significant ($p > .05$), when compared to mean GPA scores of high school core subjects. Block entry of the variable was used for this study.

Because multiple regression is an extension of correlation (Brace, Kelp, & Snelgar, 2003) the researcher first ran correlations among all the selected independent variables. Two way correlations were shown between factors used as independent variables in the regression and the dependent variable. Pearson product-moment correlation coefficients were used to measure the
relationship between the potential explanatory variables and the dependent variable. Spearman’s Rho non parametric correlation was used to indicate a relationship with the nominal categorical variables and the dependent variable.

The variables which were identified using the Pearson product-moment correlations were then entered into the model as a block and the multiple regression analysis (MRA) were run. Then the variable business education student or non-business education student was entered into the model. The $R^2$ change was examined to determine if including this variable explained a significant amount of additional variance.

In analyzing the data, three two-categorical variables were “dummy” coded. Those variables were gender (male or female), public or private school student, and business education student or non-business education student. In each variable, male, public school student and business education student were coded as “1” and the opposite was coded as “0”.

**Regression Analysis for Mathematics GPA Scores**

For descriptive purposes, two way correlations between factors used as independent variables in the regression and the mathematics GPA scores are presented in Table 25. Analysis of the Pearson product-moment correlations of the mathematic GPA revealed that the independent variable ethnicity American Indian ($r = -0.026$), was not correlated with the dependent variable at or below the 0.05 level; therefore, it was not included in the MRA. The Pearson product-moment correlations revealed that the variable ethnicity – African American ($r = -0.178$) was most highly correlated with the independent variable.

Table 25. Relationship between mathematics GPA and selected demographic characteristics for high school seniors for NAEP High School Transcript Study 2005 in the U.S.

<table>
<thead>
<tr>
<th>Factors</th>
<th>$r$</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age</td>
<td>-0.071</td>
</tr>
</tbody>
</table>

(Table continued)
<table>
<thead>
<tr>
<th>Variable</th>
<th>Coefficient</th>
</tr>
</thead>
<tbody>
<tr>
<td>Male</td>
<td>-0.117</td>
</tr>
<tr>
<td>Ethnicity – White</td>
<td>0.150</td>
</tr>
<tr>
<td>Ethnicity – African American</td>
<td>-0.178</td>
</tr>
<tr>
<td>Ethnicity – Hispanic</td>
<td>-0.075</td>
</tr>
<tr>
<td>Ethnicity – Asian</td>
<td>0.080</td>
</tr>
<tr>
<td>*Ethnicity – American Indian</td>
<td>-0.026</td>
</tr>
<tr>
<td>Either parent college graduate</td>
<td>0.166</td>
</tr>
<tr>
<td>Public school</td>
<td>-0.092</td>
</tr>
<tr>
<td>Business education</td>
<td>-0.056</td>
</tr>
</tbody>
</table>

Note. *Variable has a small correlation with the dependent variable and was not incorporated into model 1 and 2.

For model 1, the predictor values were entered into the MRA as a block. Age, gender, ethnicity, parent educational status, and school status were all entered into the MRA because they each had correlations at or above 0.05. The probability of $F$ to enter the equation was set at .05. For model 2, business education student was added as predictor value.

Table 26 presents the results of the multiple regression analysis. Model 1 explained 8.9% ($R = 0.298$, $R^2 = .089$) of the variance in the achievement of mathematics. These five variables explained 8.9% of the variance in the dependent variable mathematics GPA scores. For model 2, the variable business education student was entered into the model. The inclusion of this variable resulted in an additional 0.1% explanation of variance in the dependent variable. Even though the inclusion of this variable explained a statistically significant amount of variance, it had a small effect size.

Results of the MRA presented in Table 26 demonstrates that the independent variables of age, gender, ethnicity, parent educational status and private school student or public school student, and business education student or non-business student explained a significant portion of the variance of the mathematic GPA scores. The following standards for interpretation of effect
size developed by Cohen (1988) were utilized to interpret the results of the MRA: $R^2$ greater than .02 = small effect size; $R^2$ greater than .13 = moderate effect size, and $R^2$ greater than .26 large effect size. The results of the MRA revealed that the total model ($R^2 = .09$) has a close to moderate effect size according to Cohen’s (1988) guidelines.

Table 26. Comparison models for the multiple regression analysis of the mathematics GPA for high school seniors for NAEP High School Transcript Study 2005 in the U.S.

<table>
<thead>
<tr>
<th>Model</th>
<th>$R$</th>
<th>$R^2$</th>
<th>$F$ Value Change</th>
<th>$p(F &gt; f)$ Change</th>
</tr>
</thead>
<tbody>
<tr>
<td>1$^a$</td>
<td>.298</td>
<td>.089</td>
<td>107.79</td>
<td>&lt;.001</td>
</tr>
<tr>
<td>2$^b$</td>
<td>.030</td>
<td>.090</td>
<td>95.52</td>
<td>&lt;.001</td>
</tr>
</tbody>
</table>

Note. $^a$Model 1 includes age, gender, ethnicity, parent educational status and public school student as independent variables. Mathematics GPA score is the dependent variable. $^b$Model 2 includes age, gender, ethnicity, parent educational status public school student, and business education student as independent variables. Mathematics GPA score is the dependent variable. Model 2 was chosen since the inclusion of business education student in the multiple regression analysis added a statistically significant amount of explained variance in mathematics GPA scores.


Table 27 presents coefficients for the variables included in the regression analysis of the Mathematics GPA. A review of beta weights in Table 27 specifies that eight variables significantly contributed to the model. The variable age with $\beta = -0.035$, $t = -7.44$, and $p < .001$ suggests that older students tended to have lower on overall mathematics GPA. The variable gender with $\beta = -0.198$, $t = -15.82$, and $p < .001$ suggests that male students tended to achieve lower scores on the mathematics GPA than females.

The variable ethnicity African American with $\beta = -0.178$, $t = -2.90$, and $p = .005$ suggests that African American students tended to have lower mathematics achievement than their non-African American counterparts. The variable ethnicity Hispanic can be excluded from the model.
since it was not statistically significant \( (t = 1.146, p = 0.256) \). Parent educational status with \( \beta = 0.252, t = 9.36, \) and \( p < .001 \) suggests that students whose either parent was college graduate tended to have higher mathematics achievement than students whose either parent was not college graduate.

The variable public school with \( \beta = -0.125, t = -3.29, \) and \( p = 0.002 \) suggests that public school students tended to have lower mathematics achievement than the private school students’ achievement.

Table 27. Coefficients for the variables included in the regression analysis of the mathematics GPA for high school seniors for NAEP High School Transcript Study 2005 in the U.S.

<table>
<thead>
<tr>
<th>Model</th>
<th>Coefficients</th>
<th>( t )</th>
<th>( p &gt; t )</th>
</tr>
</thead>
<tbody>
<tr>
<td>Constant</td>
<td>3.217</td>
<td>24.357</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Age</td>
<td>-0.035</td>
<td>-7.443</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Male</td>
<td>-0.198</td>
<td>-15.816</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Ethnicity – White</td>
<td>0.218</td>
<td>3.571</td>
<td>0.001</td>
</tr>
<tr>
<td>Ethnicity – African American</td>
<td>-0.178</td>
<td>-2.904</td>
<td>0.005</td>
</tr>
<tr>
<td>Ethnicity – Hispanic</td>
<td>0.075</td>
<td>1.146</td>
<td>0.256</td>
</tr>
<tr>
<td>Ethnicity – Asian</td>
<td>0.411</td>
<td>6.281</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Either parent college graduate</td>
<td>0.252</td>
<td>9.356</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Public school</td>
<td>-0.125</td>
<td>-3.295</td>
<td>0.002</td>
</tr>
<tr>
<td>Business education</td>
<td>-0.050</td>
<td>-2.425</td>
<td>0.018</td>
</tr>
</tbody>
</table>

Note. Variables entered into the model 2: Gender - male; Ethnicity - White, African American, Hispanic, Asian; Parent Educational Status - Graduate high school and some college, Graduate college; School Status - Public School; Business Education Status - Business Education.


The variable business education student with \( \beta = -0.050, t = -2.43, \) and \( p = 0.018 \) suggests that business education students tended to have lower mathematics achievement than non
business education students’ achievement. It is important to remember that although the amount of variance explained by this variable was statistically significant, it revealed a small effect size.

**Regression Analysis for English GPA Scores**

For descriptive purposes, two way correlations between factors used as independent variables in the regression and the English GPA scores are presented in Table 28. Analysis of the Pearson product-moment correlations of the English GPA revealed that the independent variable ethnicity American Indian \((r = -0.033)\), was not correlated with the dependent variable at or below the 0.05 level; therefore, it was not included in the MRA. The Pearson product-moment correlations revealed that the variable gender – male \((r = -0.241)\) was most highly correlated with the independent variable.

Table 28. Relationship between English GPA and selected demographic characteristics for high school seniors for NAEP High School Transcript Study 2005 in the U.S.

<table>
<thead>
<tr>
<th>Factors</th>
<th>(r)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age</td>
<td>-0.064</td>
</tr>
<tr>
<td>Male</td>
<td>-0.241</td>
</tr>
<tr>
<td>Ethnicity – White</td>
<td>0.152</td>
</tr>
<tr>
<td>Ethnicity – African American</td>
<td>-0.154</td>
</tr>
<tr>
<td>Ethnicity – Hispanic</td>
<td>-0.094</td>
</tr>
<tr>
<td>Ethnicity – Asian</td>
<td>0.069</td>
</tr>
<tr>
<td>*Ethnicity – American Indian</td>
<td>-0.033</td>
</tr>
<tr>
<td>Either parent graduate college</td>
<td>0.193</td>
</tr>
<tr>
<td>Public school</td>
<td>-0.084</td>
</tr>
<tr>
<td>Business education</td>
<td>-0.045</td>
</tr>
</tbody>
</table>

Note. *Variable has a small correlation with the dependent variable and was not incorporated into model 1 and 2.


