The Role of Stanford Achievement Test 10$^{\text{TM}}$ Subtests in Sixth Grade as a Predictor of

Success on ACT's Eighth Grade Explore Exam$^{\text{TM}}$

Jeffrey D. Potts

Liberty University

The Role of Stanford Achievement Test 10^{TM} Subtests in Sixth Grade as a Predictor of

Success on ACT's Eighth Grade Explore Exam^{TM}

by Jeffrey Dale Potts

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APPROVED BY:

Ellen Lowrie Black, Ed.D., Chair   Date

Byron R. Greene, Ed.D., Committee   Date

Andrew T. Alexson, Ed.D., Committee   Date

Scott B. Watson, Ph.D., Chair of Graduate Studies   Date

Abstract

Jeffrey Potts. THE ROLE OF STANFORD ACHIEVEMENT TEST 10[TM] SUBTESTS IN SIXTH GRADE AS A PREDICTOR OF SUCCESS ON ACT'S EIGHTH GRADE EXPLORE EXAM[TM] Under the direction of Dr. Ellen Lowrie Black, School of Education, April, 2011.

The purpose of this study was to determine if there was a predictive correlation between a specific sixth grade achievement test known as the Stanford Achievement Test 10 and the eighth grade college readiness assessment instrument known as the Explore Exam for a group of North Texas students. Following an assessment during sixth grade, via the sixth grade Stanford Achievement Test 10, the sample of 123 students was later administered the Explore Exam during their eighth grade year. A subsequent analysis of the data using the Pearson product-moment correlation coefficient revealed a statistically significant predictive relationship between the respective instruments. The Pearson correlation coefficients ranged from .25 to .69. Multiple linear regression analysis was also completed in order to identify the Stanford Achievement Test 10 subtests that were the most important predictors of performance on the Explore Exam. The R-square values ranged from .32 to .51. The results suggest a predictive relationship between the two instruments in the areas of math, science, English, and reading.

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Chapter One: Introduction

There appear to be two separate discourses in America surrounding student achievement. The first deals with student achievement in terms of state exams in concert with the No Child Left Behind Act of 2001. This legislation mandated that students achieve proficiency on state adopted goals in order to receive federal education funds. The result has been a plethora of politically charged rhetoric over the assessment of these goals by what has become known as *high stakes testing*. The tests are actually a wide array of achievement based assessment instruments that vary by state, and critics maintain that such testing is solely focused on students' receiving a passing mark on questions with debatable value (Tehrani, 2007). The second discourse is the product of educational theorists and practitioners concerned with student learning who devote themselves to sound pedagogical practice regardless of politics. These educators grapple with the question of whether or not the educational goals they pursue are truly preparing their students for college, the workforce, and life in the 21st century.

There is an increasing emphasis on student performance in the American educational environment. As a result, data are generated that demonstrate student aptitude at key benchmarks in a student's educational career. In this study, standardized test data was analyzed for a group of students at the sixth grade level. Subsequently, the same students were evaluated in eighth grade on their first college readiness exam. The analysis and results determined whether a correlation exists between scores on one sixth-grade achievement test and an eighth grade college readiness exam for a population of North Texas students. The ACT Corporation's Explore Exam is the first college readiness

exam available to the nation's K-12 student population from an organization that also offers college admissions testing. As is discussed in detail later, the company continually engages in a correlational statistical study that tracks eighth grade student performance on the Explore Exam and correlates it to the student's ultimate college success. The Stanford Achievement Test 10 is an achievement test that is commonly used among K-12 institutions and has been historically used by states as the compliance component of the No Child Left Behind Act of 2002. The statistical association between these two assessments, as representative of America's larger assessment landscape, may suggest further study is warranted. The association between the tests involves a potential impact on a wide array of areas including curricular decisions, the validity of achievement testing for college preparation, and early intervention for students who lack adequate college preparation. This study specifically contributed in these areas for schools that utilize the sixth grade Stanford Achievement Test 10 and the ACT Corporation's eighth grade Explore Exam for these purposes.

There were four research questions and subsequent hypotheses that were used to accomplish this study. Each question and hypothesis was similar, with the notable difference being the subject matter. For example, what, if any, correlation was there between the 11 sixth grade English scores on the Stanford Achievement Test, and the eighth grade ACT Explore Exam English test scores for a given set of students who were tested in sixth grade and then subsequently tested in eighth grade. The associated null hypothesis was that there is no correlation between any of the 11 sixth grade standardized test strand scores relating to English, and the eighth grade ACT Explore English test

scores. These questions and hypotheses were repeated for the subject tests common to both exams and also includes reading, math, and science.

Background

As a backdrop to today's standardized testing landscape, it was important to review the literature and research that contributed to today's setting. On the heels of the educational reform movements of the 1960s, in 1975 the New York Times published a front page article entitled, "College Entry Test Scores Drop Sharply" (Fiske, 1978). The result was a 2-year national discourse and commission led by the College Board that attempted to surmise the reasons behind the decade long decline in scores as highlighted by the New York Times article.

President Reagan's Secretary of Education, Terrel Bell (1983), released the educational report "A Nation at Risk." This report, according to author Diane Ravitch (2010), was alarming and caused notice among policy makers. Among the findings of the report were accusations that secondary school curricula had been homogenized, diluted, and diffused, no longer having a central purpose (U.S. Department of Education, 1983). As a result, the nation embarked on a quest to identify standards that should be the basis for a quality American educational system. Tensions arose as state standards and national standards came into conflict. Consequently, the nation's focus quickly shifted from foundational educational concepts such as standards, course requirements, and teacher certification standards to student performances on outcome-based tests (Hunt, 2008). By 1995, the only standards that existed were vague state standards that differed from state to state and were largely ignored by educational practitioners at the local level.

On July 1, 2002, President George W. Bush introduced what has become known as the high stakes test by signing into law the No Child Left Behind Act (NCLB). This legislation allowed states to set their own standards and assess programs via their own testing instruments in the fields of math and English. At the heart of the legislation is the connection of government funding to student performance on state assessments.

Since the passage of the No Child Left Behind Act in July 2002, there has been research advancing the merits of standardized testing. This research disproportionately consists of promotional material by companies who administer standardized tests such as the Education Testing Service (2001). Proponents of standardized testing assert that the tests have contributed to high expectations and have thus raised the bar for student performance (McCabe, 2003). According to Linn and Kiplinger (1995), standardized testing has greatly helped answer the call for school reforms through the use of systematized, objective methods for measuring student achievement.

As the political debate persists, the question still remains regarding the connection achievement tests have to college readiness. Past research has attempted to link a number of factors to college success. Such factors include the courses students take in high school and high school grade point averages (Does AP Predict College Success, 2006). The problem is that very little research exists that quantifiably connects the achievement testing phenomenon to college success. This study contributed to the national discourse on standardized testing by offering tangible evidence of the connection that may or may not exist between one K-12 achievement test and one college readiness benchmark assessment instrument among a population of students in one Texas school.

For the purposes of this study, it should be noted that the term *high stakes testing* was reserved for usage when the researcher intends to link the notion of student assessment specifically to compliance with the No Child Left Behind Act of 2002. The term has been used negatively by political detractors of the legislation and as a result has associated negative connotations that are detailed further in a section of the literature review. It was not the purpose of this study to engage in politically charged rhetoric; therefore, the terms *achievement* or *standardized assessments* are used except when discussing the usage of said tests for the purposes of compliance with the No Child Left Behind Act of 2002.

Problem Statement

What should be the goal of K-12 education in America? While this is a somewhat rudimentary question, the answer is not readily apparent when considered in the context of America's educational emphasis. According to the ACT Corporation, less than one in four high school graduates in America were prepared for college entry-level coursework in each of the subjects of math, science, reading, and English. Furthermore, 28% of high school graduates met none of the predetermined benchmarks for college readiness as defined by the ACT Corporation (2010a). This is particularly alarming considering the ACT Corporation is the fastest growing college entrance exam administered in the United States and offers the most in-depth analysis of skills obtained by high school seniors (ACT Corporation, 2010b).

With the passage of the No Child Left Behind Act of 2002, a system of educational accountability was established whereby government funds were issued to states based upon their respective students' performance on annual high stakes testing.

Subsequently, states have increasingly begun to create their own high stakes instruments. The inevitable questions arose surrounding the purpose of the state-constructed assessment instrument. While seven states—Colorado, Illinois, Kentucky, Michigan, North Dakota, Tennessee, and Wyoming—have adopted the ACT Exam as their graduation exam and may appear to be committed to college readiness, some states appear to be most interested in crafting exams that allow more students to achieve acceptable scores to allow the schools to qualify for No Child Left Behind federal funding. This is highlighted by recent data trends that showed student performance on state tests was improving while assessments of students' college readiness was in annual decline (Chudowski & Chudowski, 2010).

With the overarching problem of competing goals for K-12 standardized testing, little research exists that attempted to quantify the connection between achievement tests and college readiness. This study attempted to determine if a predictive correlation existed between one such achievement test and a college readiness assessment instrument among the same population of students who were assessed via each respective instrument at the appropriate stage of their education. Specifically, this study correlated a North Texas school's sixth grade student population's performance on the Stanford Achievement Test 10 with the same students' subsequent performance on the eighth grade ACT Corporation's Explore Exam. Without this information, stakeholders such as school administrators, teachers, and educational researchers may not have all the information they need to improve student performance on college readiness exams.

Purpose Statement

With America's focus turning over the last decade to K-12 standardized testing, the data suggest the country's college bound seniors were increasingly less prepared for the academic rigor of college (ACT Corporation, 2010b). The purpose of this study was to determine if there was a predictive correlation between a specific sixth grade achievement test known as the Stanford Achievement Test 10 and the eighth grade college readiness assessment instrument known as the Explore Exam for a group of North Texas students. As was discussed in the literature review, the ACT Corporation conducts an annual correlation study that tracks subjects' performance on the eighth grade Explore Exam and their respective college success as defined by their college grade point averages. Building upon this research, this study determined if a predictive correlation exists between one group of students' performance on the sixth grade Stanford Achievement Test 10 and the Explore Exam. As evidence gathers that the Stanford Achievement Test 10 is a valid predictor of scores on the Explore Exam, the ramifications for educators could impact a myriad of educational strategies and practices for schools that utilize both instruments. A statistically significant correlation between the two exams supports the rationale behind administering the Stanford Achievement Test 10.

Limitations of the Study

This study was limited to a single school. Four classes of students passed through sixth grade in successive years beginning in 2005. The classes also completed eighth grade in successive years beginning in 2007. While the instructional program at the school did not undergo any systemic changes, it should be noted that there were minimal

personnel changes in the instructional program. Furthermore, students in each class varied by academic ability, as would be expected among any school population. However, there were no known factors in the pedagogical program that would influence student performance in this study.

The study was limited to students who completed sixth through eighth grades at the host site. The national economic downturn during the course of this study impacted the stability of the enrollment at the tuition-based host site. While there was a transient nature to some members of the school population, the classes that were the focus of this study maintained a re-enrollment rate above 90%.

The generalizability of this study to other dissimilar populations is limited. The findings of this study are applicable only to institutions where the Stanford Achievement Exam 10 and the Explore Exam are utilized at the same grade levels that they are used in the present study. Furthermore, generalizability may be limited since the school where the study takes place is a tuition-based, predominately White, non-public setting with an admission requirement that yields a student population with above average ability. Furthermore, although the researcher went to great lengths to protect the integrity of this study, it could be limited by potential researcher bias that would threaten internal validity by virtue of the researcher's employment at the host site.

Significance of the Study

The significance of this study can first be found in its contribution to the research linking achievement testing to college readiness exams and ultimately student preparation for college. The literature and research on the topic was limited and was generally associated with somewhat obscure state-authored assessments, as the subsequent

literature review in this study shows. If a correlation between the Stanford Achievement Test 10 and the ACT Explore Exam had not been found for the study participants, these findings could have suggested that hundreds of schools should question why they utilize the Stanford Achievement Test 10 and what is the overall goal of their respective standardized testing program. As is highlighted later in this study, many stakeholders erroneously assume performance on a given achievement test equates to a measure of college readiness. For many private schools, such as those accredited by the Association of Christian Schools International, achievement testing was not compulsory for state funding. The importance of this study for such schools was that if this study and others like it failed to find a significant correlation, this could result in a call to evaluate the testing program for hundreds of thousands of students. On a national level, the importance of an absence of a corollary relationship between the two instruments may mean a national discourse is warranted to determine the goal of K-12 standardized testing. Is it to secure government funding through passing student scores or is it college preparation?

Given that in the present study a predictive relationship was found between student performance on the Stanford Achievement Test 10 and the Explore Exam, the significance of this study is not limited to simply adding to the field of research and prompting debate. For the educational practitioner who utilizes both instruments, a statistically valid correlation between the two instruments carries a wide range of implications. A correlation demonstrates that the K-12 educator who utilizes the Stanford Achievement Test 10 could rely on student scores at the sixth grade level for predictive purposes when evaluating college readiness. This impact could affect early intervention

strategies, pedagogical practices, and curriculum selection. The implication of a predictive correlation for the K-12 school where the Stanford Achievement Test was utilized is wide-ranging in scope. Additionally, a correlation among several subtests on the Stanford Achievement Test 10, the accompanied regression analysis included in this study, demonstrates which subtests have the strongest correlation to the Explore Exam.

Research Questions

With the goal of the study to link standardized test scores from a single achievement test to a single college readiness exam, the overarching research question that was answered was, which, if any sixth grade Stanford Achievement Test scores explain the greatest percentage of variance in the eighth grade ACT Explore Exam scores among students who attend a K-12 school in North Texas? Four specific questions were answered to determine the relationships between the sixth grade test scores (independent variables) and the eighth grade test scores (dependent variables). These four questions were centered on the areas of reading, science, math, and English. First, which, if any of the 12 reading strand scores on the sixth grade Stanford Achievement Test explain the greatest percentage of variance in the eighth grade ACT Explore reading test score among students who attended a K-12 school in North Texas? Secondly, which, if any of the eight science strand scores on the sixth grade Stanford Achievement Test explain the greatest percentage of variance in the eighth grade ACT Explore science test score among students who attended a K-12 school in North Texas? Third, which, if any of the 15 math strand scores on the sixth grade Stanford Achievement Test explain the greatest percentage of variance in the eighth grade ACT Explore math test score among students who attended a K-12 school in North Texas? Finally, which, if any of the 11 sixth grade

English scores on the Stanford Achievement Test explain the greatest percentage of variance in the eighth grade ACT Explore English test score among students who attended a K-12 school in North Texas?

Later portions of this study detail the relevant literature surrounding student achievement scores; however, to understand what types of comparative studies were found involving student achievement data, at the outset it is important to note that the aforementioned four specific questions were illustrated by previous researchers' work. One area of note was the link between student health and student achievement scores. Previous corollary studies found that student health has affected achievement trajectories in students (Garcy, 2009). Similarly, student behavior has been the subject of research. Efforts to determine the value of classroom management and early behavioral interventions have led to researchers seeking correlations between student achievement and student behavior (Rutchick, Smyth, Lopoo, & Dusek, 2009). Over the past decade, studies have also attempted to correlate student achievement with school leadership, specifically principal leadership. These studies suggest a positive correlation can be found in schools where school leaders exhibit certain leadership qualities (Mackey, Pitcher, & Decman, 2006).

Null and Research Hypotheses

- Hypothesis 1: H_0: None of the 12 sixth grade standardized test strand scores relating to reading explain any variance in the eighth grade ACT Explore reading test score among students who attend a K-12 school in North Texas.

  H_a: One or more of the 12 sixth grade standardized test strand scores relating to reading explain a statistically significant percentage of variance in the eighth

grade ACT Explore reading test score among students who attend a K-12 school in North Texas.

- Hypothesis 2: H_0: None of the 8 sixth grade standardized test strand scores relating to science explain any variance in the eighth grade ACT Explore science test score among students who attend a K-12 school in North Texas.

  H_a: One or more of the 8 sixth grade standardized test strand scores relating to science explain a statistically significant percentage of variance in the eighth grade ACT Explore science test score among students who attend a K-12 school in North Texas.

- Hypothesis 3: H_0: None of the 15 sixth grade standardized test strand scores relating to math explain any variance in the eighth grade ACT Explore math test score among students who attend a K-12 school in North Texas.

  H_a: One or more of the 15 sixth grade standardized test strand scores relating to math explain a statistically significant percentage of variance in the eighth grade ACT Explore math test score among students who attend a K-12 school in North Texas.

- Hypothesis 4: H_0: None of the 11 sixth grade standardized test strand scores relating to English explain any variance in the eighth grade ACT Explore English test score among students who attend a K-12 school in North Texas.

  H_a: One or more of the 11 sixth grade standardized test strand scores relating to English explain a statistically significant percentage of variance in the eighth grade ACT Explore Exam English test score among students who attend a K-12 school in North Texas.

Identification of Variables

  Independent variables. The independent variables for this study were the sixth grade Stanford Achievement Test 10 subtest scores. These variables were measured on a continuous measurement scale with a range of 0 to 100. The scores represent the percentage of test questions that were answered correctly. Thus, smaller scores indicated less knowledge of the subject while larger scores indicated greater knowledge of the subject. Table 1.1 shows the names of the sixth grade exam topics (independent variables) grouped by the corresponding eighth grade subject matter test (dependent variables).

  Dependent variables. The following list defines in detail the dependent variables in use in the present study.

- Eighth Grade Explore Exam Reading Test Score (REA): This variable was measured on a continuous measurement scale with a range of 0 to 100. This score represented the percentage of eighth grade reading test questions that were answered correctly. Thus, smaller scores indicated less knowledge of reading while larger scores indicated greater knowledge of reading.

- Eighth Grade Explore Exam Science Test Score (SCI): This variable was measured on a continuous measurement scale with a range of 0 to 100. This score represented the percentage of eighth grade science test questions that were answered correctly. Thus, smaller scores indicated less knowledge of science while larger scores indicated greater knowledge of science.

- Eighth Grade Explore Exam Math Test Score (MAT): This variable was measured on a continuous measurement scale with a range of 0 to 100. This score

represented the percentage of eighth grade math test questions that were answered correctly. Thus, smaller scores indicated less knowledge of math while larger scores indicated greater knowledge of math.

- Eighth Grade Explore Exam English Test Score (ENG): This variable was measured on a continuous measurement scale with a range of 0 to 100. This score represented the percentage of eighth grade English test questions that were answered correctly. Thus, smaller scores indicated less knowledge of English while larger scores indicated greater knowledge of English.

Table 1.1

Sixth Grade Exams (Independent Variables) Grouped by the Corresponding Eighth Grade Subject Matter Test (Dependent Variables)

Sixth Grade Exam Topic	Eighth Grade Exam Topic
Reading	Synonyms
	Multiple meaning words
	Context clues
	Thinking skills – Vocabulary
	Literary
	Informational
	Functional
	Initial understanding
	Interpretation
	Critical analysis
	Strategies
	Thinking skills – Comprehension
Science	Life
	Physical
	Earth
	Nature of science
	Models
	Constancy
	Form & function
	Thinking skills – Science

(Table continues)

Math	Number sense & operations
	Patterns/relationships/algebra
	Data, statistics, & probability
	Geometry & measurement
	Communication & representation
	Estimation
	Mathematical connections
	Reasoning & problem solving
	Thinking skills – Problem solving
	Computation with whole numbers
	Computation with decimals
	Computation with fractions
	Computation in context
	Computation / Symbolic notation
	Thinking skills – Procedures
English	Capitalization
	Usage
	Punctuation
	Sentence structure
	Prewriting
	Content and organization
	Thinking skills – Language expression
	Phonetic principles
	Structural principles
	No mistake
	Homophones

Chapter Two: Literature Review

Introduction to Literature Review

On today's educational landscape, there is a seemingly limitless supply of high stakes tests. These tests and their subsequent results differ greatly from state to state and are often the topic of media scrutiny. Once a school's results are published, the school is often evaluated formally by the state and informally by the stakeholders of the school. The ramifications of each evaluation bring with them specific issues related to public opinion and funding. From here, school leaders are left with evaluating results in a reactive manner and addressing only the most glaring deficiencies as highlighted by student assessments. What is more, there is often little connection between the aforementioned achievement tests in the K-12 school and college readiness standards that are evaluated on college admissions exams.

The purpose of this study was to determine what, if any, were the sixth grade Stanford Achievement Test 10 strands that serve as valid predictors of performance on the eighth grade ACT Explore Exam for a given population of North Texas students. An analysis of the data was intended to demonstrate whether a correlation existed between a given student's performance on the sixth grade Stanford Achievement Test 10 and his or her subsequent performance on the eighth grade college readiness assessment known as the Explore Exam.

One may interpret a positive correlation as suggesting that sixth grade Stanford Achievement Test 10 test data on the strand level included in this study predicts future performance on the eighth grade Explore Exam among the students used in this study.

This was important because it offers the school the opportunity to utilize statistically valid data 2 full years earlier than what was previously available. According to the president of the ACT Corporation, it is generally agreed that college readiness begins at the sixth grade level; however, it is only during the eighth grade year that schools are currently able to evaluate progress (C. Schmeiser, personal interview, April 12, 2007). With this new study, it may now be possible to justifiably evaluate valid data for college readiness for sixth grade students who utilize both instruments. This study drew attention to and relied heavily on previous correlational research done by the ACT Corporation linking Explore Exam results to future college success. These data may be used to direct the decision-making process in a wide array of curricular areas beginning at the sixth grade level.

This study was one of the first of its kind to connect college readiness standards to K-12 achievement test objectives. Additional research has been needed to understand what relationships may exist between achievement tests and college readiness exams. Through this research, it is hoped that K-12 objectives can become more aligned with college readiness objectives leading to curricular enhancements in the K-12 institution that utilizes both assessment instruments included in this study.

Existing literature on the topic of test data can be grouped into three primary components. The first category was the research on achievement tests, such as the Stanford Achievement Test 10. The research was quite diverse and included studies and articles dedicated to proving that standardized testing, in its many forms, is inherently valuable for a myriad of reasons. Some of the most compelling reasons, some maintain, are that early intervention and post-assessment strategies can positively impact overall

student learning (Ross et al., 2004). In addition, previous studies offered significant support for the notion that improving individual and collective test scores is possible, and students are not necessarily limited in their ability to improve from year to year (Randolf, 2007). The literature on standardized testing was not all positive. In reality, the majority of discussion was devoted to the inherent problems found in standardized testing (Beyer & Gillmore, 2007) as a part of the No Child Left Behind Act of 2002. This research included the public's misunderstanding of achievement test scores and the resultant challenges for schools (Newton, 2005). However, a meta-analysis of the research on the topic revealed an assemblage of groups that maintain the view that the current testing in the United States was problematic for various groups of students that are discussed later.

The second category dealt primarily with the improvement of college admissions test scores. College admissions tests have created a multi-million dollar test preparation industry predicated upon the belief that students are ill prepared for the exams by their K-12 education. The research dedicated to simply identifying the objectives that must be mastered in order to maximize college entrance exam scores best illustrates this point (Black, 2005). Furthermore, the research suggests that states do not consult colleges when adopting K-12 standards and that the two primary national tests are quite different (Kirst, 2005).

The final component of literature reviewed was the sparse research on connecting K-12 achievement tests to college entrance exams and ultimately college success. While there were limited examples of achievement tests being linked to various types of other tests, such as intelligence quotient tests (Antonek, King, & Lowy, 1982), there were surprisingly few resources available to assist in drawing connections between the K-12

standardized tests and college entrance exams. The research available included a study completed by the state of Minnesota in an effort to determine the predictive nature of the Reading-Curriculum Based Measurement (*R*-CBM) exam with the Minnesota Comprehensive Assessment (MCA exam). This study determined that a statistically significant relationship existed between the two instruments among the 1,766 student participants (Hintze, & Silberglitt, 2005). The state of Washington has performed similar studies among elementary students that yielded similar predictive results between the state's high stakes test and achievement tests among 174 fourth grade students in reading fluency (Stage & Jacobsen, 2001). It is important to note that existing research appears to be limited to elementary age students. In order to prevent any oversight of a collection of research on the topic, for the present study there were two separate personal interviews held with leading experts in the field of educational assessment. First, Dr. Cyndie Schmeiser, President of the ACT Corporation, was interviewed. During this interview, Dr. Schmeiser indicated that she was not aware of any such research that had previously been completed on the connection between K-12 assessment and the ACT Exam (personal communication, April 25, 2008). Subsequently, the National Center for Educational Achievement was contacted, and an interview was arranged with Dr. Chrys Dougherty, Director of Research. Through this interview, it was once again confirmed that the reason for the lack of resources in this area is believed to be simply the need for more research (C. Daugherty, personal communication, April 30, 2008). As a result, a by-product of this study was to contribute to this third component of research, which was an area deficient in research.

Conceptual Framework

The nation's educational crisis is highlighted by reports of annual testing that seemingly pose a limitless supply of disappointing news regarding the student performance of America's K-12 classroom students. The news comes from all corners of the country and revolves around two themes including (a) declining annual achievement test scores among the nation's K-12 population and (b) declining college admissions scores. The phenomenon of an annual decline in America's testing scores is one with an unfortunate history that could be traced in the literature beginning in the 1970s (Savage, 1978) and continuing through the 1980s (Howe II, 1985), the 1990s (Huber, 1993), and the first decade of the current century (Kahn, 2006). Educators and policymakers have subsequently spent their combined efforts over that time on various strategies that range from fiscal policy to chasing the latest educational trends. Meanwhile educational research has devoted an ample amount of time surveying successful schools and reporting the findings; however, this effort has failed to curb the tide of falling scores in what has become a national crisis (Ornstein, 2010). What appears to be lacking is valid, quantifiable research that allows school leaders to make systematic changes to the K-12 course of study with the goal of college readiness.

The system-wide efforts that have been employed to improve student performance appear to be a disjointed menagerie of movements without a common theme and without a basis in quantifiable research. With the current federal education program allowing states to develop their own achievement tests before receiving federal funding, there appears to be little connection between the federal funding and the largely private industry devoted to performance by students on college entrance exams. In addition, there

appears to be even less use of previous research on the connection between achievement testing and college admission testing for various segments of the nation's student population, such as students with learning disabilities, non-native English speakers, and minority students.

To organize the nation's testing movement, education policy-makers must begin to include elements of the quantitative analysis of the various assessment instruments in an effort to correlate student performance on K-12 assessment instruments with college admissions exams, if the goal is college readiness for America's youth. Once the strength of correlations is found, educators must begin shifting to instruments in the K-12 program that possess the strongest possible correlations to college readiness exams. The results of the correlational studies should include as much detailed information as possible on student performance to include their respective performances at the sub-test level. Additionally, an element of intentionality must be present in the K-12 institutions that facilitates the usage of test data in an effort to make meaningful changes to the course of study based upon valid, quantitative research of their respective achievement tests.

Conceptually, educational leaders need to be empowered with the knowledge of what their students' performance means for college readiness in the areas of English, reading, math, and science. When achievement test score reports are returned to the K-12 school, the school leader and classroom teacher alike should know the effects on college readiness for improving each subject score and which sub-test scores within the subject are the most powerful agents of change for improving college readiness. Furthermore, through statistical analysis, school leaders could identify the synergy that exists through

focusing on two or more of the most important sub-tests, as defined by multi-linear regression analysis.

The crux of the issue surrounding high stakes tests was that many schools across the United States spend an inordinate amount of taxpayer money to assess students. Yet few independent studies have yet firmly established that the exams serve to indicate a level of college preparation. Such studies would be useful by suggesting areas to improve college preparation for the student. The ACT Corporation's Explore Exam was the first assessment to measure college readiness between the two major entities that administer college entrance exams in the United States. The Scholastic Aptitude Test offers the Preliminary Scholastic Aptitude Test (PSAT) directed towards high school juniors, although it may be administered as early as ninth grade. The purpose of this exam is to serve as practice for the Scholastic Aptitude Test and serves as a qualifier for the National Merit Scholarship (College Board, 2010). The other most prominent college preparation testing institution, the ACT Corporation, offers a test suite designed to measure student performance beginning in eighth grade with the Explore Exam, continuing with the PLAN Exam in 10th grade, and culminating with the ACT Exam following 11th grade. The purpose of the exam suite is to support student planning, aid instructional support, provide assessment opportunities, and evaluate scholastic progress (ACT Corporation, 2010b). The selection of the ACT Corporation's Explore Exam for this study was based upon the opportunity that exists in assessing eighth graders via an instrument conceptually linked to the ACT Exam. At the time of this study, the majority of Explore Exam participants were eighth graders across the United States, while the

majority of PSAT Exam participants were 10th and 11th graders (J. Noble, personal communication, October 5, 2010).