For model 1, the predictor values were entered into the MRA as a block. Age, gender, ethnicity, parent educational status, and school status were all entered into the MRA because
they each had correlations at or above 0.05. The probability of $F$ to enter the equation was set at .05. For model 2, business education student was added as predictor value, although it had a correlation at -0.045.

Table 29 presents the results of the multiple regression analysis. Model 1 explained 14.1% ($R = 0.375, R^2 = .141$) of the variance in the achievement of English. These five variables explained 14.1% of the variance in the dependent variable English GPA scores. For model 2, the variable business education student was entered into the model. The inclusion of this variable did not add any additional explanation of variance in the dependent variable. Model 1 was chosen since the inclusion of business education student did not add statistically significant amount of explained variance.

Table 29. Comparison models for the multiple regression analysis of the English GPA for high school seniors for NAEP High School Transcript Study 2005 in the U.S.

<table>
<thead>
<tr>
<th></th>
<th>Model</th>
<th>$R$</th>
<th>$R^2$</th>
<th>$F$ Value Change</th>
<th>$p(F &gt; f)$ Change</th>
</tr>
</thead>
<tbody>
<tr>
<td>1&lt;sup&gt;a&lt;/sup&gt;</td>
<td>.375</td>
<td>.141</td>
<td>205.12</td>
<td>&lt;.001</td>
<td></td>
</tr>
<tr>
<td>2&lt;sup&gt;b&lt;/sup&gt;</td>
<td>.375</td>
<td>.141</td>
<td>183.46</td>
<td>&lt;.001</td>
<td></td>
</tr>
</tbody>
</table>

Note. <sup>a</sup>Model 1 includes age, gender, ethnicity, parent educational status and public school student as independent variables. English GPA score is the dependent variable. <sup>b</sup>Model 2 includes age, gender, ethnicity, parent educational status public school student, and business education student as independent variables. English GPA score is the dependent variable. Model 1 was chosen since the inclusion of business education student in the multiple regression analysis did not add a statistically significant amount of explained variance in English GPA scores.


Results of the MRA presented in Table 29 demonstrates that the independent variables of age, gender, ethnicity, parent educational status and private school student or public school student, and business education student or non-business student explained a significant portion of
the variance of the English GPA scores. The following standards for interpretation of effect size developed by Cohen (1988) were utilized to interpret the results of the MRA: $R^2$ greater than .02 = small effect size; $R^2$ greater than .13 = moderate effect size, and $R^2$ greater than .26 large effect size. The results of the MRA revealed that the total model ($R^2=0.141$) has a moderate effect size according to Cohen’s (1988) guidelines.

Table 30 presents coefficients for the variables included in the regression analysis of the English GPA. A review of beta weights in Table 30 specifies that six variables significantly contributed to the model. The variable age with $\beta = -0.019$, $t = -2.50$, and $p = 0.015$ suggests that older students tended to have lower overall English GPA. The variable gender with $\beta = -0.379$, $t = -35.30$, and $p < .001$ suggests that male students tended to achieve lower scores on the English GPA than females.

The variable ethnicity White with $\beta = 0.253$, $t = 3.36$, and $p = .001$ suggests that White students tended to have higher English achievement than other ethnicities. The variable ethnicity African American ($t = 1.325$, $p = 0.190$) and Hispanic ($t = 1.068$, $p = 0.290$) can be excluded from the model since both were not statistically significant.

Parent educational status with $\beta = 0.343$, $t = 13.19$, and $p < .001$ suggests that students whose either parent was college graduate tended to have higher English achievement than students whose either parent was not college graduate. The variable public school student with $\beta = -0.093$, $t = -2.52$, and $p = 0.014$ suggests that public school students tended to have lower English achievement than the private school students’ achievement.

The variable business education student with $\beta = -0.027$ suggests that business education students tended to have lower English achievement than their non-business counterparts. However, the variable of business education ($t = -1.32$, $p = 0.191$) can be excluded from the model since it was not statistically significant.
Table 30. Coefficients for the variables included in the regression analysis of the English GPA for high school seniors for NAEP High School Transcript Study 2005 in the U.S.

<table>
<thead>
<tr>
<th>Model</th>
<th>Coefficients</th>
<th>t</th>
<th>p &gt; t</th>
</tr>
</thead>
<tbody>
<tr>
<td>Constant</td>
<td>3.085</td>
<td>0.165</td>
<td>18.747</td>
</tr>
<tr>
<td>Age</td>
<td>-0.019</td>
<td>0.008</td>
<td>-2.504</td>
</tr>
<tr>
<td>Male</td>
<td>-0.379</td>
<td>0.011</td>
<td>-35.298</td>
</tr>
<tr>
<td>Ethnicity – White</td>
<td>0.253</td>
<td>0.075</td>
<td>3.355</td>
</tr>
<tr>
<td>Ethnicity – African American</td>
<td>-0.102</td>
<td>0.077</td>
<td>-1.325</td>
</tr>
<tr>
<td>Ethnicity – Hispanic</td>
<td>0.077</td>
<td>0.072</td>
<td>1.068</td>
</tr>
<tr>
<td>Ethnicity – Asian</td>
<td>0.405</td>
<td>0.079</td>
<td>5.116</td>
</tr>
<tr>
<td>Either parent college graduate</td>
<td>0.343</td>
<td>0.026</td>
<td>13.188</td>
</tr>
<tr>
<td>Public school</td>
<td>-0.093</td>
<td>0.037</td>
<td>-2.517</td>
</tr>
<tr>
<td>Business education</td>
<td>-0.027</td>
<td>0.021</td>
<td>-1.322</td>
</tr>
</tbody>
</table>

Note. Variables entered into the model 2: Gender - male; Ethnicity - White, African American, Hispanic, Asian; Parent Educational Status - Graduate high school and some college, Graduate college; School Status - Public School; Business Education Status - Business Education.

Regression Analysis for Social Studies GPA Scores

For descriptive purposes, two way correlations between factors used as independent variables in the regression and the social studies GPA scores are presented in Table 31. Analysis of the Pearson product-moment correlations of the social studies GPA revealed that the independent variable ethnicity – American Indian (r = -0.015), was not correlated with the dependent variable at or below the 0.05 level; therefore, it was not included in the MRA. The Pearson product-moment correlations revealed that the variable parent educational status – Either parent college graduate (r = .191) was most highly correlated with the independent variable.

For model 1, the predictor values were entered into the MRA as a block. Age, gender, ethnicity, parent educational status, and school status were all entered into the MRA because
they each had correlations at or above 0.05. The probability of $F$ to enter the equation was set at 0.05. For model 2, business education student was added as predictor value.

Table 31. Relationship between social studies GPA and selected demographic characteristics for high school seniors for NAEP High School Transcript Study 2005 in the U.S.

<table>
<thead>
<tr>
<th>Factors</th>
<th>$r$</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age</td>
<td>-0.084</td>
</tr>
<tr>
<td>Male</td>
<td>-0.152</td>
</tr>
<tr>
<td>Ethnicity – White</td>
<td>0.168</td>
</tr>
<tr>
<td>Ethnicity – African American</td>
<td>-0.162</td>
</tr>
<tr>
<td>Ethnicity – Hispanic</td>
<td>-0.104</td>
</tr>
<tr>
<td>Ethnicity – Asian</td>
<td>0.055</td>
</tr>
<tr>
<td>*Ethnicity – American Indian</td>
<td>-0.015</td>
</tr>
<tr>
<td>Either parent college graduate</td>
<td>0.191</td>
</tr>
<tr>
<td>Public school</td>
<td>-0.099</td>
</tr>
<tr>
<td>Business education</td>
<td>-0.049</td>
</tr>
</tbody>
</table>

Note. *Variable has a small correlation with the dependent variable and was not incorporated into model 1 and 2.

Table 32 presents the results of the multiple regression analysis. Model 1 explained 10.7% ($R = 0.327, R^2 = .107$) of the variance in the achievement of social studies. These five variables explained 10.7% of the variance in the dependent variable social studies GPA scores. For model 2, the variable business education student was entered into the model, although it had a correlation at -0.040. The inclusion of this variable did not add any additional explanation of variance in the dependent variable. Model 1 was chosen since the inclusion of business education student did not add statistically significant amount of explained variance.

Results of the MRA presented in Table 32 demonstrates that the independent variables of age, gender, ethnicity, parent educational status and private school student or public school student, and business education student or non-business student explained a significant portion of
the variance of the social studies GPA scores. The following standards for interpretation of
effect size developed by Cohen (1988) were utilized to interpret the results of the MRA: $R^2$
greater than .02 = small effect size; $R^2$ greater than .13 = moderate effect size, and $R^2$ greater
than .26 large effect size. The results of the MRA revealed that the total model ($R^2=.107$) has a
close to moderate effect size according to Cohen’s (1988) guidelines.

Table 32. Comparison models for the multiple regression analysis of the social studies GPA for
high school seniors for NAEP High School Transcript Study 2005 in the U.S.