One important conceptual link of importance to the present study was the previous work accomplished by the ACT Corporation that linked a given eighth grade student's performance on the Explore Exam with his or her subsequent college performance many years later. The ACT Corporation has a history of over 40 years of educational research that linearly tracks student performance on college admissions tests and subsequent college success as measured by the students' college grade point averages (ACT Corporation, 2010d). An interview with Dr. Jeff Allen, Director of Statistical Services-Research of the ACT Corporation, revealed that the Explore Exam has benefited from the same longitudinal monitoring process. While the results were unpublished proprietary data used within the corporation, Dr. Allen stated that the Explore Exam was a valid predictor of college grade point averages as verified by the company's commitment to measuring student performance on the Explore Exam at the eighth grade level and then subsequently tracking the students' academic records through college graduation (J. Allen, personal communication, February 18, 2010).

A review of the types of studies that have been published by the ACT Corporation may illustrate what types of research were being done specific to the Explore Exam. In 2002, the company published a study that included over 200,000 students and 84 large post-secondary institutions. The research used logistic regression models to determine that student scores on the ACT Exam were valid predictors of college grade point averages (Noble & Sawyer, 2002). Similarly, outside university research concluded that student ACT Exam scores were valid predictors of college success. This was especially

true when ACT composite scores were combined with the students' high school grade point averages (Bleyaert, 2010).

The marketing material from the ACT Corporation's Explore Exam touts the aforementioned linkage to college success through what it calls college readiness standards. The company defines college readiness standards as statements that describe what students were likely to know and to be able to do, based on their ACT scores (ACT Corporation, 2009d). The company then used its longitudinal data to determine if a given student, or set of students, was on track for college success in each of the four core areas of reading, math, science, and English. The ACT Corporation (2009) uses this model for what it calls early preparation for college. The Explore Exam was documented as the first college readiness assessment instrument between the two major entities that offer college admissions testing in the United States. However, an interview with the president of the ACT Corporation, Dr. Cyndie Schmeiser, revealed she believes that "college readiness really begins at the sixth grade level" (personal communication, April 25, 2008). One of the products of this present study was to establish an association between one sixth-grade achievement test and the Explore Exam.

The ACT Corporation's Explore Exam is a component of the company's EPAS test suite, which includes the aforementioned college readiness exams known as the PLAN and ACT Exams. It is focused on age appropriate objectives derived from the ACT Exam. The literature review demonstrates that very little research exists connecting college entrance exams to K-12 standardized testing. Similarly, there was no known research linking the classroom performance of students to the Explore Exam and standardized testing, including the Stanford Achievement Test 10. The Stanford

Achievement Test 10 was selected because of the accessibility of the data at the subject

school due to its testing policy. The Stanford Achievement Test 10 has a statistical

reliability figure of .87 (Technical Manual, 2003) and is an achievement test that serves

as the state assessment for thousands of students in states such as Arkansas and Alabama

as required by the No Child Left Behind Act of 2002.

When considering the instruments to be used, comparing two exams that are

achievement based significantly enhanced the conceptual framework. The Explore Exam

and all exams in the EPAS suite of tests are achievement based, similar to the Stanford

Achievement Test 10, while the Scholastic Aptitude Test 10 is primarily reasoning based.

It should be noted that one exception exists in the subject of science. The Explore Exam

and all EPAS exams are reasoning assessments in the subject of science. This was

highlighted in measuring and quantifying any predictive correlation that existed between

the two instruments.

A correlation of a predictive nature between the two instruments would indicate

that earlier intervention in the K-12 academic program could prove to enhance college

readiness. The prior research suggested that much of school improvement prior to high

school was indicted by student performance on achievement based, high-stakes tests. At

the high school level, some schools make the transition to preparation for student

performance based on college admission exams such as the ACT Exam. However, with

the benefit of results from this present study, schools that make use of the Stanford

Achievement Test 10 at the sixth grade level could confidently make the transition at the

sixth grade level if a correlation of a predictive nature was found between individual

aspects of the Stanford Achievement Test 10 and the Explore Exam. As further

illustration of the need, the Stanford Achievement Test 10 has historically served as the state test for Arkansas and Alabama. In addition, there are over 5,700 private schools accredited by Association of Christian Schools International (2009a; ACSI) in the United States and 600,000 students in international ACSI schools who are subject to assessment by the Stanford Achievement Test 10 annually.

Site Characteristics for the Present Study

This study was limited to a single school. Four cohorts of students passed through sixth grade in successive years beginning in 2005. These cohorts also completed eighth grade in successive years beginning in 2007. The instructional program at the school did not undergo any systemic changes. In addition, it should be noted that there were minimal personnel changes in the instructional program. Furthermore, students in each class varied by academic ability, as would be expected among any school population. There were no known unique factors in the pedagogical program that would influence student performance in this study.

The study was limited to students who completed sixth through eighth grades at the host site. The national economic downturn during the course of this study impacted the stability of the enrollment at the tuition-based host site, as a result of some transience for some segments of the school population. Yet the classes that were the focus of this study maintained a re-enrollment rate above 90%.

The generalizability of this study to other dissimilar populations is limited. The findings of this study are applicable only to institutions for which the Stanford Achievement Exam 10 and the Explore Exam are utilized at the same grade levels. Furthermore, generalizability may be limited by the fact that the school where the study

took place was a tuition-based, predominately White, non-public setting with an admission requirement that yielded a student population with above average ability. Furthermore, although the researcher went to great lengths to protect the integrity of this study, it could be limited by potential researcher bias that would threaten internal validity by virtue of the researcher's employment at the host site.

Overview of the History of Standardized Testing

In the mid-19th Century, education became more readily available to the influx of immigrants who arrived in America. As the availability of an education moved from the socially elite to the mass population, educators sought ways to ensure that all students were receiving an adequate education. This led to standardized testing in American schools (Haladyna & Haas, 1998). In 1905, French psychologist Alfred Binet published the first intelligence test that was rapidly adopted in the United States and implemented by the military. The use of the intelligence test reached its peak in the 1950s shortly after the Russian launch of the Sputnik satellite and American's resultant concern about science and math education (Rise of Testing, 2001). Following the 1950s, American educators began to place an emphasis on the aggregation of standardized test data. This emphasis led to the observance of trends in student performance that critics argued pointed to social inequalities in the areas of race, gender, and socio-economic background (Grodsky, Warren, & Felts, 2008). Standardized testing in the United States was long considered to be synonymous with the Scholastic Aptitude Test and the American College Testing Exam (Fletcher, 2009). During the educational reform era of the 1960s and 1970s, standardized testing had became part of the mainstream educational culture. Standardized testing has recently become a political issue as billions of taxpayer dollars

are distributed to states based on student performance, and testing quickly began to dominate the national discourse on education.

Today's Testing Landscape

In political circles, the goal of standardized testing, as it relates to what has become known as *high stakes testing*, is to provide data on student performance that is readily comparable from student to student, district to district, and state to state. Students are assessed amid strict administrative standards that include directives such as time limits and scripts for test proctors. According to Karantonis and Sireci (1997), standardized tests in American public schools are intended to be administered under similar testing environments for all students. Many standardized tests, such as the Stanford Achievement Test 10, report scores to students and schools along with a sample norm or group norm. Framer and Wall (1997) state that statistical methods determine placement of the test scores on a normal curve, which should appear in a bell-shaped curve when graphed. The scores are then plotted and used to compare students from different locales.

Proponents of standardized testing point to several benefits of the practice. Supporters argue that standardized testing provides necessary accountability for schools. Specifically, schools that receive federal funds through the No Child Left Behind Act are required to meet minimum proficiency benchmarks as set forth by the respective state. Goldenberg (2005) emphasizes that testing plays a vital role in upholding accountability in school systems in order to determine whether students are mastering the necessary critical concepts and skills.

Advocates maintain that standardized testing is helpful in determining subject matter proficiencies of the individual student for placement in advanced classes. In addition, as science has advanced its understanding of learning disabilities, standardized testing has become a useful tool in identifying students who require special attention for successful testing (Cheek & Joy, 2003). Fremmer and Wall (2003) point out that standardized tests can identify particular issues in individual students whose progress is hindered by a potential learning disability, thus identifying the need for further diagnostic testing.

Opportunities for Early Intervention

One of the benefits of standardized testing is the opportunity for proven early intervention strategies on behalf of students who are failing to meet age-appropriate educational objectives. A review of the literature on early intervention strategies revealed that students consistently benefit from early intervention. Prior to the No Child Left Behind Act of 2002, early intervention strategies were based on a broader range of subject matter. However, the No Child Left Behind Act of 2002 focused the entirety of its accountability mechanism on student performance in the subjects of English and Math. A major research project in 2007, published by the Arizona Department of Education, found that students in 10 schools who received early intervention for math deficiencies significantly outperformed similar schools across the state (Judson, 2007).

Intervention strategies can be included in the course program or in alternative settings such as after school programs. In Chicago, a group of over 650 early childhood students were assessed and tracked linearly on a 3-year and 5-year year basis. The results supported the conclusion that students who received intervention in both reading and

math consistently outperformed students outside the treatment group (Reynolds & Temple, 1998). Third and fourth grade students demonstrated a similar response to early intervention in a 2006 study by the University of Washington (Berninger et al., 2006).

Early intervention in English and math with adolescents has also been shown to benefit student scores on achievement exams. A study of high performing math students in one Tennessee high school demonstrated that the school population benefited from content mastery through post-intervention remediation. The sample of 886 students collectively scored higher than other Tennessee students and an accompanied survey indicated students' self-reported higher motivation levels (Zimmerman & Dibenedetto, 2008). Similarly, high school reading and writing intervention in the subject of English has also been demonstrated to be effective (Voyager, 2006). Additionally, various types of research are devoted to early intervention strategies for students with various conditions such as test anxiety and learning disabilities. Much of this research is devoted to the effects of intervention strategies prior to student failure. One such study found that students benefited from simple test taking strategies and accommodations to a statistically significant degree on graduation exams (Carter et al., 2005).

While research was available that highlights beneficial early intervention strategies, it should be noted that not all intervention strategies were generally accepted as successful. This was the case with much of the research surroundings the nation's Head Start Program. Founded in 1965, Head Start was an example of social policy intervention that was designed to offer educational services to underprivileged families of pre-school children (Welshman, 2010). While a noble goal, a meta-analysis of the research suggested that the long-term benefits of Head Start are not clear. Specifically,

much of the research suggested that although students benefited while enrolled in the program, these benefits were deemed to be mostly absent by the time the student finished first grade (Viadero, 2010). In addition to broad impact studies on the overall effect of the Head Start Program, more specific research has called into question specific aspects of the program. One such study determined that low and middle-income students achieved no significant gains in phonological and vocabulary knowledge as a result of their participation in Head Start pre-kindergarten programs (O'Leary, Cockburn, Powell, & Diamond, 2010). While proponents of the Head Start Program maintained the costs of the program are off-set by the cost of later remediation of student learning outcomes, as of the spring of 2011 many states were considering cutting funding to the program in favor of alternative programs (Kelleher, 2011). The research suggested that some educators favored the consideration of other models such as the United Kingdom's Sure Start Program (Welshman, 2010).

In addition, research was found that highlighted failures of intervention strategies in a broad range of areas. Some of these included research that found the intervention itself was not inherently inadequate, rather the implementation of the intervention strategy led to no significant gains in student performance. This was especially true in the research surrounding early literacy intervention strategies (Dickinson & Neuman, 2006). Also, ample research was discovered that has historically contributed to the treatment of students with disabilities. One such study found that the traditional practice of grade retention of students with socio-emotional issues offered no significant advantage to the student (Anderson, Whipple, & Jimerson, 2011).

Minorities and Standardized Testing

The literature that exists on high stakes testing in the United States as it relates to minority participation is largely qualitative and anecdotal. However, statistics are present in the research that suggest the high stakes testing environment has had a disproportionate negative affect on Blacks verses Whites. As evidence, in 2006, a study found that 40% of Black students passed the Math portion of North Carolina's high stakes exam, versus 93% of their White counterparts. Similarly, 94% of North Carolina's White student population passed the English portion of the same exam versus 80% of Black students (McNeil, 2008). North Carolina's statistics are representative of a larger problem across the country as evidenced by the Harvard University Civil Rights Project findings that minorities in the United States consistently experience a higher failure rate on state assessments (Chenoweth, 2000).

According to some, this phenomenon has led to precisely the opposite of the desired effect of the No Child Left Behind Act for minority students. As schools become increasingly focused on high stakes test performance and less focused on college preparation, students who are upwardly mobile are seeking K-12 educational opportunities outside of standard public education. This leaves a disproportionate number of minorities in schools that emphasize low level thinking skills in an effort to pass state assessments (Lattimore, 2001). In Florida, the National Association for the Advancement of Colored People (NAACP) has leveled charges that the aforementioned phenomenon has led to significantly segregated schools. The group points out the addition of programs for gifted students, while ignoring programs devoted to high stakes test preparation, further polarizes schools along racial lines (Richard, 2003).

In addition to the statistics regarding minority performance on high stakes testing, qualitative studies suggest minority students experience negative consequences as a result of the assessments. In Ohio, minority students interviewed for qualitative research report discontentment with a pedagogical program that is defined by a narrow curriculum devoted to the sole purpose of passing the state exam (Lattimore, 2005). This research is echoed repeatedly across the country where minority success on high stakes testing is disproportionately negative and problems reported by all test takers are seemingly exacerbated among minorities (Stutz, 2005).

The compilation of this research over the past decade has led to the inevitable and immediate lawsuits in such states as Louisiana, where some local school districts have reported as many as 50% of minority students failing the state's high stakes test (Robelen, 2000). The issue received national attention in the past 2 years as members of the Congressional Black Caucus have called for a moratorium on all high stakes testing nationwide due to the aforementioned minority issues with the test (Darling-Hammond, 2007). The value of high stakes testing among minorities in the United States is in question; the literature from around the country suggests that the No Child Left Behind Act may not have the intended consequence for many of America's minority students.

Socioeconomic Factors Affecting Test Performance

The statistics surrounding student performance on high stakes tests by socioeconomic background are much more clear. According to the National Poverty Center at the University of Michigan, over 20%, or 15.4 million children, in the United States lived in poverty (National Poverty Center, 2008). This has led many to discount the value of high stakes testing altogether, stating that education should instead be

focused on ensuring that these students are sufficiently fed, do not suffer from untreated vision or hearing problems, and generally are in acceptable health. In other words, education should more broadly address the causes and effects of poverty on a societal level (Strauss, 2011). Regardless of the debate surrounding the goal of education, the current literature consistently demonstrates that poorer schools and impoverished students underperform their respective counterparts across the country. One such study of over 14,000 Florida eighth grade students found that students in socioeconomically disadvantaged areas scored up to 26 percentile points lower on standardized reading tests (Baker & Johnston, 2010).

The debate surrounding why students in lower socioeconomic classes perform lower on high stakes test is politically charged. However, there is research that offers some insight into the contributing factors associated with impoverished student performance. Some ethnographic research points to the lack of upward mobility by poorer students into areas where quality education exists (Newman & Chin, 2003). Meanwhile, interesting anatomical research is also being done that suggests poor students suffer very real afflictions resulting from poverty that include poor diet, lead poisoning, and asthma (Armstrong, 2010). Regardless of the reason, in regions of the country where teachers earn merit pay, studies show this money flows to affluent schools (Stein, 2008). This has led some to argue that poor students have limited access to good teachers as highly-qualified teachers are drawn to areas with a history of high merit pay (Tuerk, 2005). Consequently, and perhaps cynically, Mercogliano (2004) argues that standardized tests only measure income levels and socioeconomic status of students and not their academic capacity.

Non-Native English Speakers' Test Performance

Another subgroup that has under-performed in the high stakes testing arena is non-native English speakers. This group of students is assessed via the same instruments as their native English-speaking counterparts. This raises inevitable concerns regarding this student group's ability to compete on the same state mandated assessments. Studies suggest that 80% of all non-native English speaking American students are Hispanic. Of this population of students, quantitative studies with large sample sizes suggest that Hispanics generally perform similarly to other non-native English speaking ethnic groups (Capraro, Capraro, Yetkiner, Rangel-Chavez, & Lewis, 2010).

Much of the research devoted to Hispanic performance on high stakes testing is devoted to cultural and ethnic norms that are unique to the Hispanic culture. Evidence of this is found in surveys of Hispanic individuals via opinion surveys regarding high stakes testing. In general, Hispanics have been found to have a higher opinion of state mandated testing and have been found to be more optimistic about the public education system (Lay & Stokes-Brown, 2009). However, when research is performed in areas with a high Hispanic population coupled with a high poverty rate, researchers found student attitudes to closely align with minority students who generally oppose state assessments. The reasons for dissatisfaction in these surveys generally include poor instructional strategies and curriculum integration (Bussert-Webb, 2009).

Some recent research suggests that stakeholders in the Hispanic community believe that their respective performance on high stakes testing is significantly impacted by a cultural bias (Altshuler & Schmautz, 2006). In essence, it is argued that the cultural and ethnic norms present in the Hispanic community limit the success of the student on

an assessment instrument written for predominantly White, native English-speaking

students. While there may be disparate performance between Hispanics and native

English-speaking students, it is difficult to ascribe this to specific Hispanic cultural and

ethnic differences in light of research by Capraro et al. (2010), who suggest Hispanic

performance is consistent with all other non-native English speaking students of varied

ethnic backgrounds. It seems more likely that Hispanic struggles are similar to other

ethnic groups who consistently score lower on the English portion of high stakes

assessment due in part to their unfamiliarity with the language (Dobbs, 2003).

Students With Learning Disabilities and Test Performance

In recent decades, as a better understanding of students with learning disabilities

reaches the forefront of the American educational system, so has the research improved

on the interaction between learning disabilities and high stakes testing. By and large,

gone are the days where students with learning disabilities were simply referred to as

dumb, and pundits could write articles in major newspapers with titles such as "Extra

Credit for Doing Poorly" when referring to educational accommodations (Robert, 1997,

p. 23). Today, the research is more appropriately focused on the specific accommodations

that may be used to assist students with learning disabilities who are subject to the high

stakes test environment.

Research studies exist in three primary forms for students with learning

disabilities. The research includes studies on reading disabilities, math disabilities, and

writing disabilities. While other research exists, the vast majority of it falls within one of

these three categories, and variations within the categories primarily involve the age of

the learner. A representation of the latest research available for students with reading

disabilities includes a study of seventh grade students with reading disabilities. Researchers found that the subjects were able to perform markedly better versus the control group when questions were read aloud to them and the exam was administered over a 2 day period (Fletcher et al., 2009). Similar research suggests that students with math disabilities also benefit from extended time. In a large 2005 study of 2500 ninth grade students, it was determined that one of the key contributors to success among students with math disabilities was an additional allotment of time (Cohen, Gregg, & Meng, 2005).

The research regarding students with writing disabilities and their performance on high stakes testing centers around accommodations for students with dyslexia. Students with dyslexia typically underperform in the areas of vocabulary, spelling, and handwriting. Quantitative research suggests that allowing students to type their assessments can significantly help students with dyslexia. Further increases in student performance are also found when students are allowed the opportunity to edit their typed answers to high stakes test questions (Gregg, Coleman, Davis, & Chalk, 2007).

The remaining research devoted to the assessment of students with learning disabilities can be characterized as non-accommodated testing strategies. Current research suggests that students with learning disabilities can see measurable gains in performance through an emphasis by the instructor on explicit and detailed instructions prior to the administration of a given exam (Swain, 2006). Further, the latest research has found that in addition to accommodations, simple study skill improvements offer students increased performance on state mandated testing (Steele, 2010).

Emphasis on School and Teacher Accountability

Today's critics of K-12 standardized testing point to the high stakes nature of the testing process, created by the No Child Left Behind Act of 2002. The act links federal funding to district performance on state standardized testing. According to critics, this presents several problems. A system that depends upon a single test to gauge student performance in a district places a large amount of stress on teachers and administrators and may contribute to negative outcomes (Popham, 2003). Each year, the news media includes stories of test fraud from around the country. Reports continue to surface of teacher impropriety as the pressure leads some educators to outright cheating. According to one recent article, 1% to 3% of all teachers actually compromise the validity of testing in order to ensure student performance (Gabriel, 2010). However, a much more subtle quandary may exist in the classroom instruction amidst the high stakes test culture. Many teachers will admit to adapting their classroom objectives and instruction for the sole purpose of teaching particular content covered in the high stakes test (Widemuth, Madaus, & Haney, 1994). Some authors have suggested this is the primary reason why American students have continued to decline in their performance on exams administered around the world. As curriculum continues to narrow in order to achieve passing scores on high stakes testing, broader knowledge required to compete on global exams has diminished (Ravitch & Cortese, 2009). This raises a wide range of pedagogical and ethical questions including the validity of any score improvements and the overall goal of American education.

With the advent of the No Child Left Behind Act, an increased emphasis was placed on teacher training. Schools whose students fail to make adequate progress are

required to send teachers of the topics in the areas of student academic deficiency to training workshops in order for the school to receive federal funding. While it is difficult to ascertain the benefits of this emphasis on teacher accountability, some point out that the threat of additional professional workshops has contributed to teachers placing too much emphasis on high stakes test results (Fremmer & Wall, 2003). Once student performance became linked to teacher pay, teacher unions wasted little time in making the issue political (Maxwell, 2010).

As administrators feel greater pressure to show adequate proficiency levels, unintended consequences have arisen for the disadvantaged students that legislation was purportedly intended to not leave behind. Administrators have disincentives to retain in their schools the students who tend to score poorly and can be shifted to groups whose scores will not be included in the aggregated test scores, such as students with behavior problems and/or learning disorders that can be assigned to alternative and remedial programs. In these programs outside the mainstream schools and classrooms, they may have more specialized attention but also fewer opportunities to obtain a standard diploma than would be afforded them in the mainstream setting (Motley-King, 2008).

Pedagogical Changes and Effects on Student Motivation

Pedagogical concerns resulting from high stakes testing include the over emphasis on rote memorization and the rehearsal of a process for successfully performing on a single objective exam. For example, recent research has been focused on how to effectively integrate proven teaching strategies such as differentiated instruction in an atmosphere where there appears to be limited time for such practices (Brimijoin, 2005).

Critics also maintain that this environment has contributed to an abandonment of many effective teaching strategies that engage critical thinking skills (Jones et al., 1999).

Teachers, administrators, and communities feel the pressure exerted by the accountability system prevalent on today's educational landscape. However, if students are the objects of education, it is important to consider the affects of the system on the learner. Student motivation has long been regarded as the key to classroom teaching. In decades past, students could be expected to desire learning for its intrinsic value. However, research in recent years suggests that educators are relying heavily upon determining the best extrinsic motivators for ensuring student success on state mandated testing (Hoffman & Nottis, 2008). Research on motivation for learning consistently has shown that intrinsic motivation is more effective for learning, and the presence of extrinsic motivators can actually detract from and lesson intrinsic motivation to learn (Crow & Small, 2011).

In addition, some researchers raise questions about the emotional ramifications for students when basing grade level promotions or even graduation on a student's performance on a single objective exam (Gay, 1990). The pressure on a student to succeed on a single quantitative high stakes test that is administered annually can be immense, leading to self-esteem issues for students who fall short of the mark (Kruger, Wandle, & Struzziero, 2007). Some researchers suggest that the failure to recognize qualitative learning and the resultant impact on a student's self-esteem is the largest drawback to high stakes testing (Bracey, 2001).

Predictors of College Success

Many students, regardless of language, ethnicity, or learning disability, associate their performance on the K-12 standardized test with predictive college success. It should be noted that the goal of many of these exams is to measure proficiency on state or national educational objectives. As such, the quality of a given test as a predictor of college success is predicated upon the state adopting objectives that are set forth by colleges and universities. Therefore, it would be erroneous to assume K-12 standardized test performance is a valid predictor of student performance in college. This determination would only come through a correlational evaluation of each respective exam, such as the ACT Corporation's college entrance exam.

Since many of America's colleges and universities require a college entrance exam for admission, many prospective college students believe their performance on the assessment is the primary indicator of their potential college success. An analysis of the research indicates this may not be true. When considering prospective college success, the research suggests K-12 performance, curriculum, cultural issues, and other factors associated with the students' previous education may be a better predictor of college success versus a single admission exam.

Gronna (1998) states that when most people are asked about the uses of K-12 standardized tests, they usually reference future college success; however, he points out a better predictor of success may be student grade point averages for the junior and senior years of high school. In fact, colleges and universities find that utilizing student grades in conjunction with college entrance exams offers better prediction of college success.

According to one study of 81,000 California students, the single biggest predictor of second-year college grade point average was success during high school on an Advanced Placement Exam (AP Courses, 2005). Similarly, research suggests that high school grade point averages and class rank are often better predictors of college success than admission scores (Kirby, White, & Aruguete, 2007). The review of the literature suggests this is particularly true for minority students and has led some colleges and universities to abandon the college admission exam altogether (Cloud, 1997). Additionally, certain ethnic populations have pointed to cultural bias in admissions tests and proposed other factors to consider, such as student motivation, when evaluating a student's potential college success (Strage, 2000). Finally, a review of the literature on predictors of college success reveals an eclectic amalgam of studies that range from proposed alternative tests (Olson, 2006) to studies that suggest a correlation between low college grade point averages and the existence of a large percentage of part-time instructional staff (Burgess & Samuels, 1999).

College Entrance Exams

For admission to a college or university in the United States, most high school diploma holders are required to be assessed via one of two college entrance exams. The Scholastic Aptitude Test and the ACT exam (formerly known as the American College Testing Exam) are the two major college entrance exams, which have been in existence for over the past 50 years (Rothstein & Jesse, 2004). The exams are used for the evaluation of prospective students in American colleges and universities along with other factors such as high school grade point averages and extra-curricular activities. The two exams are both widely accepted for admissions purposes, however some colleges still

require one exam over the other as an admission criteria (Doyle, 2006). College entrance exams have been in existence since the early 1900s (Pine, 2008). Initially they were necessitated by the existence of great disperity in the quality of the educational system across the United States. Though the ACT Exam and the Scholastic Aptitude Test hold similar roles, there are differences in the content, administration, subjects assessed, and timing of the tests. The Scholastic Aptitude Test is administered by a national body known as the College Board, while ACT is administered by a private company known as The ACT Corporation (Rothstein & Jesse, 2004). The exams have registered increasing popularity not only in the United States but also in other countries (Doyle, 2006). Colleges have found the subjects included in the exams to be an essential way of assessing the eligibility of students joining the colleges and universities from across the world.

The ACT exam. According to Contreras (2005), the ACT Exam is a college entrance exam used in the United States and its territories for admission into various colleges. The exam was developed and is administered by an American company formerly known as the American College Testing Company. The subjects included in the exams are considered the most important subjects in the high school curriculum as a predictor for college success. The subjects included on the ACT Exam are mathematics, English, reading, and science. Contreras (2005) maintains that the exam measures the academic knowledge in core subjects that a student has acquired in his or her formal education prior to college admission. Colleges and universities use student performance on the ACT Exam in two primary ways. Colleges use individual student scores to compare students' academic preparation from high schools all over the country. In

addition, the ACT Exam, along with other factors, plays a significant role in merit-based scholarship awards by colleges and universities each year. The fact that the results of student performance on the ACT Exam can be used to enable accessibility to funds and scholarships is indicative of the vital role the exam plays for millions of Americans who are seeking higher education (Shavelson, 2007).