<table>
<thead>
<tr>
<th>Model</th>
<th>$R$</th>
<th>$R^2$</th>
<th>$F$ Value</th>
<th>$p(F &gt; f)$</th>
</tr>
</thead>
<tbody>
<tr>
<td>1$^a$</td>
<td>.327</td>
<td>.107</td>
<td>151.15</td>
<td>&lt;.001</td>
</tr>
<tr>
<td>2$^b$</td>
<td>.327</td>
<td>.107</td>
<td>133.46</td>
<td>&lt;.001</td>
</tr>
</tbody>
</table>

Note. $^a$Model 1 includes age, gender, ethnicity, parent educational status and public school
student as independent variables. Social studies GPA score is the dependent variable. $^b$Model 2
includes age, gender, ethnicity, parent educational status public school student, and business
education student as independent variables. Social studies GPA score is the dependent variable.
Model 1 was chosen since the inclusion of business education student in the multiple regression
analysis did not add a statistically significant amount of explained variance in social studies GPA
scores.

Source: U.S. Department of Education, Institute of Education Sciences, National Center for

Table 33 presents coefficients for the variables included in the regression analysis of the
social studies GPA. A review of beta weights in Table 33 specifies that six variables significantly
contributed to the model. The variable age with $\beta = -0.037$, $t = -4.38$, and $p < .001$ suggests that
older students tended to have lower overall social studies GPA. The variable gender with $\beta =$
-0.244, $t = -20.07$, and $p < .001$ suggests that male students tended to achieve lower scores on the
social studies GPA than females.

The variable ethnicity African American with $\beta = -0.246$, $t = -3.26$, and $p = .002$ suggests
that African American students tended to have lower social studies achievement than their non-
African American counterparts. The variable ethnicity White ($t = 1.528, p = 0.131$) and Hispanic ($t = -0.934, p = 0.354$) can be excluded from the model since both were not statistically significant.

Table 33. Coefficients for the variables included in the regression analysis of the social studies GPA for high school seniors for NAEP High School Transcript Study 2005 in the U.S.

<table>
<thead>
<tr>
<th>Model</th>
<th>Coefficients</th>
<th>t</th>
<th>p &gt; t</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>$\beta$</td>
<td>$SD$</td>
<td></td>
</tr>
<tr>
<td>Constant</td>
<td>3.601</td>
<td>0.167</td>
<td>21.510</td>
</tr>
<tr>
<td>Age</td>
<td>-0.037</td>
<td>0.008</td>
<td>-4.380</td>
</tr>
<tr>
<td>Male</td>
<td>-0.244</td>
<td>0.012</td>
<td>-20.065</td>
</tr>
<tr>
<td>Ethnicity – White</td>
<td>0.117</td>
<td>0.077</td>
<td>1.528</td>
</tr>
<tr>
<td>Ethnicity – African American</td>
<td>-0.246</td>
<td>0.076</td>
<td>-3.255</td>
</tr>
<tr>
<td>Ethnicity – Hispanic</td>
<td>-0.071</td>
<td>0.076</td>
<td>-0.934</td>
</tr>
<tr>
<td>Ethnicity – Asian</td>
<td>0.216</td>
<td>0.083</td>
<td>2.603</td>
</tr>
<tr>
<td>Either parent college graduate</td>
<td>0.320</td>
<td>0.024</td>
<td>13.355</td>
</tr>
<tr>
<td>Public school</td>
<td>-0.129</td>
<td>0.034</td>
<td>-3.857</td>
</tr>
<tr>
<td>Business Education</td>
<td>-0.012</td>
<td>0.019</td>
<td>-0.655</td>
</tr>
</tbody>
</table>

Note. Variables entered into the model 2: Gender - male; Ethnicity - White, African American, Hispanic, Asian; Parent Educational Status - Graduate high school and some college, Graduate college; School Status - Public School; Business Education Status - Business Education.


Parent educational status with $\beta = 0.320, t = 13.36, and p < .001$ suggests that students whose either parent was college graduate tended to have higher social studies achievement than students whose either parent was not college graduate. The variable public school student with $\beta = -0.129, t = -3.86, and p < .001$ suggests that public school students tended to have lower social studies achievement than the private school students’ achievement.
The variable business education student with $\beta = -0.012$ suggests that business education students tended to have lower social studies achievement than their non-business counterparts. However, the variable business education students ($t = -0.66, p = 0.515$) can be excluded from the model since it was not statistically significant.

**Regression Analysis for Science GPA Scores**

For descriptive purposes, two way correlations between factors used as independent variables in the regression and the science GPA scores are presented in Table 34.

Table 34. Relationship between science GPA and selected demographic characteristics for high school seniors for NAEP High School Transcript Study 2005 in the U.S.

<table>
<thead>
<tr>
<th>Factors</th>
<th>$r$</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age</td>
<td>-0.067</td>
</tr>
<tr>
<td>Male</td>
<td>-0.119</td>
</tr>
<tr>
<td>Ethnicity – White</td>
<td>0.177</td>
</tr>
<tr>
<td>Ethnicity – African American</td>
<td>-0.181</td>
</tr>
<tr>
<td>Ethnicity – Hispanic</td>
<td>-0.097</td>
</tr>
<tr>
<td>Ethnicity – Asian</td>
<td>0.057</td>
</tr>
<tr>
<td>*Ethnicity – American Indian</td>
<td>-0.023</td>
</tr>
<tr>
<td>Either parent college graduate</td>
<td>0.192</td>
</tr>
<tr>
<td>Public school</td>
<td>-0.083</td>
</tr>
<tr>
<td>Business education</td>
<td>-0.045</td>
</tr>
</tbody>
</table>

*Note. Note. *Variable has a small correlation with the dependent variable and was not incorporated into model 1 and 2.*


Analysis of the Pearson product-moment correlations of the science GPA revealed that the independent variable ethnicity – American Indian ($r = -0.023$), was not correlated with the dependent variable at or below the 0.05 level; therefore, it was not included in the MRA. The Pearson product-moment correlations revealed that the variable parent educational status – Either parent college graduate ($r = .192$) was most highly correlated with the independent variable.
For model 1, the predictor values were entered into the MRA as a block. Age, gender, ethnicity, parent educational status, and school status were all entered into the MRA because they each had correlations at or above 0.05. The probability of $F$ to enter the equation was set at .05. For model 2, business education student was added as predictor value.

Table 35 presents the results of the multiple regression analysis. Model 1 explained 10.0% ($R = 0.316, R^2 = .100$) of the variance in the achievement of science. These five variables explained 8.9% of the variance in the dependent variable science GPA scores. For model 2, the variable business education student was entered into the model. The inclusion of this variable did not add any additional explanation of variance in the dependent variable. Model 1 was chosen since the inclusion of business education student did not add statistically significant amount of explained variance.

Table 35. Comparison models for the multiple regression analysis of the science GPA scores for high school seniors for NAEP High School Transcript Study 2005 in the U.S.

<table>
<thead>
<tr>
<th>Model</th>
<th>$R$</th>
<th>$R^2$</th>
<th>$F$ Value Change</th>
<th>$p(F &gt; f)$ Change</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>.316</td>
<td>.100</td>
<td>78.30</td>
<td>&lt;.001</td>
</tr>
<tr>
<td>2</td>
<td>.316</td>
<td>.100</td>
<td>69.85</td>
<td>&lt;.001</td>
</tr>
</tbody>
</table>

Note. $^a$Model 1 includes age, gender, ethnicity, parent educational status and public school student as independent variables. Science GPA score is the dependent variable. $^b$Model 2 includes age, gender, ethnicity, parent educational status public school student, and business education student as independent variables. Science GPA score is the dependent variable. Model 1 was chosen since the inclusion of business education student in the multiple regression analysis did not add a statistically significant amount of explained variance in science GPA scores.


Results of the MRA presented in Table 35 demonstrates that the independent variables of age, gender, ethnicity, parent educational status and private school student or public school
student, and business education student or non-business student explained a significant portion of the variance of the science GPA scores. The following standards for interpretation of effect size developed by Cohen (1988) were utilized to interpret the results of the MRA: $R^2$ greater than .02 = small effect size; $R^2$ greater than .13 = moderate effect size, and $R^2$ greater than .26 large effect size. The results of the MRA revealed that the total model ($R^2=.10$) has a close to moderate effect size according to Cohen’s (1988) guidelines.

Table 36 presents coefficients for the variables included in the regression analysis of the Science GPA. A review of beta weights in Table 36 specifies that seven variables significantly contributed to the model. The variable age with $\beta=-0.246$, $t=-3.36$, and $p=.001$ suggests that older students tended to have lower on overall science GPA. The variable gender with $\beta=-0.209$, $t=-17.52$, and $p<.001$ suggests that male students tended to achieve lower scores on the science GPA than females.

The variable ethnicity African American with $\beta=-0.218$, $t=-3.49$, and $p=0.001$ suggests that African American students tended to have lower science achievement than their non-African American counterparts. The variable ethnicity Hispanic ($t=-0.084$, $p=0.933$) can be excluded from the model since it was not statistically significant.

Parent educational status with $\beta=0.326$, $t=10.06$, and $p<.001$ suggests that students whose either parent was college graduate tended to have higher science achievement than students whose either parent was not college graduate. The variable public school student with $\beta=-0.097$, $t=-2.47$, and $p=0.019$ suggests that public school students tended to have lower science achievement than the private school students’ achievement.

The variable business education student with $\beta=-0.024$ suggests that business education students tended to have lower social studies achievement than their non-business counterparts.
However, the variable business education students \((t = -1.15, p = 0.254)\) can be excluded from the model since it was not statistically significant.