The Scholastic Aptitude Test. The Scholastic Aptitude Test is administered by the College Board to junior and senior high school students. The College Board is a nation-wide, non-profit association whose stated mission is to connect students to college success and opportunity (College Board, 2010). The College Board was started in 1900 and has to its credit 3800 schools, colleges, and universities as its members. The original rise in popularity of the Scholastic Aptitude Test was a result of the increasing number of colleges requiring the exam for admission and other services the corporation offered (Napoli & Raymond, 2004). In 1901, 973 students were administered the Scholastic Aptitude Test in the United States and Europe (Doyle, 2006). Today, according to Napoli and Raymond (2004), the College Board connects over 22,000 high school graduates with 3500 colleges every year. Colleges use the entrance exams such as the Scholastic Aptitude Test in two primary ways. The initial use was a standardization tool to compare students from across the United States that have different educational backgrounds. In addition, exams such as the Scholastic Aptitude Test are used as a key component in evaluating students for merit-based scholarships. The Scholastic Aptitude Test was originally developed by Carl Brigham, a psychologist who also worked on the Army Alpha and Beta tests. These tests were initially used by colleges and universities in the northeastern parts of the United States to eliminate bias in exams, especially between

people of different social-economic backgrounds. Authors argue that this humble background of the Scholastic Aptitude Test has enabled its success.

Most authors agree that the importance of college entrance exams is found in the measurement of literacy, level of numeracy, and writing skills. These are important skills needed for academic success in the college. For example, the Scholastic Aptitude Test is focused on assessing how college entrants taking the exam can analyze and solve problems (Napoli & Raymond, 2004). This means that the exam attempts to ensure that those students joining colleges possess these important skills. Colleges depend on the outcomes of college entrance exams, together with grade point averages and other factors, to determine who receives admission to the college or university. Studies suggest that performance on college admissions tests and high school gradepoint averages serve as a valid predictor of success by students during their freshmen year of college (Frederick, 2005).

Despite the popularity of the Scholastic Aptitude Test, the test has met with criticism throughout its history. There were wide spread accusations that the exams were designed with open bias to certain segments of the population. This was depicted in the structure and terminology of questions commonly associated with analogy questions. Detractors of the Scholastic Aptitude Test maintained that certain questions possessed bias that led under-privileged or minority students to underperform on the exam when compared to their counterparts. Ultimately, analogy questions were replaced with short reading comprehension questions. Throughout the last decade, claims of test bias have led some colleges and universities to waive the Scholastic Aptitude Test as a requirment for admission (Frederick, 2005).

A comparison. A survey of the current competition between the Scholastic Aptitude Test and ACT exams reveals that the Scholastic Aptitude Test has always had a larger number of test-takers nationwide. However, in the past decade the ACT has closed the gap and gained in popularity. In 2007, 1.5 million students took the Scholastic Aptitude Test while 1.2 million took the ACT exam (DeGregorio & Bartosiewicz, 2007). This marked the closest the ACT had come to rivaling its Scholastic Aptitude Test counterpart. Experts suggest this narrowing gap between the two tests is a result of students' comfort level with a test that more closely resembles their high school achievement tests and resultant curriculum. Students who are subject to standardized testing apparently prefer an achievement-based test versus an aptitude test when it comes to college admission testing (DeGregorio & Bartosiewicz, 2007).

Interestingly, the popularity of each exam appears to be somewhat linked to the geography of the United States. The Scholastic Aptitude Test is most popular on the East and West coasts of the country while the ACT has consistently assessed more students in America's heartland (Barnes, 2002). While it is unknown why this phenomenon exists, each exam has taken on a different reputation. The Scholastic Aptitude Test exam, with its aptitude emphasis, has become the assessment known as the test that measures a student's ability to learn. Meanwhile, the ACT exam, with its achievement emphasis, has become the assessment known as the best option for determining what a student has learned (Barnes, 2002). One must ask if the research supports these stereotypes. When evaluating the ACT exam, the answer appears to be "no." Recent quantitative studies suggest that the ACT exam can also adequately predict student aptitude and intelligence quotient (IQ). One such study measured approximately 1200 student ACT scores with

two separate intelligence tests and found a high correlation of a predictive nature between the ACT and both intelligence exams (Koenig, Frey, & Detterman, 2008). What is more, studies completed in the last year indicate self-reported student anxiety is lower with the ACT, and minorities are showing marked improvement on the ACT exam, leading some to suggest it may increase minority interest in attending college (Galuska, 2010).

Summary

It is important to note that high stakes tests in the United States have become a debate that extends far beyond educational circles. In reality, the topic has become a political issue with far more stakeholders than the educational theorist or practitioner. The students continue to be caught in the debate as high school exit exams and college admission tests redefine success as showing the least student decline each year on test scores (Marklein, 2010).

Chapter Three: Methodology

Introduction

This study was designed to determine if there was a predictive correlation between student performance on the sixth grade Stanford Achievement Test 10 and the eighth grade Explore Exam among a population of North Texas students. If certain strands of the sixth grade exam were found to be valid predictors of performance on the eighth grade exam's subject tests, then early interventions can be designed to help under-performing members of the population in sixth grade. This will serve to better prepare this population of students for their eighth grade exams. The Stanford Achievement Test is a typical representation of the K-12 high stakes test that was mandated by the 2002 legislation known as the No Child Left Behind Act. The Explore Exam is the first college readiness exam available to students offered by either the College Board or the ACT Corporation. The Explore Exam is available to students beginning in eighth grade and offers a prediction of student performance on the subsequent college admissions test known as the ACT Exam. In addition, the ACT Corporation engages in an ongoing study that correlates student performance on the Explore Exam with subsequent college success as measured by the students' grade point averages. The findings of this study were noteworthy as much of the current research ignores the lack of an established statistical connection between K-12 achievement testing and college readiness.

This quantitative study measures student performance on the Stanford Achievement Test 10 in sixth grade and subsequently measures the same students' performance on the eighth grade Explore Exam for a given population of students in

North Texas. Each strand from the sixth grade assessment in the areas of reading, science, math, and English is measured against the subject test score of the eighth grade assessment. The analysis includes the use of the Pearson correlation statistic, multi-linear regression analysis, and R-square analysis.

Design

This was a quantitative, cross-sectional correlational study that used archived student performance data. According to Creswell (2008), this research design provided an objective means for analyzing student performance via two valid instruments to determine the relationships among variables imbedded within each respective exam. A quantitative correlation study design was used in order to isolate the quantifiable variables of interest. The purpose of this study was to evaluate the correlation between the variables through Pearson's correlation statistic, multi-linear regression analysis, and R-square analysis. This research analysis was chosen for its thorough methodology and likelihood of identifying statistical significance between the variables, should it exist. The research includes four main hypotheses.

Research Questions and Hypotheses

The following research questions and hypotheses have guided the present study.

Research question 1. Which, if any, of the 12 reading strand scores on the sixth grade Stanford Achievement Test explain the greatest percentage of variance in the eighth grade ACT Explore reading test score among students who attended a K-12 school in North Texas?

- Hypothesis 1: H_0: None of the 12 sixth grade standardized test strand scores relating to reading explain any variance in the eighth grade ACT Explore reading test score among students who attend a K-12 school in North Texas.

- H_a: One or more of the 12 sixth grade standardized test strand scores relating to reading explain a statistically significant percentage of variance in the eighth grade ACT Explore reading test score among students who attend a K-12 school in North Texas.

Research question 2. Which, if any, of the eight science strand scores on the sixth grade Stanford Achievement Test explain the greatest percentage of variance in the eighth grade ACT Explore science test score among students who attended a K-12 school in North Texas?

- Hypothesis 2: H_0: None of the eight sixth grade standardized test strand scores relating to science explain any variance in the eighth grade ACT Explore science test score among students who attend a K-12 school in North Texas.

- H_a: One or more of the eight sixth grade standardized test strand scores relating to science explain a statistically significant percentage of variance in the eighth grade ACT Explore science test score among students who attend a K-12 school in North Texas.

Research question 3. Which, if any, of the 15 math strand scores on the sixth grade Stanford Achievement Test explain the greatest percentage of variance in the eighth grade ACT Explore math test score among students who attended a K-12 school in North Texas?

- Hypothesis 3: H_0: None of the 15 sixth grade standardized test strand scores relating to math explain any variance in the eighth grade ACT Explore math test score among students who attend a K-12 school in North Texas.

- H_a: One or more of the 15 sixth grade standardized test strand scores relating to math explain a statistically significant percentage of variance in the eighth grade ACT Explore math test score among students who attend a K-12 school in North Texas.

Research question 4. Which, if any, of the 11 sixth grade English scores on the Stanford Achievement Test explain the greatest percentage of variance in the eighth grade ACT Explore English test score among students who attended a K-12 school in North Texas?

- Hypothesis 4: H_0: None of the 11 sixth grade standardized test strand scores relating to English explain any variance in the eighth grade ACT Explore English test score among students who attend a K-12 school in North Texas.

- H_a: One or more of the 11 sixth grade standardized test strand scores relating to English explain a statistically significant percentage of variance in the eighth grade ACT Explore Exam English test score among students who attend a K-12 school in North Texas.

Participants

The study took place in a private Christian day school in its 9th year of existence. The school's admissions policy required students to be academically above average. Specifically, prospective students are required to have a minimum complete battery stanine of five on the Stanford Achievement Test 10. There were 191 potential subjects

eligible for inclusion in this research. Selection and participation in the research was based on a convenience sample with a selection solely determined by the enrollment date and subsequent administering of the two assessment tools between the years of 2005-2009. All students included in the study were enrolled in sixth grade during 2005 and subsequently completed eighth grade at the same school in 2009. Eligibility for inclusion in the study began with 191 sixth graders who were initially administered the Stanford Achievement Test 10 by the school; and, 123 of these students were subsequently tested in eighth grade. During the study, 68 students were considered dropouts and several factors could have attributed to this. First, as a tuition based school and given the national economic environment during the period of this study, the school population became somewhat transient with some students seeking alternative educational venues. In addition, absenteeism on a single portion of either exam precluded student participation in this study. It should also be noted that the school's program for homeschooling students offered student testing as an optional service and therefore impacted the number of students assessed via each instrument in a given year. Stringent measures were taken to safeguard the anonymity of the students and their respective scores, as described in detail in the subsequent section on data collection procedures. Of the 123 subjects, 11% identified themselves as minority, 54% were female, and 46% were male.

Setting

The school site for this study was located in the southern United States, in what is known as the Dallas-Fort Worth Metroplex, situated in North Texas. The region includes a dense urban population of over 10 million people (North Central Texas Council of Governments, 2009). Included in this population are a myriad of K-12 private education

entities, including 80 schools accredited or recognized by the Association of Christian Schools International (2009b). The dynamic created by the competition of many different tuition based schools has created the need for schools in the area to offer a broad range of student activities while maintaining academic proficiency. In addition to the academic program, the school offers a wide array of athletic and fine art opportunities for students. Also, the school incorporated a program for a limited number of students with learning disabilities and included an enrichment program for K-8 home-school students.

The school where the research was conducted is a PK4-12, co-educational, private Christian day school. The student enrollment was 731 students and had steadily increased since the school's inception in 1999. The demographic breakdown of the school mirrored the local community with approximately 11% of students identifying themselves as minority. The school was registered as a 501.C3 not-for-profit tax entity and incorporated an undisclosed amount of funds for financial aid in each annual budget. An independent, self-perpetuating board that was not connected to any outside church led the institution through the onsite management of a school president and leadership team. The school was self-described as a Christian educational institution and sought to hire teachers and enroll students in concert with its statement of faith. The school was concurrently accredited by the Southern Association of Christian Schools and the Association of Christian Schools International.

Instrumentation

The two assessment instruments used in this project were the Stanford Achievement Test 10, published by Pearson Education, and the ACT Corporation's Explore Exam. The Stanford Achievement Test 10 was selected because of the

accessibility of the data at the subject school due to its testing policy. However, it should be noted that the Stanford Achievement Test 10 is an extremely popular achievement test that was administered in over 5700 private schools last year as well as serving as the state tests for Arkansas and Alabama (ACSI, 2008). The Stanford Achievement Test 10 has a statistical reliability figure of .87 (Technical Manual, 2003).

The ACT Corporation's Explore Exam was selected because it is the only college readiness assessment available to students as young as eighth grade. The Explore Exam is a fast growing college assessment that is a component of the ACT Corporation's EPASS program, which seeks to gauge college readiness as students enter high school (ACT Corporation, 2010c). The EPASS program includes subsequent assessment components during each year of high school. The assessment program concludes with students being administered the ACT college entrance exam. The reliability of the Explore Exam is .85 (ACT Corporation, 2007). It should be further noted that the ACT Corporation monitors select students' college grade point averages and has found a statistically significant correlation between the students' scores and their previous performance on the eighth grade Explore Exam.

Procedures

Data collection procedures. For the purposes of this study, students were required to be assessed by the Stanford Achievement Test 10 and the ACT Explore Exam. These assessments are an annual practice at the school site as a part of the school's curriculum evaluation cycle. The sixth grade students are assessed by the Stanford Achievement Test 10 and the eighth grade students were assessed with the ACT Explore Exam during the spring of the sixth grade and eighth grade years respectively. Scores are

reported back to the school with group summaries and individual student reports. The parents of these students are also issued score reports. Once the testing is completed, there are no further requirements of the students.

The following steps were taken in the data collection process to ensure subject anonymity. First, following a formal, verbal request, the Office of the President of the subject school took the existing data from the sixth grade Stanford Achievement Test scores and reconciled the list of students with students who were subsequently assessed by the school via the ACT Explore Exam in the eighth grade year. Once the list was compiled, the Office of the President made a request to the President of the ACT Corporation. The request was for the Detailed Item Analysis scores from the Explore Exam for the students in question. Upon receipt of the Explore Exam scores, the Office of the President removed all identifying student information including, but not limited to, the student name, identification number, and date of birth. Instead, students were assigned a random number beginning with 01. Once the initial compilation of data was complete, it was entered into a Microsoft Office Excel spreadsheet that was used for SPSS analysis. After the initial data entry was completed, two additional individuals manually reviewed all score inputs to ensure accuracy. Once completed and agreed to by the Office of the President of the school, the data were sent to the researcher for analysis.

Data analysis. All statistical analyses were performed using SPSS Statistics for Windows. All of the analyses were two-tailed with a 5% alpha level. Demographic characteristics of the study sample were described using (a) the mean, standard deviation, and range for continuous scaled variables, and (b) frequency and percent for categorical scaled variables. Pearson's correlation statistic was used to analyze the relationship

among each of the sixth-grade Stanford Achievement Test sub-strand scores in the areas of reading, science, math, and English with the overall Explore Exam score within each subject area. Specifically, Pearson's correlation statistic was used to relate each of the 12 sixth grade standardized test strand scores relating to reading individually with the eighth grade ACT Explore reading test score. Next, Pearson's correlation statistic was used to compare each of the 8 sixth grade standardized test strand scores relating to science individually with the eighth grade ACT Explore science test score. In addition, Pearson's correlation statistic was used to compare each of the 15 sixth grade standardized test strand scores relating to math individually with the eighth grade ACT Explore math test score. Finally, Pearson's correlation statistic was used to compare each of the 11 sixth grade standardized test strand scores relating to English individually with the eighth grade ACT Explore English test score. For a visual breakdown of the sixth grade strands grouped by the eighth grade subject matter test, please reference Table 1.1.

Hypothesis 1 was tested using stepwise multiple linear regression analysis. Stepwise model selection was chosen in order to avoid multicollinearity and over fitting the model (Friedman, & Wall, 2005). The dependent variable in the regression model was the eighth grade ACT Explore reading test score. The candidate independent variables were the 12 sixth grade standardized test strand scores relating to reading (see Table 1.1). If any one of the 12 sixth grade standardized test strand scores relating to reading were found to be statistically significant, then the null hypothesis would be rejected and it would be concluded that one or more sixth grade standardized test strand scores relating to reading is a valid predictor of the eighth grade ACT Explore reading test score. The

equation of the model was reported and statistically significant regression coefficients were interpreted. The *R*-square for the final model was also presented and interpreted.

Similarly, Hypothesis 2 was tested using stepwise multiple linear regression analysis. The dependent variable in the regression model was the eighth grade ACT Explore science test score. The candidate independent variables were the 8 sixth grade standardized test strand scores relating to science (see Table 1.1). If any one of the 8 sixth grade standardized test strand scores relating to science were to be statistically significant, then the null hypothesis would be rejected, and it would be concluded that one or more sixth grade standardized test strand scores relating to science is a valid predictor of the eighth grade ACT Explore reading test score. The equation of the model was reported and statistically significant regression coefficients were interpreted. The *R*-square for the final model was also presented and interpreted.

Likewise, Hypothesis 3 was tested using stepwise multiple linear regression analysis. The dependent variable in the regression model was the eighth grade ACT Explore math test score. The candidate independent variables were the 15 sixth grade standardized test strand scores relating to math (see Table 1.1). If any one of the 15 sixth grade standardized test strand scores relating to math were to be statistically significant, then the null hypothesis would be rejected, and it would be concluded that one or more sixth grade standardized test strand scores relating to math is a valid predictor of the eighth grade ACT Explore math test score. The equation of the model was reported and statistically significant regression coefficients were interpreted. The *R*-square for the final model was presented and interpreted.

Finally, Hypothesis 4 was tested using stepwise multiple linear regression analysis. The dependent variable in the regression model was the eighth grade ACT Explore English test score. The candidate independent variables were the 11 sixth grade standardized test strand scores relating to English (see Table 1.1). If any one of the 11 sixth grade standardized test strand scores relating to English were to be statistically significant, then the null hypothesis would be rejected, and it would be concluded that one or more sixth grade standardized test strand scores relating to English is a valid predictor of the eighth grade ACT Explore English test score. The equation of the model was reported and statistically significant regression coefficients were interpreted. The R-square for the final model was also presented and interpreted.

Sample size justification. The power calculations were performed using the Power Analysis and Sample Size (PASS) software (Hintze, 2008). As discussed elsewhere in the research, the researcher had access to a sample size of 123 for this study. Hypotheses 1 through 4 were tested using multiple linear regression analysis. Power analysis for multiple linear regression analysis is based on the amount of change in R-squared attributed to the variables of interest. According to Cohen (1988), small, medium, and large effect sizes for hypothesis tests about R-squared are: R-squared = 0.0196, R-squared = 0.13, and R-squared = 0.26 respectively. A sample size of 123 achieves 80% power to detect an R-squared of 0.06 (which is a small to medium effect size) attributed to one independent variable using an F-test with a significance level (alpha) of 0.05. However, the number of independent variables in the model has an influence on the effect size that can be detected with a given sample size, alpha level, and power. Since stepwise model selection was used to test the hypotheses, the number of

independent variables that were actually included in the model could not be known prior to conducting the analysis. Nevertheless, the fewest number of independent variables that could be in the model was 1 and the most was 15 (hypothesis 3). Thus, Table 3.1 shows the detectable effect sizes with a sample size of 123, an alpha level of 0.05, and power of 0.80 for various numbers of independent variables. Based on Table 3.1, a sample size of 123 was justifiable for detecting medium to large effect sizes for hypotheses 1 through 4.

Table 3.1

Detectable Effect Sizes Using Multiple Linear Regression Analysis

Number of Independent Variables	Effect Size
1	0.06
2	0.07
3	0.08
4	0.09
5	0.10
6	0.10
7	0.11
8	0.11
9	0.12
10	0.12
11	0.13
12	0.13
13	0.14
14	0.14
15	0.14

Note. The analysis uses a sample size of 123, alpha of 0.05, power of 0.80 for various numbers of independent variables.

Chapter Four: Results

Overview

As was discussed in Chapter One, the purpose of this study was to determine if there is a predictive correlation between a specific sixth grade achievement test known as the Stanford Achievement Test 10 and the eighth grade college readiness assessment instrument known as the Explore Exam for a group of North Texas students. Within each of the four subjects of reading, science, math, and English, the research question that was answered is what, if any, correlation is there between sixth grade Stanford Achievement Test 10 scores and eighth grade ACT Explore Exam scores among 123 students who attend a K-12 school in North Texas. This study evaluated the correlation between the variables through Pearson's correlation statistic and multi-linear regression analysis. The independent variables for this study were the sixth grade Stanford Achievement Test 10 subtest scores, while the dependent variables were the corresponding eighth grade Explore Exam subject test scores as described in Chapter One. As also discussed in Chapter One, all scores are reported in percentiles. After an initial reporting of the descriptive statistics for student performance on the Stanford Achievement Test 10 and the Explore Exam, this chapter is organized by reported findings according to the research questions and hypotheses as described in Chapter One and in the following subsections.

Research Questions and Hypotheses

The following research questions and hypotheses have guided the present study.

Research question 1. Which, if any, of the 12 reading strand scores on the sixth grade Stanford Achievement Test explain the greatest percentage of variance in the eighth grade ACT Explore reading test score among students who attended a K-12 school in North Texas?

- Hypothesis 1: H_0: None of the 12 sixth grade standardized test strand scores relating to reading explain any variance in the eighth grade ACT Explore reading test score among students who attend a K-12 school in North Texas.

- H_a: One or more of the 12 sixth grade standardized test strand scores relating to reading explain a statistically significant percentage of variance in the eighth grade ACT Explore reading test score among students who attend a K-12 school in North Texas.

Research question 2. Which, if any, of the eight science strand scores on the sixth grade Stanford Achievement Test explain the greatest percentage of variance in the eighth grade ACT Explore science test score among students who attended a K-12 school in North Texas?

- Hypothesis 2: H_0: None of the eight sixth grade standardized test strand scores relating to science explain any variance in the eighth grade ACT Explore science test score among students who attend a K-12 school in North Texas.

- H_a: One or more of the eight sixth grade standardized test strand scores relating to science explain a statistically significant percentage of variance in the eighth

grade ACT Explore science test score among students who attend a K-12 school in North Texas.

Research question 3. Which, if any, of the 15 math strand scores on the sixth grade Stanford Achievement Test explain the greatest percentage of variance in the eighth grade ACT Explore math test score among students who attended a K-12 school in North Texas?

- Hypothesis 3: H_0: None of the 15 sixth grade standardized test strand scores relating to math explain any variance in the eighth grade ACT Explore math test score among students who attend a K-12 school in North Texas.

- H_a: One or more of the 15 sixth grade standardized test strand scores relating to math explain a statistically significant percentage of variance in the eighth grade ACT Explore math test score among students who attend a K-12 school in North Texas.

Research question 4. Which, if any, of the 11 sixth grade English scores on the Stanford Achievement Test explain the greatest percentage of variance in the eighth grade ACT Explore English test score among students who attended a K-12 school in North Texas?

- Hypothesis 4: H_0: None of the 11 sixth grade standardized test strand scores relating to English explain any variance in the eighth grade ACT Explore English test score among students who attend a K-12 school in North Texas.

- H_a: One or more of the 11 sixth grade standardized test strand scores relating to English explain a statistically significant percentage of variance in the eighth

grade ACT Explore Exam English test score among students who attend a K-12 school in North Texas.

Descriptive Statistics for the Independent and Dependent Variables

Table 4.1 shows descriptive statistics for the sixth grade Stanford Achievement Test 10 reading test scores. Considering the lowest possible score was 0 and the highest possible score was 100, all of the test scores were relatively high on average. The average test scores ranged from 76.0 to 88.5. The test with the lowest average was Informational, and the test with the highest average was Context Clues. The Strategies test score had the greatest variability with a minimum score of 20 and a maximum of 100. The Initial Understanding test had the least variability, with a minimum of 58.3 and a maximum of 100.

Table 4.1

Descriptive Statistics for the Sixth Grade Stanford Achievement Test 10 Reading Test Scores

Topic	Valid N	Missing N	Mean	*SD*	Min.	Max.
Synonyms	123	0	84.4173	13.36742	41.67	100.00
Multiple meaning words	123	0	88.4372	12.91374	44.44	100.00
Context clues	123	0	88.5276	13.18796	33.33	100.00
Thinking skills – Vocabulary	123	0	88.0307	11.40398	38.89	100.00
Literary	123	0	84.5980	13.09310	44.44	100.00
Informational	123	0	76.0163	15.02742	38.89	100.00
Functional	123	0	83.5592	13.96425	38.89	100.00
Initial understanding	123	0	84.6883	10.74279	58.33	100.00
Interpretation	123	0	83.3333	12.34190	45.00	100.00
Critical analysis	123	0	79.0650	15.80296	33.33	100.00
Strategies	123	0	77.0732	17.63620	20.00	100.00
Thinking skills – Comprehension	123	0	80.4684	13.14379	42.86	100.00

Table 4.2 shows descriptive statistics for the sixth grade Stanford Achievement Test 10 science test scores. The average test scores were generally lower than the average test scores for reading. The average test scores ranged from 67.8 to 80.0. The Physical test score had the lowest average while the Constancy test score had the highest average. The Physical test score had the greatest amount of variation with a minimum of 18.2 and a maximum of 100. The Life score had the least amount of variation with a range of 45.5 to 100.

Table 4.2

Descriptive Statistics for the Sixth Grade Stanford Achievement Test 10 Science Test Scores

Topic	Valid N	Missing N	Mean	SD	Min.	Max.
Life	123	0	78.9357	13.13366	45.45	100.00
Physical	123	0	67.8492	16.09873	18.18	100.00
Earth	123	0	77.3097	15.10358	36.36	100.00
Nature of science	123	0	76.0743	17.10925	14.29	100.00
Models	123	0	71.8351	15.06373	28.57	100.00
Constancy	123	0	79.9875	13.60230	23.08	100.00
Form and function	123	0	73.1707	13.37310	38.46	100.00
Thinking skills – Science	123	0	75.2033	13.14170	35.00	100.00

Table 4.3 shows descriptive statistics for the sixth grade Stanford Achievement Test 10 math test scores. The average test scores ranged from 56.1 to 81.9. The Reasoning and Problem Solving test score had the lowest average while the Computation with Whole Numbers test score had the highest average. The Communication and Representation test score had the greatest amount of variation with a minimum of 0.0 and a maximum of 100. The Thinking Skills – Problem Solving score had the least amount of variation with a range of 24.4 to 95.1.

Table 4.3

Descriptive Statistics for the Sixth Grade Stanford Achievement Test 10 Math Test Scores

Topic	Valid *N*	Missing *N*	Mean	*SD*	Min.	Max.
Number sense and operations	123	0	63.3407	19.46601	18.18	100.00
Patterns, relationships, and algebra	123	0	66.0859	25.56804	14.29	100.00
Data, statistics, and probability	123	0	63.1098	21.04187	12.50	100.00
Geometry and measurement	123	0	71.9143	19.51200	18.18	100.00
Communication and representation	123	0	66.6667	25.30686	.00	100.00
Estimation	123	0	66.7480	20.02031	20.00	100.00
Mathematical connections	123	0	70.0736	18.23522	19.05	100.00
Reasoning and problem solving	123	0	56.0976	21.55375	8.33	100.00
Thinking skills – Problem solving	123	0	65.4174	16.93562	24.39	95.12
Computation with whole numbers	123	0	81.8699	17.28970	20.00	100.00
Computation with decimals	123	0	70.7317	20.84961	20.00	100.00
Computation with fractions	123	0	58.1301	26.27581	8.33	100.00
Computation in context	123	0	69.9695	19.29964	18.75	100.00
Computation and symbolic notation	123	0	69.0041	19.77069	12.50	100.00
Thinking skills – Procedures	123	0	69.9695	19.29964	18.75	100.00

Table 4.4 shows descriptive statistics for the sixth grade Stanford Achievement Test 10 English test scores. The average test scores ranged from 71.2 to 90.2. The Phonetic Principles test score had the lowest average while the Usage test score had the highest average. The Content and Organization test score had the greatest amount of variation with a range of 11.1 to 100. The No Mistakes score had the least amount of variation with a range of 42.9 to 100.

Table 4.4

Descriptive Statistics for the Sixth Grade Stanford Achievement Test 10 English Test Scores

Topic	Valid N	Missing N	Mean	*SD*	Min.	Max.
Capitalization	123	0	81.3008	16.81429	12.50	100.00
Usage	123	0	90.2439	12.85725	37.50	100.00
Punctuation	123	0	75.0000	18.45742	25.00	100.00
Sentence structure	123	0	83.4146	16.08529	30.00	100.00
Prewriting	123	0	84.8780	15.85621	40.00	100.00
Content and organization	123	0	81.8428	15.92257	11.11	100.00
Thinking skills – Language expression	123	0	82.1138	14.30234	33.33	100.00
Phonetic principles	123	0	71.1834	18.52633	27.78	100.00
Structural principles	123	0	75.8537	20.20091	30.00	100.00
No mistakes	123	0	87.6887	14.44006	42.86	100.00
Homophones	123	0	74.6341	23.05705	20.00	100.00

Table 4.5 shows descriptive statistics for the eighth grade Explore Exam test scores. The average test scores ranged from 64.6 to 77.9. The Math test score had the lowest average while the English test score had the highest average. The Science test score had the greatest amount of variation with a range of 21.4 to 100. The English score had the least amount of variation with a range of 45.0 to 100.