Table 36. Coefficients for the variables included in the regression analysis of the science GPA for high school seniors for NAEP High School Transcript Study 2005 in the U.S.

<table>
<thead>
<tr>
<th>Model</th>
<th>Coefficients</th>
<th>(t)</th>
<th>(p &gt; t)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Model</strong></td>
<td><strong>Coefficients</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>(\beta)</strong></td>
<td><strong>SD</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Constant</td>
<td>3.104</td>
<td>0.170</td>
<td>18.266</td>
</tr>
<tr>
<td>Age</td>
<td>-0.027</td>
<td>0.008</td>
<td>-3.360</td>
</tr>
<tr>
<td>Male</td>
<td>-0.209</td>
<td>0.012</td>
<td>-17.517</td>
</tr>
<tr>
<td>Ethnicity – White</td>
<td>0.202</td>
<td>0.058</td>
<td>3.503</td>
</tr>
<tr>
<td>Ethnicity – African American</td>
<td>-0.218</td>
<td>0.062</td>
<td>-3.487</td>
</tr>
<tr>
<td>Ethnicity – Hispanic</td>
<td>0.005</td>
<td>0.061</td>
<td>0.084</td>
</tr>
<tr>
<td>Ethnicity – Asian</td>
<td>0.308</td>
<td>0.068</td>
<td>4.529</td>
</tr>
<tr>
<td>Either parent college graduate</td>
<td>0.326</td>
<td>0.032</td>
<td>10.055</td>
</tr>
<tr>
<td>Public school</td>
<td>-0.097</td>
<td>0.040</td>
<td>-2.407</td>
</tr>
<tr>
<td>Business education</td>
<td>-0.024</td>
<td>0.021</td>
<td>-1.152</td>
</tr>
</tbody>
</table>

Note. Variables entered into the model 2: Gender - male; Ethnicity - White, African American, Hispanic, Asian; Parent Educational Status - Graduate high school and some college, Graduate college; School Status - Public School; Business Education Status - Business Education.

CHAPTER 5

SUMMARY, CONCLUSIONS AND RECOMMENDATIONS

Summary

Statement of the Problem

The research problem of this study was “What is the achievement of business education high school students as measured by GPA in high school core subjects (mathematics, English, social studies, and science)?”

Purpose and Objectives of the Study

The specific research objectives explored in the study were:

1. To describe the graduating high school students in the U.S on the following characteristics: age, gender, ethnicity, socioeconomic status as measured by parent educational status, private school student or public school student status, and business education student or non business education student status.

2. To describe the academic achievement of graduating high school students in the U.S. as measured by their GPA in mathematics, English, social studies, and science.

3. To compare the academic achievement of graduating high school students in the U.S. based on whether or not they are identified as a business education student as measured by their GPAs in mathematics, English, social studies, and science.

4. To determine if differences exist in academic achievement of graduating high school students based on their personal demographic characteristics that is age, gender, ethnicity, parent educational status, and private school student or public school student status as measured by their GPA scores in mathematics, English, social studies and science.
5. To determine if selected variables explain significant portions of the variance in high school student achievement as measured by GPA scores in the mathematics, English, social studies, and science. The variables used as potential explanatory variables in these analyses were: age, gender, ethnicity, socioeconomic status as measured by parent educational status, private school student or public school student status, and business education student or non business education student status.

**Method**

The target population for this study is all public and private high school students in the U.S. The frame for this study is defined as all students enrolled in public and private high schools in the U.S. All public and private high schools in the United States with one or more graduates in 2005 were eligible for NAEP HSTS 2005. The accessible population is defined as all graduating high school students enrolled in public and private high schools in the U.S in 2005 and had valid scores in the database of NAEP. The subjects for this study were the samples of the defined accessible population.

Data for this study were collected from an archival data source, developed by IES. Permission was sought to acquire a copy of the information needed to accomplish the objectives of the study by contacting the IES.

The data for research objective 1 was analyzed using descriptive statistics to describe respondents on their demographic characteristics. The statistics used were mean, standard deviation, minimum, maximum, frequency, and percent.

The data for research objective 2 was analyzed using descriptive statistics to describe respondents’ achievement as measured by their GPA on mathematics, English, social studies, and science.
The data for objective 3 was analyzed using comparative statistics to compare the achievement of business education students with that of non-business education students by their GPA on mathematics, English, social studies, and science. The researcher utilized t-test procedures with an alpha level set a’ priori at 0.05. Cohen’s d was computed to measure effect size and interpreted using Cohen’s (1988) effect size descriptors for two independent groups.

The data for objective 4 was analyzed using comparative statistics to compare the students’ achievement by their demographic characteristics – age, gender, ethnicity, parent educational status and public or private school students. The researcher utilized t-test procedures with an alpha level set a’ priori at 0.05. Cohen’s d was computed to measure effect size and interpreted using Cohen’s (1988) effect size descriptors for two independent groups.

The data for objective 5 was analyzed using multiple regression analysis to determine if selected variables explain significant portions of variance in achievement as measured by GPA scores on mathematics, English, social studies, and science. The predictor variables were age, grade, ethnicity, parent educational status, and whether or not they were identified as a business education student. The dependent variable was student GPA scores on mathematics, English, social studies, and science. The alpha level was set a’ priori at 0.05. Cohen’s d was computed to measure effect size and interpreted using Cohen’s (1988) effect size descriptors. The researcher followed the standards developed by Cohen (1988) for interpreting effect size in multiple regression analysis.

Findings

Research Objective 1

Age. The mean age of the graduating students was 18.41 years of age. The youngest student was 15.75 years and the oldest was 28.5 years of age. The largest number of respondents were in the age group of 17 - 18 years (n = 21,951, 91.7%). The second largest group was the 19
- 20 age group, with 1,460 (6.1%) of the respondents indicating their age in this group. The smallest number of respondents were in the age group of 21 years and above (n = 431, 1.8%).

**Gender.** There were (n = 12,591, 52.6%) females compared to (n = 11,347, 47.4%) males drawn from the samples. Table 6 illustrates the data regarding gender of the respondents.

**Ethnicity.** A total of five ethnic groups were represented from the samples. The largest group by ethnicity was White (n = 16,685, 69.7%) and the second largest was African-Americans (n = 3,040, 12.7%), followed by Hispanic (n = 2,749, 11.4%), Asian (n = 1,125, 4.7%) and American Indian (n = 192, 0.8%). There were 167 respondents (.07%) who either refused to provide information regarding their ethnicity, their ethnicity could not be determined, or the system did not recognize their ethnicity. Table 7 illustrates the data regarding ethnicity of the respondents.

**Parent Educational Status.** Students were also described by the variable socioeconomic status. This variable was measured by parent educational status. The largest group of respondent (n = 7,739, 50.1 %) has either parent who graduated from college. The second largest group has either parent graduated from high school and with some college education (n = 6,657, 43.1%). The third largest group has neither parent graduated from high school (n = 1,050, 6.8%). There were 8,492 respondents whose parental educational status was unknown. The results should be read with caution as there were 8,492 respondents whose parent educational statuses were unknown. Table 8 illustrates the data with regards to their parental highest educational status.

**Public or Private Schools Student.** There were (n = 21,448, 89.6%) students attended public schools compared to (n = 2,490, 10.4%) students attended private schools.

**Business Education or Non-Business Student Status.** The students were categorized whether or not students were identified as a business education student or non-business education student. Students who have accumulated at least two Carnegie units in business
subjects were defined as a business education student. There were \( n = 4,189, 17.5\% \) students who were identified as business education students while \( n = 19,749, 82.5\% \) students were identified as non-business education students.

**Research Objective 2**

**Mathematics Achievement.** There were 23,930 valid mathematic GPA scores in the data set. The highest possible GPA on mathematics was 4.000. The lowest possible scaled score was 0.330. The mean GPA score of all students on mathematics was 2.655. Students with GPA less than 2.000 accounted for \( n = 4,164, 17.4\% \) of respondents. There were \( n = 10,864, 45.4\% \) students who had GPA between 2.000 to 2.999 and \( n = 8,902, 37.2\% \) students who had GPA 3.000 or greater.

**English Achievement.** The next scores examined in the data analysis were the GPA for English. There were 23,933 valid English GPA scores in the data set. The highest GPA score on English was 4.000. The lowest GPA score was 0.560. The mean GPA score of all students on English was 2.856. Students with GPA less than 2.000 accounted for \( n = 2,848, 11.9\% \) of respondents. There were \( n = 9,454, 39.5\% \) students who had GPA between 2.000 to 2.999 and \( n = 11,631, 48.6\% \) students who had GPA 3.000 or greater.

**Social Studies Achievement.** There were 23,935 valid social studies GPA scores in the data set. The highest possible GPA on social studies was 4.000. The lowest possible scaled score was 0.500. The mean GPA score of all students on social studies was 2.921. Students with GPA less than 2.000 accounted for \( n = 2,537, 10.6\% \) of respondents. There were \( n = 8,904, 37.2\% \) students who had GPA between 2.000 to 2.999 and \( n = 12,494, 52.2\% \) students who had GPA 3.000 or greater.

**Science Achievement.** There were 23,914 valid science GPA scores in the data set. The highest possible GPA on science was 4.000. The lowest possible scaled score was 0.250. The
mean GPA score of all students on science was 2.722. Students with GPA less than 2.00 accounted for \((n = 3,611, 15.1\%)\) of respondents. There were \((n = 10,259, 42.9\%)\) students who had GPA between 2.000 to 2.999 and \((n = 10,044, 42.0\%)\) students who had GPA 3.000 or greater.