Table 4.5

Descriptive Statistics for the Eighth Grade Explore Exam Test Scores

Test Topic	N		Mean	*SD*	Min.	Max.
8th grade reading	123	0	72.6829	18.23575	23.33	100.00
8th grade science	123	0	66.8118	18.76906	21.43	100.00
8th grade math	123	0	64.5528	15.68862	23.33	96.67
8th grade English	123	0	77.8659	12.03514	45.00	100.00

Pearson's Correlation Statistics

Each individual sixth grade sub-test was compared with the eighth grade test using Pearson's correlation statistic. It is possible for each of the subtests to be individually correlated with the dependent variable, yet not all may be statistically significant in the same multiple linear regression analysis. The various sub-tests may not explain independent variance in the dependent variable. For example, it is possible that all 12 subtests are individually correlated with the eighth grade test, and yet, once one knows a student's scores on the first three subtests, the other nine test scores may not add additional predictive information about the eighth grade test beyond the predictive information provided by the first three subtests.

Reading. Table 4.6 shows the Pearson correlation statistics for comparing each of the sixth grade Stanford Achievement Test 10 reading subtest scores with the eighth grade Explore reading test score. There were statistically significant, positive correlations between each of the sixth grade subtest scores and the eighth grade test score. The strength of the correlations ranged from .362 to .621. The Multiple Meaning Words test score had the weakest correlation with the eighth grade test score while the Thinking Skills – Comprehension test score had the strongest correlation with the eighth grade test score.

Table 4.6

Pearson's Correlation Statistics for Sixth Grade Stanford Achievement Test 10 Reading Test Scores Versus the Eighth Grade Explore Reading Test Scores

Test Topic	Pearson Correlation
Synonyms	.512*
Multiple meaning words	.362*
Context clues	.405*
Thinking skills – Vocabulary	.518*
Literary	.499*
Informational	.585*
Functional	.563*
Initial understanding	.553*
Interpretation	.603*
Critical analysis	.516*
Strategies	.609*
Thinking skills – Comprehension	.621*

Note. $N = 123$, * indicates $p < .001$

Science. Table 4.7 shows the Pearson correlation statistics for comparing each of the sixth grade Stanford Achievement Test 10 science subtest scores with the eighth grade Explore science test score. There were statistically significant, positive correlations between each of the sixth grade subtest scores and the eighth grade test score. The strength of the correlations ranged from .322 to .499. The Earth test score had the weakest correlation with the eighth grade test score while the Physical test score had the strongest correlation with the eighth grade test score.

Table 4.7

Pearson's Correlation Statistics for Sixth Grade Stanford Achievement Test 10 Science Test Scores Versus the Eighth Grade Explore Science Test Score

Test Topic	Pearson Correlation
Life	.384*
Physical	.499*
Earth	.322*
Nature of science	.329*
Models	.461*
Constancy	.374*
Form and function	.419*
Thinking skills – Science	.462*

Note. N = 123; * indicates *p*-value = <.001

Math. Table 4.8 shows the Pearson correlation statistics for comparing each of the sixth grade Stanford Achievement Test 10 math subtest scores with the eighth grade Explore math test score. There were statistically significant, strong positive correlations between each of the sixth grade subtest scores and the eighth grade test score. The strength of the correlations ranged from .420 to .688. The Computation with Whole Numbers test score had the weakest correlation with the eighth grade test score while the Thinking Skills – Problem Solving test score had the strongest correlation with the eighth grade test score.

Table 4.8

Pearson's Correlation Statistics for Sixth Grade Stanford Achievement Test 10 Math Test Scores Versus the Eighth Grade Explore Math Test Score

Test Topic	Pearson Correlation
Number sense and operations	.644*
Patterns, relationships, and algebra	.572*
Data, statistics, and probability	.454*
Geometry and measurement	.510*
Communication and representation	.479*
Estimation	.496*
Mathematical connections	.624*
Reasoning and problem solving	.626*
Thinking skills-problem solving	.688*
Computation with whole numbers	.420*
Computation with decimals	.509*
Computation with fractions	.616*
Computation in context	.612*
Computation and symbolic notation	.581*
Thinking skills – procedures	.612*

Note. $N = 123$, * indicates $p < .001$

English. Table 4.9 shows the Pearson correlation statistics for comparing each of the sixth grade Stanford Achievement Test 10 English subtest scores with the eighth grade Explore English test score. There were statistically significant, positive correlations between each of the sixth grade subtest scores and the eighth grade test score. The strength of the correlations ranged from .250 to .501. The Capitalization test score had the weakest correlation with the eighth grade test score while the Content and Organization test score had the strongest correlation with the eighth grade test score.

Table 4.9

Pearson's Correlation Statistics for Sixth Grade Stanford Achievement Test 10 English Test Scores Versus the Eighth Grade Explore English Test Score

Test Topic	Pearson Correlation
Capitalization	.245*
Usage	.364*
Punctuation	.379*
Sentence structure	.440*
Prewriting	.242*
Content and organization	.501*
Thinking skills – Language expression	.497*
Phonetic principles	.357*
Structural principles	.421*
No mistakes	.270*
Homophones	.495*

Note. N = 123, * indicates $p < .001$

Hypothesis Testing

Hypothesis 1: Reading. Research Question 1: Which, if any, of the 12 reading strand scores on the sixth grade Stanford Achievement Test explain the greatest percentage of variance in the eighth grade ACT Explore reading test score among students who attended a K-12 school in North Texas?

- Hypothesis 1: H_0: None of the 12 sixth grade standardized test strand scores relating to reading explain any variance in the eighth grade ACT Explore reading test scores among students who attend a K-12 school in North Texas.

- H_a: One or more of the 12 sixth grade standardized test strand scores relating to reading explain a statistically significant percentage of variance in the eighth grade ACT Explore reading test score among students who attend a K-12 school in North Texas.

Hypothesis 1 was tested using stepwise multiple linear regression analysis. The dependent variable in the regression model was the eighth grade ACT Explore reading test score. The candidate independent variables were the 12 sixth grade standardized subtest scores relating to reading. The normal probability plot was inspected and there was no indication of a violation of the normality assumption. Scatter plots were inspected and there were no indications that the linearity assumption was violated. The variance inflation factor for each of the independent variables was less than 2.0, indicating multicollinearity was not a problem. A scatter plot of the standardized residuals against the standardized predicted values did not give any indication of a violation of the constant variance assumption. Table 4.10 shows that Thinking Skills – Comprehension, Thinking Skills – Vocabulary, and Initial Understanding were statistically significant, $F(3, 119) = 36.1$, $p < .001$. Therefore, the null hypothesis was rejected and it was concluded that the sixth grade Thinking Skills – Comprehension, Thinking Skills – Vocabulary, and Initial Understanding test scores explain a statistically significant percentage of the variance in the eighth grade ACT Explore reading test score.

The equation of the model was: RE = -34.2 + 5.15*TC + 4.08*TV + 3.49*IU

Where:

- RE = The average eighth grade ACT Explore reading test score
- TC = The sixth grade Thinking Skills – Comprehension test score, measured in units of 10%
- TV = The sixth grade Thinking Skills – Vocabulary test score, measured in units of 10%
- TC = The sixth grade Initial Understanding test score, measured in units of 10%

The interpretation of the model is, when controlling for Thinking Skills –

Vocabulary and Initial Understanding, the average eighth grade ACT Explore reading test

score is expected to increase by 5.14 points for every 10-point increase in the sixth grade

Thinking Skills – Comprehension test score. When controlling for Thinking Skills –

Comprehension and Initial Understanding, the average eighth grade ACT Explore

reading test score is expected to increase by 4.08 points for every 10-point increase in the

sixth grade Thinking Skills – Vocabulary test score. When controlling for Thinking

Skills – Comprehension and Thinking Skills - Vocabulary, the average eighth grade ACT

Explore reading test score is expected to increase by 3.49 points for every 10-point

increase in the sixth grade Initial Understanding test score. The R-square for the final

model was .476, which means that collectively, Thinking Skills – Comprehension,

Thinking Skills – Vocabulary, and Initial Understanding explain 47.6% of the total

variance in eighth grade ACT Explore reading test scores. Since the adjusted R-square

(.46) was very close to the R-square (.48), the sample size was deemed large enough to be

confident in the R-square value. A post-hoc power analysis revealed that this study had

greater than 99% power to detect an R-square of .48 with a sample size of 123 and an

alpha level of .05.

Among the three independent variables, Thinking Skills – Comprehension was

the most important predictor of the eighth grade reading test because it explained 38.6%

(as measured by squaring the semi-partial correlation coefficient) of the total variance in

the eighth grade reading test scores. After controlling for Thinking Skills –

Comprehension, Thinking Skills – Vocabulary explained only an additional 6.6% of

variance in the eighth grade reading test scores. When controlling for both the Thinking

Skills – Comprehension and Thinking Skills – Vocabulary test scores, Initial

Understanding explained only an additional 2.4% of variance in the eighth grade reading

test scores.

Table 4.10

Stepwise Multiple Linear Regression Analysis to Test Hypothesis 1

Model	Unstandardized Coefficients		Standardized Coefficients		
	B	Std. Error	Beta	*T*	*p*-value
(Constant)	-34.224	11.200	-		
Thinking skills – Comprehension	5.146	1.239	.371	4.152	<.001
Thinking skills – Vocabulary	4.080	1.226	.255	3.329	.001
Initial understanding	3.492	1.490	.206	2.343	.021

Note. Dependent variable: eighth grade reading
Candidate independent variables: All 12 sixth grade standardized subtest scores relating to reading
Independent variables were divided by 10 in order to aid in the interpretation of the regression coefficients
R-Square attributed to Thinking Skills Comprehension = .386
R-Square attributed to Thinking Skills Vocabulary = .066
R-Square attributed to Initial Understanding = .024
R-Square attributed to full model = .4476

Hypothesis 2: Science. Research Question 2: Which, if any, of the eight science

strand scores on the sixth grade Stanford Achievement Test explain the greatest

percentage of variance in the eighth grade ACT Explore science test score among

students who attended a K-12 school in North Texas?

- Hypothesis 2: H_0: None of the eight sixth grade standardized test strand scores

  relating to science explain any variance in the eighth grade ACT Explore science

  test score among students who attend a K-12 school in North Texas.

- *H$_a$*: One or more of the eight sixth grade standardized test strand scores relating to science explain a statistically significant percentage of variance in the eighth grade ACT Explore science test score among students who attend a K-12 school in North Texas.

Hypothesis 2 was tested using stepwise multiple linear regression analysis. The dependent variable in the regression model was the eighth grade ACT Explore science test score. The candidate independent variables were the eight sixth grade standardized subtest scores relating to science. The normal probability plot was inspected and there was no indication of a violation of the normality assumption. Scatter plots were inspected and there were no indications that the linearity assumption was violated. The variance inflation factor for each of the independent variables was less than 2.0, indicating multicollinearity was not a problem. A scatter plot of the standardized residuals against the standardized predicted values did not give any indication of a violation of the constant variance assumption. Table 4.11 shows that Physical, as well as Life and Models, were statistically significant, $F(3, 119) = 18.6, p < .001$. Therefore, the null hypothesis was rejected and it was concluded that the sixth grade Physical, Life, and Models test scores explain a statistically significant percentage of the variance in the eighth grade ACT Explore science test score.

The equation of the model was: SC = 3.62 + 3.65*PH + 2.57*LI + 2.53*MO

Where:

- SC = The average eighth grade ACT Explore science test score
- PH = The sixth grade Physical test score, measured in units of 10%
- LI = The sixth grade Life test score, measured in units of 10%

- MO = The sixth grade Models test score, measured in units of 10%

The interpretation of the model is, when controlling for Life and Models, the average eighth grade ACT Explore science test score is expected to increase by 3.65 points for every 10-point increase in the sixth grade Physical test score. When controlling for Physical and Models, the average eighth grade ACT Explore science test score is expected to increase by 2.57 points for every 10-point increase in the sixth grade Life test score. When controlling for Physical and Life, the average eighth grade ACT Explore science test score is expected to increase by 2.53 points for every 10-point increase in the sixth grade Models test score. The R-square for the final model was .319, which means that collectively, Physical, Life, and Models explain 31.9% of the total variance in eighth grade ACT Explore science test scores. Since the adjusted R-square (.30) was very close to the R-square (.32), the sample size was deemed large enough to be confident in the R-square value. A post-hoc power analysis revealed that this study had greater than 99% power to detect an R-square of .32 with a sample size of 123 and an alpha level of .05.

Among the three independent variables, Physical was the most important predictor of the eighth grade science test because it explained 24.9% (as measured by squaring the semi-partial correlation coefficient) of the total variance in the eighth grade science test scores. After controlling for Physical, the Life test score explained only an additional 4.5% of variance in the eighth grade science test scores. When controlling for both the Physical and Life test scores, Models explained only an additional 2.5% of variance in the eighth grade science test scores.

Table 4.11

Stepwise Multiple Linear Regression Analysis to Test Hypothesis 2

Model	Unstandardized Coefficients		Standardized Coefficients		
	B	Std. Error	Beta	*T*	*p*-value
(Constant)	3.619	9.436	-	.384	.702
Physical	3.653	1.102	.313	3.316	.001
Life	2.567	1.213	.180	2.116	.036
Models	2.526	1.203	.203	2.100	.038

Note. Dependent variable: eighth grade science
Candidate independent variables: All 8 sixth grade standardized subtest scores relating to science.
Independent variables were divided by 10 in order to aid in the interpretation of the regression coefficients
R-Square attributed to Physical = .249
R-Square attributed to Life = .045
R-Square attributed to Models = .025
R-Square attributed to full model = .319

Hypothesis 3: Math. Research Question 3: Which, if any, of the 15 math strand scores on the sixth grade Stanford Achievement Test explain the greatest percentage of variance in the eighth grade ACT Explore math test score among students who attended a K-12 school in North Texas?