**Research Objective 3**

**Comparison of Achievement on the Mathematics GPA.** For mathematics, non business education students had a statistically significantly \(t\)-test \((t = 6.55)\) for higher mean GPA score \((m = 2.673)\) than business education students \((m = 2.569)\). Although statistical differences existed between the GPAs of non business education students and business education students, Cohen’s \(d\) \((d = 0.14)\) revealed a small effect size.

**Comparison of Achievement on the English GPA.** For English, non business education students had a statistically significantly \(t\)-test \((t = 4.59)\) for higher mean GPA score \((m = 2.869)\) than business education students \((m = 2.791)\). Although statistical differences existed between the GPAs of non business education students and business education students, Cohen’s \(d\) \((d = 0.11)\) revealed a small effect size.

**Comparison of Achievement on the Social Studies GPA.** For social studies, non business education students had a statistically significantly \(t\)-test \((t = 4.03)\) for higher mean GPA score \((m = 2.932)\) than business education students \((m = 2.866)\). Although statistical differences existed between the GPAs of non business education students and business education students, Cohen’s \(d\) \((d = 0.09)\) revealed a small effect size.

**Comparison of Achievement on the Science GPA.** For science, non business education students had a statistically significantly \(t\)-test \((t = 6.47)\) for higher mean GPA score \((m = 2.740)\) than business education students \((m = 2.638)\). Although statistical differences existed between
the GPAs of non business education students and business education students, Cohen’s $d (d = 0.13)$ revealed a small effect size.

**Research Objective 4**

**Comparison of Achievement Based on Age.** Comparisons for differences in the mean GPA scores and the variable age were made following collapse and recoding of the levels of age group into “Below 19” and “19 and above” categories. This maneuver was performed in an effort to reduce the danger of achieving spurious results after descriptive statistics revealed that the other age group categories had much lesser. There were $(n = 22,047, 92.1\%)$ students who were in the age group “below 19” and $(n = 1,891, 7.9\%)$ students were in the age group “19 and above”.

Independent $t$-test analysis revealed “Below 19” age group students had higher GPA scores on all four subjects than the scores of “19 and above” age group students. For mathematics, “Below 19” students had a statistically significantly $t$-test ($t = 15.37$) for higher mean GPA score ($m = 2.679$) than “19 and above” students ($m = 2.375$). The statistical differences existed between the GPAs of “Below 19” students and “19 and above” students revealed an effect size Cohen’s $d (d = 0.41)$ which represents close to moderate effect size. For English, “Below 19” students had a statistically significantly $t$-test ($t = 16.47$) for higher mean GPA score ($m = 2.886$) than “19 and above” students ($m = 2.503$). The statistical differences existed between the GPAs of “Below 19” students and “19 and above” students revealed an effect size Cohen’s $d (d = 0.53)$ which corresponds to moderate effect size.

For social studies, “Below 19” students had a statistically significantly $t$-test ($t = 14.99$) for higher mean GPA score ($m = 2.952$) than “19 and above” students ($m = 2.549$). The statistical differences existed between the GPAs of “Below 19” students and “19 and above” students revealed an effect size Cohen’s $d (d = 0.56)$ which corresponds to moderate effect size.
For science, “Below 19” students had a statistically significantly $t$-test ($t = 14.51$) for higher mean GPA score ($m = 2.751$) than “19 and above” students ($m = 2.389$). The statistical differences existed between the GPAs of “Below 19” students and “19 and above” students revealed an effect size Cohen’s $d$ ($d = 0.48$) which corresponds to small effect size.

**Comparison of Achievement Based on Gender.** Independent $t$-test analysis revealed female students had higher GPA scores on all four subjects than their male counterparts. For mathematics, female students had a statistically significantly $t$-test ($t = 15.06$) for higher mean GPA score ($m = 2.740$) than male students ($m = 2.561$). Although statistical differences existed between the GPAs of female students and male students, Cohen’s $d$ ($d = 0.24$) revealed a small effect size. For English, female students had a statistically significantly $t$-test ($t = 36.71$) for higher mean GPA score ($m = 3.023$) than male students ($m = 2.670$). The statistical differences existed between the GPAs of female students and male students revealed an effect size Cohen’s $d$ ($d = 0.52$) which to moderate effect size. For social studies, female students had a statistically significantly $t$-test ($t = 21.63$) for higher mean GPA score ($m = 3.030$) than male students ($m = 2.670$). The statistical differences existed between the GPAs of female students and male students revealed an effect size Cohen’s $d$ ($d = 0.33$) which corresponds to small effect size. For science, female students had a statistically significantly $t$-test ($t = 17.09$) for higher mean GPA score ($m = 2.813$) than male students ($m = 2.622$). Although statistical differences existed between the GPAs of female students and male students, Cohen’s $d$ ($d = 0.26$) revealed a small effect.

**Comparison of Achievement Based on Ethnicity.** Comparisons for differences in the mean GPA scores and the variable ethnicity were made following collapse and recoding of the levels of ethnic background into “White” and “Non-White” categories. This maneuver was performed in an effort to reduce the danger of achieving spurious results after descriptive
statistics revealed that the other ethnic variable categories “Asian,” and “American Indian” had much lesser respondents as compared with “White.”

Independent t-test analysis revealed “White” students had higher GPA scores on all four subjects than the scores of “Non White” students. For mathematics, “White” students had a statistically significantly t-test \( t = 15.03 \) for higher mean GPA score \( m = 2.728 \) than “Non White” students \( m = 2.485 \). The statistical differences existed between the GPAs of “White” students and “Non White” students revealed an effect size Cohen’s \( d \) \( d = 0.32 \) which corresponds to small effect size.

For English, “White” students had a statistically significantly t-test \( t = 17.82 \) for higher mean GPA score \( m = 2.930 \) than “Non White” students \( m = 2.684 \). The statistical differences existed between the GPAs of “White” students and “Non White” students revealed an effect size Cohen’s \( d \) \( d = 0.34 \) which corresponds to small effect size. For social studies, “White” students had a statistically significantly t-test \( t = 20.09 \) for higher mean GPA score \( m = 3.004 \) than “Non White” students \( m = 2.728 \). The statistical differences existed between the GPAs of “White” students and “Non White” students revealed an effect size Cohen’s \( d \) \( d = 0.38 \) which corresponds to small effect size. For science, “White” students had a statistically significantly t-test \( t = 17.96 \) for higher mean GPA score \( m = 2.810 \) than “Non White” students \( m = 2.520 \). The statistical differences existed between the GPAs of “White” students and “Non White” students revealed an effect size Cohen’s \( d \) \( d = 0.38 \) which corresponds to small effect size.

**Comparison of Achievement Based on Parent Educational Status.** The educational status of respondents’ parents was examined. Respondents were asked to identify the educational status of their parents by choosing one of three categories for both the mothers’ educational status and the fathers’ educational status: “did not complete high school,” “completed high school or/and some college but no degree,” and “earned a bachelor’s degree.” These categories
were collapsed and recoded into the dichotomy of “Either Parent College Graduate” and “Neither Parent College Graduate,” which included the other already mentioned categories. There were \((n = 7,738, 50.1\%)\) students who had either parent college graduate and \((n = 7,708, 49.9\%)\) students who had neither parent college graduate.

Independent \(t\)-test analysis revealed “Either Parent College Graduate” students had higher GPA scores on all four subjects than the scores of “Neither Parent College Graduate.” For mathematics, “Either Parent College Graduate” students had a statistically significantly \(t\)-test \((t = 16.38)\) for higher mean GPA score \((m = 2.806)\) than “Neither Parent College Graduate” students \((m = 2.558)\). The statistical differences existed between the GPAs of “Either Parent College Graduate” students and “Neither Parent College Graduate” students revealed an effect size Cohen’s \(d\) \((d = 0.34)\) which corresponds to small effect size. For English, “Either Parent College Graduate” students had a statistically significantly \(t\)-test \((t = 19.70)\) for higher mean GPA score \((m = 3.015)\) than “Neither Parent College Graduate” students \((m = 2.736)\). The statistical differences existed between the GPAs of “Either Parent College Graduate” students and “Neither Parent College Graduate” students revealed an effect size Cohen’s \(d\) \((d = 0.39)\) which corresponds to small effect size.

For social studies, “Either Parent College Graduate” students had a statistically significantly \(t\)-test \((t = 19.47)\) for higher mean GPA score \((m = 3.093)\) than “Neither Parent College Graduate” students \((m = 2.818)\). The statistical differences existed between the GPAs of “Either Parent College Graduate” students and “Neither Parent College Graduate” students revealed an effect size Cohen’s \(d\) \((d = 0.38)\) which corresponds to small effect size. For science, “Either Parent College Graduate” students had a statistically significantly \(t\)-test \((t = 16.93)\) for higher mean GPA score \((m = 2.893)\) than “Neither Parent College Graduate” students \((m = 2.603)\). The statistical differences existed between the GPAs of “Either Parent College
Graduate” students and “Neither Parent College Graduate” students revealed an effect size Cohen’s $d (d = 0.39)$ which corresponds to small effect size.

**Comparison of Achievement Based on Private or Public School Status.** Independent $t$-test analysis revealed private students had higher GPA scores on all four subjects than their public counterparts. For mathematics, private school students had a statistically significantly $t$-test ($t = 6.23$) for higher mean GPA score ($m = 2.875$) than public students ($m = 2.629$). The statistical differences existed between the GPAs of private school students and public school students, Cohen’s $d (d = 0.33)$ which corresponds to small effect size. For English, private students had a statistically significantly $t$-test ($t = 5.19$) for higher mean GPA score ($m = 3.028$) than public students ($m = 2.836$). The statistical differences existed between the GPAs of private school students and public school students, Cohen’s $d (d = 0.30)$ which corresponds to small effect size.

For social studies, private students had a statistically significantly $t$-test ($t = 6.64$) for higher mean GPA score ($m = 3.118$) than public students ($m = 2.898$). Although statistical differences existed between the GPAs of private students and public students, Cohen’s $d (d = 0.26)$ revealed a small effect size. For science, private students had a statistically significantly $t$-test ($t = 5.43$) for higher mean GPA score ($m = 2.928$) than public students ($m = 2.699$). The statistical differences existed between the GPAs of private school students and public school students, Cohen’s $d (d = 0.30)$ which corresponds to small effect size.

**Research Objective 5**

**Regression Analysis for Mathematics GPA Scores.** The MRA for the mathematics GPA score revealed a significant model containing five independent variables. The variables age, gender, ethnicity, parent educational status and business education student or non-business education student combined to explain 9.0% ($R^2 = 0.09$) of the variance in the dependent
variable, mathematics GPA score \( (F = 95.52, \ p < .001) \). The results of this model revealed a close to moderate effect size according to Cohen’s (1988) guidelines. The variable business education student contributed an additional 0.10% of the explained variance in the dependent variable. While this was statistically significant, it had a small effect size.

**Regression Analysis for English GPA Scores.** The MRA for the English GPA score revealed a significant model containing five independent variables. The variables age, gender, ethnicity, parent educational status and business education student or non-business education student combined to explain 14.1\% \( (R^2 = 0.141) \) of the variance in the dependent variable, English GPA score \( (F = 183.46, \ p < .001) \). The results of this model revealed a moderate effect size according to Cohen’s (1988) guidelines. The variable business education student did not contribute additional explained variance in the dependent variable.

**Regression Analysis for Social Studies GPA Scores.** The MRA for the social studies GPA score revealed a significant model containing six independent variables. The variables age, gender, ethnicity, parent educational status and business education student or non-business education student combined to explain 10.7\% \( (R^2 = 0.107) \) of the variance in the dependent variable, social studies GPA score \( (F = 133.46, \ p < .001) \). The results of this model a close to moderate effect size according to Cohen’s (1988) guidelines. The variable business education student did not contribute additional explained variance in the dependent variable.

**Regression Analysis for Science GPA Scores.** The MRA for the science GPA score revealed a significant model containing six independent variables. The variables age, gender, ethnicity, parent educational status and business education student or non-business education student combined to explain 10.0\% \( (R^2 = 0.10) \) of the variance in the dependent variable, science GPA score \( (F = 69.85, \ p < .001) \). The results of this model revealed a close to moderate effect
size according to Cohen’s (1988) guidelines. The variable business education student did not contribute additional explained variance in the dependent variable.

**Conclusions**

**Conclusion 1**

The majority graduating high school students were between 17-18 years old and female. This is based on the finding that graduating high school students in 2005, the age of 91.7% of the students were between 17-18 years and the gender of 52.6% of the students were female.

The majority of graduating high school students was White. The two largest minority groups were African-American and Hispanic. This is based on the finding that of the graduating students in 2005, the ethnicity of 69.7% of the students was White, 12.7% of the students was African-American and 11.7% of the students was Hispanic.

The majority of graduating high school students has either parent graduate from college. This is based on the finding that 50.1% of the students had either parent graduate from college. Most of graduating students attended public schools. This is based on the finding that 89.6% of the students went to public schools.

A moderate number of graduating high school students were identified as business education students. This is based on the finding that 17.5% of the students were identified as business education students.

**Conclusion 2**

Most students had better than C grade in mathematics. This conclusion is based on the finding that 19,766 (82.6%) students had GPA 2.000 and above. Conversely, 4,164 (17.4%) had lower than C grade or GPA less than 2.000. For English, most students had better than C grade. This conclusion is based on the finding that 21,085 (88.1%) students had GPA 2.000 and above.
Conversely, 2,848 (11.9%) had lower than C grade or GPA less than 2.000. For social studies, most students had better than C grade. This conclusion is based on the finding that 21,398 (89.4%) students had GPA 2.000 and above. Conversely, 2,537 (10.6%) had lower than C grade or GPA less than 2.000. For science, most students had better than C grade. This conclusion is based on the finding that 20,303 (84.9%) students had GPA 2.000 and above. Conversely, 3,611 (15.1%) had lower than C grade or GPA less than 2.000.

**Conclusion 3**

Business education students had a statistically significant lower GPA score than non-business education students on the mathematic GPA. This conclusion is based on the finding that the mean difference with statistical significance ($t = 6.55$, $p < 0.001$) was found between the two groups and Cohen’s $d$ ($d = 0.14$) revealed a small effect size.

Business education students had a statistically significant lower GPA score than non-business education students on the English GPA. This conclusion is based on the finding that the mean difference with statistical significance ($t = 4.59$, $p < 0.001$) was found between the two groups and Cohen’s $d$ ($d = 0.11$) revealed a small effect size.

Business education students had a statistically significant lower GPA score than non-business education students on the social studies GPA. This conclusion is based on the finding that the mean difference with statistical significance ($t = 4.03$, $p < 0.001$) was found between the two groups and Cohen’s $d$ ($d = 0.09$) revealed a small effect size.

Business education students had a statistically significant lower GPA score than non-business education students on the science GPA. This conclusion is based on the finding that the mean difference with statistical significance ($t = 6.47$, $p < 0.001$) was found between the two groups and Cohen’s $d$ ($d = 0.13$) revealed a small effect size.
Conclusion 4

“Below 19” age group students had higher GPA scores on all four subjects than the scores of “19 and above” age group students. This result is consistent with Coleman, et al. (1966) and White's (1982) studies, which showed that as students become older, the correlation between age and school achievement diminishes. “Below 19” students had a higher GPA score than “19 and above” students on the mathematic GPA. This conclusion is based on the finding that the mean difference with statistical significance ($t = 15.37, p <0.001$) was found between the two groups and Cohen’s $d$ ($d = 0.41$) revealed a small effect size. For English, “Below 19” students had a higher GPA score than “19 and above” students. This conclusion is based on the finding that the mean difference with statistical significance ($t = 16.47, p <0.001$) was found between the two groups and Cohen’s $d$ ($d = 0.53$) revealed a moderate effect size. For social studies, “Below 19” students had a higher GPA score than “19 and above” students. This conclusion is based on the finding that the mean difference with statistical significance ($t = 14.99, p <0.001$) was found between the two groups and Cohen’s $d$ ($d = 0.56$) revealed a moderate effect size. For science, “Below 19” students had a higher GPA score than “19 and above” students. This conclusion is based on the finding that the mean difference with statistical significance ($t = 14.51, p <0.001$) was found between the two groups and Cohen’s $d$ ($d = 0.48$) revealed a small effect size.

Female students had higher GPA scores on all four subjects than their male counterparts. For mathematics, female students had a higher GPA score than male students. This conclusion is based on the finding that the mean difference with statistical significance ($t = 15.06, p <0.001$) was found between the two groups and Cohen’s $d$ ($d = 0.24$) revealed a small effect size. For English, female students had a higher GPA score than male students. This conclusion is based on the finding that the mean difference with statistical significance ($t = 36.71, p <0.001$) was found between the two groups and Cohen’s $d$ ($d = 0.52$) revealed a moderate effect size. For
social studies, female students had a higher GPA score than male students. This conclusion is based on the finding that the mean difference with statistical significance \((t = 21.63, p < 0.001)\) was found between the two groups and Cohen’s \(d = 0.33\) revealed a small effect size. For science, female students had a higher GPA score than male students. This conclusion is based on the finding that the mean difference with statistical significance \((t = 17.09, p < 0.001)\) was found between the two groups and Cohen’s \(d = 0.26\) revealed a small effect size. However, this result contradicted with DeBaz’s (1994) who found a significant gender effect favoring males in overall science achievement.

“White” students had higher GPA scores on all four subjects than the scores of “Non White” students. This result is consistent with (Lareau, 2002; Stanton-Salazar, 2001, Walker & Satterwhite’s, 2002, Garibaldi, 1997; and Mannan, Charleston, & Saghafi, 1986) studies. For mathematics, “White” students had a higher GPA score than “Non White” students. This conclusion is based on the finding that the mean difference with statistical significance \((t = 15.03, p < 0.001)\) was found between the two groups and Cohen’s \(d = 0.32\) revealed a small effect size. For English, “White” students had a higher GPA score than “Non White” students. This conclusion is based on the finding that the mean difference with statistical significance \((t = 17.82, p < 0.001)\) was found between the two groups and Cohen’s \(d = 0.34\) revealed a small effect size. For social studies, “White” students had a higher GPA score than “Non White” students. This conclusion is based on the finding that the mean difference with statistical significance \((t = 20.09, p < 0.001)\) was found between the two groups and Cohen’s \(d = 0.38\) revealed a small effect size. For science, “White” students had a higher GPA score than “Non White” students. This conclusion is based on the finding that the mean difference with statistical significance \((t = 17.96, p < 0.001)\) was found between the two groups and Cohen’s \(d = 0.38\) revealed a small effect size.
“Either Parent College Graduate” students had higher GPA scores on all four subjects than the scores of “Neither Parent College Graduate” students. This result is consistent with Campbell, Hombo, and Mazzeo (1999) study which indicated that students who reported higher parental education levels tended to have higher average scores. For mathematics, “Either Parent College Graduate” students had a higher GPA score than “Neither Parent College Graduate” students. This conclusion is based on the finding that the mean difference with statistical significance \( t = 16.38, p < 0.001 \) was found between the two groups and Cohen’s \( d (d = 0.34) \) revealed a small effect size. For English, “Either Parent College Graduate” students had a higher GPA score than “Neither Parent College Graduate” students. This conclusion is based on the finding that the mean difference with statistical significance \( t = 19.70, p < 0.001 \) was found between the two groups and Cohen’s \( d (d = 0.39) \) revealed a small effect size. For social studies, “Either Parent College Graduate” students had a higher GPA score than “Neither Parent College Graduate” students. This conclusion is based on the finding that the mean difference with statistical significance \( t = 19.47, p < 0.001 \) was found between the two groups and Cohen’s \( d (d = 0.38) \) revealed a small effect size. For science, “Either Parent College Graduate” students had a higher GPA score than “Neither Parent College Graduate” students. This conclusion is based on the finding that the mean difference with statistical significance \( t = 16.93, p < 0.001 \) was found between the two groups and Cohen’s \( d (d = 0.39) \) revealed a small effect size.

Private students had higher GPA scores on all four subjects than their public counterparts. This result is consistent with the National Assessment of Educational Progress (NAEP) 2000 study, which indicated that private school students performed higher than public school students. For mathematics, private school students had a higher GPA score than public school students. This conclusion is based on the finding that the mean difference with statistical significance \( t = 6.23, p < 0.001 \) was found between the two groups and Cohen’s \( d (d = 0.33) \) revealed a small
effect size. For English, private students had a higher GPA score than public school students. This conclusion is based on the finding that the mean difference with statistical significance ($t = 5.19, p < 0.001$) was found between the two groups and Cohen’s $d$ ($d = 0.30$) revealed a small effect size. For social studies, private students had a higher GPA score than public school students. This conclusion is based on the finding that the mean difference with statistical significance ($t = 6.64, p < 0.001$) was found between the two groups and Cohen’s $d$ ($d = 0.26$) revealed a small effect size. For science, private students had a higher GPA score than public school students. This conclusion is based on the finding that the mean difference with statistical significance ($t = 5.43, p < 0.001$) was found between the two groups and Cohen’s $d$ ($d = 0.30$) revealed a small effect size.

**Conclusion 5**

The predictor variables of age, gender, ethnicity, parent educational status, public school student, and business education student explain a close to moderate portion of the variance in the mathematics GPA. Being enrolled in business education courses does have a statistically significant positive effect on the overall mathematics achievement. However, this should be read with caution since it has a small effect size.

The predictor variables of age, gender, ethnicity, parent educational status, public school student, and business education student explain a moderate portion of the variance in the English GPA. Being enrolled in business education courses does not have a statistically significant positive effect on the overall English achievement.

The predictor variables of age, gender, ethnicity, parent educational status, public school student, and business education student explain a close to moderate portion of the variance in the social studies GPA. Being enrolled in business education courses does not have a statistically significant positive effect on the overall social studies achievement.
The predictor variables of age, gender, ethnicity, parent educational status, public school student, and business education student explain a close to moderate portion of the variance in the science GPA. Being enrolled in business education courses does not have a statistically significant positive effect on the overall science achievement.

In the multiple regression analysis for all dependent variables, the variable age has negative beta (β) values suggests older students tended to have lower academic achievement in mathematics, English, social studies and science. This result is consistent with Coleman et al. (1966) and White's (1982) studies, which showed that as students become older, the correlation between age and school achievement diminishes. The variable gender has negative beta (β) values suggests females tended to achieve higher scores on the mathematics, English, social studies and science GPAs than males. However, this result contradicted with DeBaz’s (1994) who found a significant gender effect favoring males in certain subject. The variable ethnicity African American has negative beta (β) values suggests that African American students tended to have lower academic achievement in mathematics, English, social studies and science than their non-African American counterparts. This supports the findings of numerous other research studies (Lareau, 2002; Stanton-Salazar, 2001, Walker & Satterwhite’s, 2002, Garibaldi, 1997; and Mannan, Charleston, & Saghafi, 1986) that African-American students score lower than non-African American students on standardized tests. The variable parent educational status has positive beta (β) values suggests that students whose either parent has a college degree tended to have higher academic achievement in mathematics, English, social studies and science than the students’ achievement whose either parent was not a college graduate. This result is consistent with Campbell, Hombo, and Mazzeo (1999) study which indicated that students who reported higher parental education levels tended to have higher average scores. The variable public school student has negative beta (β) values suggests that public school students tended to have lower
mathematics, English, social studies and science achievement than the private school students’ achievement. This result is consistent with the National Assessment of Educational Progress (NAEP) 2000 study, which indicated that private school students performed higher than public school students.

This study showed that demographic factors played important role in determining students’ academic achievement. This finding is consistent with the studies done by previous researchers (Coleman, et. al., 1966; Coley, 2001; DeBaz 19944; Lareau, 2002; Stanton-Salazar, 2001).

**Recommendations**

**Recommendation 1**

The researcher recommends that the business education educators, policy makers and counselors make efforts to change the public perceptions toward business education programs. The popular views about career and technical education programs including business education have been: (a) the programs were often targeted primarily to educationally disadvantaged or inferior students; (b) the programs may not appropriate for students aspiring to a four-year college or university since the context of career and technical education often associated for work; and (c) the programs may deter rather than expand students’ future career and educational choices (Catri, 1998; Innerst, 1999; Ries, 1997). Thus, it is imperative to change these perceptions in order to attract a wider range of students. Career and technical education has been an integral part of American high school. Information drawn from previous researches and literature suggests that the major purposes for high school career and technical education are (Lynch, 2000a):

1. Providing career exploration and planning
2. Enhancing academic achievement and motivation to learn more
3. Acquiring generic work competencies and skills useful for employment

4. Establishing pathways for continuing education and lifelong learning

In addition, advanced placement (AP) and dual-enrollment courses that provide college credit such as economics, accounting, management, and marketing should be made available to students. These courses will attract college-bound students and they are expected to continue to expand in the future. However, AP and dual enrollment courses may involve planning and implementing articulation agreements with local colleges and may necessitate additional credentialing for high school business educators (Rader & Meggison, 2007).

**Recommendation 2**

The researcher recommends that the state education leaders and policy makers and counselors to examine the effectiveness of their present business education teachers. The result of the study found that the achievement of business education students was not as high as the achievement of non business education students. May be one of the potential explanation is the performance of business education teachers. For example, with the issue of training, the business education teachers should be properly trained just like teachers for other important subjects such as mathematics and English. The teachers should be knowledgeable in their subject matter, while reinforcing basic math, reading, vocabulary, and other important skills. In addition, business education teachers need to have an effective and motivational teaching method so that they can make their students want to learn more and become interested in business, possibly as a career choice or leave with skills that the student can use no matter what career choice they make.

In 1996 and 1997, several groups converged in their thinking about preparing the teachers for 21st Century career and technical education programs. Lynch (1997) summarized these discussion groups, reports and conferences according to the following reform themes:
1. Increase the supply and academic quality of those entering the career and technical education teaching force.

2. Set high standards for teacher education programs.

3. Improve the academic preparation of career and technical teachers.


5. Collaborate with schools, social service agencies, businesses and industries, communities, and other learning environments for educational purposes.

6. Increase funding for career and technical teacher education

There are numerous formal training in business education, business teacher education as a major at the four-year college or university and departments, including colleges of business, colleges of education, colleges of technology, and other educational units. Business teacher education programs at the undergraduate level normally are a hybrid of general education requirements, the business core, and education courses required for state licensure or certification, including student teaching (Rader & Meggison, 2007).

**Recommendation 3**

The researcher recommends that school counselors and administrators need to educate and promote to high school students about the academic benefits of business education. For example, counselors should be aware of the topics addressed in business education courses, and how they benefit student achievement. A comprehensive career counseling programs at schools would normally promote self knowledge, exploration, career planning, and self-advocacy skill attainment needed for a time when career planning should be individually defined (Feller, 1996). This led to school counselors and school counseling programs play key roles “as schools will need to prepare students who can successfully transition to the next level, whether it is a college or university, a community college, a technical institution, or a job. Students eventually need to
have the skills and competencies required for the option they choose.” (Hughey & Hughey, 1999, p. 207).

**Recommendation 4**

The researcher recommends that the state education leaders and policy makers should make financial literacy, one of business education courses, a required subject for graduating high schools students. Studies found that most of high school graduates left without a basic understanding of money and money management, credits, interest rates, spending, saving and investing. A survey conducted for the National Council on Economic Education, 2005 indicated that nearly all U.S. high schools and working-age adults have deficient financial knowledge. The objective of this mandate is to equip students with practical financial decision-making skills that would be useful in their adult lives. Early exposure to financial concepts may increase comfort and familiarity with financial matters (Bernheim, Garret, & Maki, 2001).

**Recommendation 5**

The researcher recommends that further research studies could be conducted in the following areas:

a. The impact of high school career and technical education programs especially in the business education programs on occupational success and advancement after high school and identify links between high school course takings with employment outcomes.

b. Gender differences on high school achievements. This study concluded that female students tend to do better than their male counterparts in all four core subjects. Some empirical studies found the opposite.

c. The similar study could be done with additional control on students’ intelligence. This can be done by taking into consideration the students’ achievement on their
standardized tests such as LEAP tests in grade 8 or ACTs or other standardized tests.

This effort is to ensure that the business education students and non business educations would have about similar intelligence standards.
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Ries, E. (1997). To V or not to V: For many the word vocational doesn't work. *Techniques* 72(8), 32-36.


APPENDIX A: IRB APPROVAL FORM

Application for Exemption from Institutional Oversight

Unless qualified as meeting the specific criteria for exemption from Institutional Review Board (IRB) oversight, ALL LSU research/projects using living humans as subjects, or samples, or data obtained from humans, directly or indirectly, with or without their consent, must be approved or exempted in advance by the LSU IRB. This form helps the PI determine if a project may be exempted, and is used to request an exemption.

- Applicant, Please fill out the application in its entirety and include the completed application as well as parts A-E, listed below, when submitting to the IRB. Once the application is completed, please submit two copies of the completed application to the IRB Office or to a member of the Human Subjects Screening Committee. Members of this committee can be found at http://www.lsu.edu/screeningmembers.shtml
- A Complete Application Includes All of the Following:
  (A) Two copies of this completed form and two copies of part B thru E.
  (B) A brief project description (adequate to evaluate risks to subjects and to explain your responses to Parts 18 & 2)
  (C) Copies of all instruments to be used.
  (D) If proposal is part of a grant proposal, include a copy of the proposal and all recruitment material.
  (E) The consent form that you will use in the study (see part 3 for more information.)
- Certificate of Completion of Human Subjects Protection Training for all personnel involved in the project, including students who are involved with testing or handling data, unless already on file with the IRB. Training link: (https://phpr.nltraining.com/users/login.php)

1) Principal Investigator: Mohd. Khata Bin Jabor
   Ph: (225) 334-5110   Rank: Graduate Student
   Dept: Human Resource Ed.
   Ph: (225) 578-7844   E-mail: khata.jabor@gmail.com

2) Co-investigators: please include department, rank, phone, and e-mail for each
   If student, please identify and name supervising professor in this space
   Dr. Krisanna Machmets, Associate Professor
   School of Human Resource Education and Workforce Development
   Tel. (225) 578-7844, email: machmets@lsu.edu

3) Project Title: The achievement of business education students on high school core subjects

4) Proposal? (yes or no) No
   If Yes, LSU Proposal Number
   Also, if YES, either
   ○ This application completely matches the scope of work in the grant
   ○ More IRB Applications will be filed later

5) Subject pool (e.g. Psychology students)
   Private and public high school graduating seniors
   *Circle any "vulnerable populations" to be used: (children <18; the mentally impaired, pregnant women, the ages, other).
   Projects with incarcerated persons cannot be exempted.

6) PI Signature
   Date: 12/06/09
   (no per signatures)

**I certify my responses are accurate and complete. If the project scope or design is later changed, I will resubmit for review. I will obtain written approval from the Authorized Representative of all non-LSU institutions in which the study is conducted. I also understand that it is my responsibility to maintain copies of all consent forms at LSU for three years after completion of the study. If I leave LSU before that time the consent forms should be preserved in the Departmental Office.

Screening Committee Action: Exempted
Not Exempted Category/Paragraph #
Reviewer Mathews Signature Date: 12/22/09

Part 1: Determination of "Research" and Potential For Risk

- This section determines whether the project meets the Department of Health and Human Services (HHS) definition of research involving human subjects, and if not, whether it nevertheless presents more than "minimal risk" to human subjects that makes IRB review prudent and necessary.
APPENDIX B: APPROVAL TO USE NAEP HSTS 2005 DATA

-----Original Message-----
From: IESData.Security@ed.gov [mailto:IESData.Security@ed.gov]
Sent: Fri 2/5/2010 8:21 AM
To: Krisanna Machtmes
Cc: neil.russell@ed.gov; marilyn.seastrom@ed.gov; jesse.rine@ed.gov
Subject: Approved- #09110045

License number: 09110045

Dear Krisanna Machtmes,

We have completed our review of your application. Your application has been approved. Keep a copy of this License approval email in your License file. Please reference your License number in any future correspondence.

We will be mailing the data and a copy of your License paperwork to you in the next few business days. Please retain the documents in your License file.

Once you receive the data, please contact the IES Data Security Office for the password that you will need to unencrypt the data. You must secure this password from unauthorized access.

You are licensed for the data you requested in your Formal Request. The data you will receive are on loan for the time period specified in your Formal Request commencing with the date of the NCES Commissioner's signature on the signed License document. Once your License expires, please send the data back to IES and close the License or submit an amendment to renew the License.

Please read and have other project staff read the IES Restricted-use Data Procedures Manual at: http://nces.ed.gov/statprog/rudman/toc.asp. Violations of any of the License or security requirements by any project staff could result in License cancellation.

If during the course of your research you need to add project staff, take staff off of the project, need additional restricted-use data, extend the time period of your License, or need to close your License, please read how to do any of these at: http://nces.ed.gov/statprog/instruct_mod.asp

Any draft reports or other pre-publication documents that use or contain IES restricted-use data must be reviewed by the IES Data Security office prior to their dissemination outside the licensed project staff. Please send these reports to the email address below.

If you have any questions, please contact us.

IES Data Security Office
Department of Education/IES/NCES
1990 K. Street, NW, Room 9060
Washington, DC 20006
202-502-7307

IES Data Security Office <mailto:IESData.Security@ed.gov>
APPENDIX C: CERTIFICATE OF TRAINING COMPLETION TO USE NAEP HSTS DATABASE

This certificate is awarded to

Khata Jabor

on the 24th day of July, 2009.

[Signature]

Director, Data User Training Program

[Name]

[Position]

[Institution]
APPENDIX D: CERTIFICATE OF TRAINING COMPLETION TO USE NAEP DATABASE

This certifies that
Khata Jabor
has satisfactorily completed the training program on the use of the National Assessment of Educational Progress (NAEP) Database.

Emmanuel Sikali, Ph.D.
Director, Data User Training Program

Stuart Kerecuky, Ph.D.
Acting Commissioner, NCEES
If Khata Jabor were asked where he is from, he will proudly answer that he is from Malaysia. He will not hesitate to say he comes from a developing country. He feels fully blessed to be born and raised in Malaysia, a country with vast opportunity and plenty to give. He received his elementary education at Seri Maimon Elementary School in Batu Pahat and Bandar Mas Elementary School in Kota Tinggi, Malaysia and secondary education at English College in Johor Bahru, Malaysia. After completing his high school, he was awarded a highly competitive scholarship from Public Service Department, Malaysia, to further his study at the University of Michigan in Ann Arbor. There, he completed his Bachelor of Arts degree in economics in three years. Right after he finished his bachelor degree, he went to pursue Master of Business Administration at West Virginia University in Morgantown. He successfully completed his M.B.A in 13 months. At the age of 23 he already earned a degree in economics and an M.B.A from reputable universities, which was quite an achievement during that time.

After completing his degrees, Khata Jabor went on to become an economist at an oil and gas company for over five years and had a great experience. As an economist, he conducted comprehensive commercial evaluations of implementing new upstream and downstream petroleum exploitation projects. He also developed and updated financial model for evaluating feasibility of petroleum projects and formulated terms for petroleum exploitation. He presented to the management on the outcome of the feasibility studies on new petroleum projects. However, later he realized that what he really wanted to do was to educate and inspire. For him teaching presents great opportunities to directly reach out to people whom he cares about. He believes that teaching could be part of his life and is not just a job.

Since making the switch in 1997, Khata Jabor has been a faculty member at a large public university in the southern part of Malaysia teaching business and management subjects.
such as entrepreneurship, marketing and business statistics. As a faculty member he prepared materials for lectures such as the notes, modules and presentation slides. He developed and updated course outlines and assessments. He identified and implemented course improvements. He was also an academic advisor for a group of students assigned by the university. He supervised final year students’ projects and monitored student achievement and progress. He served on several departmental and faculty committees and was active in campus activities. As part of his service to the university and community and consultancy and industrial networking, Khata Jabor conducted short courses for general public and organizations in financial literacy, managing debt, entrepreneurship training. Khata Jabor also is an active and avid researcher. His primary research interests are in human resource development, entrepreneurship, technical education, and personal development. He has written articles for academic journals and presented papers at conferences. He welcomes any collaboration in research and training in these areas. In addition to a variety professional and community activities he enjoys reading, jogging, travelling and spending time with friends and family.

In the fall of 2007 Khata Jabor was awarded a scholarship by Ministry of Higher Education of Malaysia to pursue his doctoral degree. He began his doctoral study at the School of Human Resource Education and Workforce Development, Louisiana State University. Since then, he has taken a number of courses ranging from research methodology to human resource development to add his knowledge and hone his skills in teaching, research and training. While working towards his doctorate, Khata Jabor has been appointed as a tutor at LSU’s Cox Communications Academic Center for Student Athletes, tutoring students in statistics, mathematics, and economics. He also has been very fortunate to be a graduate assistant at the School of Human Resource Education and Workforce Development, which has given him
experience in writing papers for academic journals and conferences, conducting professional
development courses for teachers and organizing student career development events.

Khata Jabor was inducted into Phi Kappa Phi National Honor Society and Gamma Sigma
Delta Honor Society. He is a member of American Education Research Association (AERA) and
Association for Career and Technical Education Research (ACTER). He is due to receive the
degree of Doctor of Philosophy in August 2010 commencement, having completed the doctoral
program in 3 years.