- Hypothesis 3: H_0: None of the 15 sixth grade standardized test strand scores relating to math explain any variance in the eighth grade ACT Explore math test score among students who attend a K-12 school in North Texas.

- H_a: One or more of the 15 sixth grade standardized test strand scores relating to math explain a statistically significant percentage of variance in the eighth grade ACT Explore math test score among students who attend a K-12 school in North Texas.

Hypothesis 3 was tested using stepwise multiple linear regression analysis. The dependent variable in the regression model was the eighth grade ACT Explore math test score. The candidate independent variables were the 15 sixth grade standardized subtest scores relating to math. The normal probability plot was inspected and there was no indication of a violation of the normality assumption. Scatter plots were inspected and there were no indications that the linearity assumption was violated. The variance inflation factor for each of the independent variables was less than 2.0, indicating multicollinearity was not a problem. A scatter plot of the standardized residuals against the standardized predicted values did not give any indication of a violation of the constant variance assumption. Table 4.12 shows that Thinking Skills – Problem Solving and Computation with Fractions were statistically significant, $F(2, 120) = 61.7$, $p < .001$. Therefore, the null hypothesis was rejected and it was concluded that the sixth grade Thinking Skills – Problem Solving and Computation with Fractions test scores explain a statistically significant percentage of the variance in the eighth grade ACT Explore math test score.

The equation of the model was: MA = 24.96 + 4.68*TS + 1.55*CF

Where:

- MA = The average eighth grade ACT Explore math test score
- TS = The sixth grade Thinking Skills – Problem Solving test score, measured in units of 10%
- CF = The sixth grade Computation with Fractions test score, measured in units of 10%

The interpretation of the model is, when controlling for Computation with Fractions, the average eighth grade ACT Explore math test score is expected to increase by 4.68 points for every 10-point increase in the sixth grade Thinking Skills – Problem Solving test score. When controlling for Thinking Skills – Problem Solving, the average eighth grade ACT Explore math test score is expected to increase by 1.55 points for every 10-point increase in the sixth grade Computation with Fractions test score. The R-square for the final model was .507, which means that collectively, Thinking Skills – Problem Solving and Computation with Fractions explain 50.7% of the total variance in eighth grade ACT Explore math test scores. Since the adjusted R-square (.50) was very close to the R-square (.51), the sample size was deemed large enough to be confident in the R-square value. A post-hoc power analysis revealed that this study had greater than 99% power to detect an R-square of .51 with a sample size of 123 and an alpha level of .05.

Among the two independent variables, Thinking Skills – Problem Solving was the most important predictor of the eighth grade math test because it explained 47.3% (as measured by squaring the semi-partial correlation coefficient) of the total variance in the eighth grade math test scores. After controlling for Thinking Skills – Problem Solving, Computation with Fractions explained only an additional 3.4% of variance in the eighth grade math test scores.

Table 4.12

Stepwise Multiple Linear Regression Analysis to Test Hypothesis 3

Model	Unstandardized Coefficients		Standardized Coefficients	T	p-value
	B	Std. Error	Beta		
(Constant)	24.955	4.077	-	6.122	<.001
Thinking Skills-Problem Solving (An increase of 1 point = 10% increase on the test score)	4.676	.838	.505	5.579	<.001
Computation with Fractions (An increase of 1 point = 10% increase on the test score)	1.550	.540	.260	2.869	.005

Note. Dependent variable: eighth grade math
Candidate independent variables: All 15 sixth grade standardized subtest scores relating to math.
Independent variables were divided by 10 in order to aid in the interpretation of the regression coefficients
R-Square attributed to Thinking Skills - Problem Solving = .473
R-Square attributed to Computation with Fractions = .034
R-Square attributed to full model = .507

Hypothesis 4: English. Research Question 4: Which, if any, of the 11 sixth

grade English scores on the Stanford Achievement Test explain the greatest percentage of

variance in the eighth grade ACT Explore English test score among students who

attended a K-12 school in North Texas?

- Hypothesis 4: H_0: None of the 11 sixth grade standardized test strand scores

  relating to English explain any variance in the eighth grade ACT Explore English

  test score among students who attend a K-12 school in North Texas.

- H_a: One or more of the 11 sixth grade standardized test strand scores relating to

  English explain a statistically significant percentage of variance in the eighth

grade ACT Explore Exam English test score among students who attend a K-12 school in North Texas.

Hypothesis 4 was tested using stepwise multiple linear regression analysis. The dependent variable in the regression model was the eighth grade ACT Explore English test score. The candidate independent variables were the 11 sixth grade standardized subtest scores relating to English. The normal probability plot was inspected and there was no indication of a violation of the normality assumption. Scatter plots were inspected and there were no indications that the linearity assumption was violated. The variance inflation factor for each of the independent variables was less than 2.0, indicating multicollinearity was not a problem. A scatter plot of the standardized residuals against the standardized predicted values did not give any indication of a violation of the constant variance assumption. Table 4.13 shows that Content and Organization, Homophones, and Structural Principles were statistically significant, $F(3, 119) = 27.9$, $p < .001$. Therefore, the null hypothesis was rejected and it was concluded that the sixth grade Content and Organization, Homophones, and Structural Principles test scores explain a statistically significant percentage of the variance in the eighth grade ACT Explore English test scores.

The equation of the model was: EN = 34.57 + 2.88*CO + 1.53*HO + 1.10*SP

Where:

- EN = The average eighth grade ACT Explore English test score

- CO = The sixth grade Content and Organization test score, measured in units of 10%

- HO = The sixth grade Homophones test score, measured in units of 10%

- SP = The sixth grade Structural Principles test score, measured in units of 10%

The interpretation of the model is, when controlling for Homophones and Structural Principles, the average eighth grade ACT Explore English test score is expected to increase by 2.88 points for every 10-point increase in the sixth grade Content and Organization test score. When controlling for Content and Organization as well as Structural Principles, the average eighth grade ACT Explore English test score is expected to increase by 1.53 points for every 10-point increase in the sixth grade Homophones test score. When controlling for Content and Organization as well as Homophones, the average eighth grade ACT Explore English test score is expected to increase by 1.10 points for every 10-point increase in the sixth grade Structural Principles test score. The R-square for the final model was .413, which means that collectively, Content and Organization, Homophones, and Structural Principles explain 41.3% of the total variance in eighth grade ACT Explore English test scores. Since the adjusted R-square (.40) was very close to the R-square (.41), the sample size was deemed large enough to be confident in the R-square value. A post-hoc power analysis revealed that this study had greater than 99% power to detect an R-square of .41 with a sample size of 123 and an alpha level of .05.

Among the three independent variables, Content and Organization was the most important predictor of the eighth grade English test because it explained 25.1% (as measured by squaring the semipartial correlation coefficient) of the total variance in the eighth grade English test scores. After controlling for Content and Organization, Homophones explained an additional 13.8% of variance in the eighth grade English test scores. After controlling for Content and Organization as well as Homophones, Structural

Principles explained only an additional 2.4% of variance in the eighth grade English test

scores.

Table 4.13

Stepwise Multiple Linear Regression Analysis to Test Hypothesis 4

Model	Unstandardized Coefficients		Standardized Coefficients		
	B	Std. Error	Beta	*T*	*p*-value
(Constant)	34.567	5.010	-	6.900	<.001
Content and Organization (An increase of 1 point = 10% increase on the test score)	2.876	.554	.380	5.191	<.001
Homophones (An increase of 1 point = 10% increase on the test score)	1.534	.439	.294	3.495	.001
Structural Principles (An increase of 1 point = 10% increase on the test score)	1.096	.494	.184	2.220	.028

Note. Dependent variable: eighth grade English
Candidate independent variables: All 11 sixth grade standardized subtest scores relating to English.
Independent variables were divided by 10 in order to aid in the interpretation of the regression coefficients
R-Square attributed to Content and Organization = .251
R-Square attributed to Homophones = .138
R-Square attributed to Structural Principles = .024

R-Square attributed to full model = .413

Chapter Five: Implications and Conclusions

This chapter briefly reviews and summarizes the current correlational research study and provides discussion on the findings. Specifically, this chapter is divided into the following sections: (a) the purpose of this study, (b) restatement of the problem, (c) review of the methodology, (d) summary of findings, (e) discussion of the findings with respect to the relevant literature, (f) outline of the study limitations and recommendations for further research, and (g) conclusion.

Purpose of the Study

The purpose of this study was to determine if there is a correlation between a specific sixth grade achievement test known as the Stanford Achievement Test 10 and the eighth grade college readiness assessment instrument known as the Explore Exam for a group of North Texas students. As was discussed in the literature review, the ACT Corporation conducts an annual correlation study that tracks subjects' performance on the eighth grade Explore Exam and their respective college success as defined by their college grade point averages. Building upon this research, this study was to determine if a predictive correlation exists between one group of students' performance on the sixth grade Stanford Achievement Test 10 and the Explore Exam. The specific research questions and associated hypotheses are as follows:

Research question 1. Which, if any, of the 12 reading strand scores on the sixth grade Stanford Achievement Test explain the greatest percentage of variance in the eighth grade ACT Explore reading test score among students who attended a K-12 school in North Texas?

- Hypothesis 1: H_0: None of the 12 sixth grade standardized test strand scores relating to reading explain any variance in the eighth grade ACT Explore reading test score among students who attend a K-12 school in North Texas.

- H_a: One or more of the 12 sixth grade standardized test strand scores relating to reading explain a statistically significant percentage of variance in the eighth grade ACT Explore reading test score among students who attend a K-12 school in North Texas.

Research question 2. Which, if any, of the eight science strand scores on the sixth grade Stanford Achievement Test explain the greatest percentage of variance in the eighth grade ACT Explore science test score among students who attended a K-12 school in North Texas?

- Hypothesis 2: H_0: None of the eight sixth grade standardized test strand scores relating to science explain any variance in the eighth grade ACT Explore science test score among students who attend a K-12 school in North Texas.

- H_a: One or more of the eight sixth grade standardized test strand scores relating to science explain a statistically significant percentage of variance in the eighth grade ACT Explore science test score among students who attend a K-12 school in North Texas.

Research question 3. Which, if any, of the 15 math strand scores on the sixth grade Stanford Achievement Test explain the greatest percentage of variance in the eighth grade ACT Explore math test score among students who attended a K-12 school in North Texas?

- Hypothesis 3: H_0: None of the 15 sixth grade standardized test strand scores relating to math explain any variance in the eighth grade ACT Explore math test score among students who attend a K-12 school in North Texas.

- H_a: One or more of the 15 sixth grade standardized test strand scores relating to math explain a statistically significant percentage of variance in the eighth grade ACT Explore math test score among students who attend a K-12 school in North Texas.

Research question 4. Which, if any, of the 11 sixth grade English scores on the Stanford Achievement Test explain the greatest percentage of variance in the eighth grade ACT Explore English test score among students who attended a K-12 school in North Texas?

- Hypothesis 4: H_0: None of the 11 sixth grade standardized test strand scores relating to English explain any variance in the eighth grade ACT Explore English test score among students who attend a K-12 school in North Texas.

- H_a: One or more of the 11 sixth grade standardized test strand scores relating to English explain a statistically significant percentage of variance in the eighth grade ACT Explore Exam English test score among students who attend a K-12 school in North Texas.

Restatement of the Problem

With the passage of the No Child Left Behind Act of 2002, a system of educational accountability was established whereby government funds were issued to states based upon their respective students' performance on annual achievement based, high stakes testing. Subsequently, states have increasingly begun to create their own high

stakes instruments. The inevitable questions arise surrounding the purpose of the state constructed assessment instrument. Is determination of college and career readiness the common goal for the state tests or are states crafting assessment instruments in order to ensure student success and secure government funding? With the potential problem of competing goals for K-12 standardized testing, little research exists that attempts to quantify the connection between achievement tests and college readiness. This study determines that a predictive correlation exists between one such achievement test and a college readiness assessment instrument among the same population of students who were assessed via each respective instrument at the appropriate stage of their education. Specifically, this study correlates a North Texas school's sixth grade student population's performance on the Stanford Achievement Test 10 with their subsequent performance on the eighth grade ACT Corporation's Explore Exam.

Review of Methodology

As explained in Chapter Three, the study reported here is a quantitative correlational study that examined the association between student performance on the sixth grade Stanford Achievement Test 10 and the eighth grade ACT Corporation's Explore Exam among a population of North Texas students. The research population was 123 students who were assessed the Stanford Achievement Test 10 in sixth grade and subsequently assessed via the eighth grade Explore Exam. The school site was a private educational institution that has been in existence since 1999. The research relied on Stanford Achievement Test 10 scores reported by the host school and detailed Explore Exam scores that were secured through a special request to the ACT Corporation.

Quantitative, non-experimental statistical methods were used to analyze the data. Demographic characteristics of the study sample were described using (a) the mean, standard deviation, and range for continuous scaled variables, and (b) frequency and percent for categorical scaled variables. Pearson's correlation statistic was used to compare each of the sixth grade Stanford Achievement Test sub-strand scores in the areas of reading, science, math, and English with the overall eighth grade Explore Exam score within each subject area.

Each of four hypotheses was tested using stepwise multiple linear regression analysis. The dependent variable in the regression model was the eighth grade ACT Explore subject test score. The candidate independent variables were the sixth grade standardized test strand scores relating to the corresponding Explore Exam subject score (see Table 1.1). If any one of the sixth grade standardized test strand scores, in a given subject, was statistically significant, then the null hypothesis was rejected, and it was concluded that one or more sixth grade standardized test strand scores relating to the given subject was a valid predictor of the corresponding eighth grade ACT Explore test score. The equation of the model was reported and statistically significant regression coefficients were interpreted. The R-square for the final model was also presented and interpreted.

Summary of Findings

This study showed that there are statistically significant positive correlations between each of the sixth grade standardized subtest scores and the respective eighth grade subject matter ACT Explore test scores. Thinking Skills – Comprehension, Thinking Skills – Vocabulary, and Initial Understanding explained 47.6% of the total

variance in eighth grade ACT Explore reading test scores. Scores for Physical, Life, and Models explained 31.9% of the total variance in eighth grade ACT Explore science test scores. Thinking Skills – Problem Solving and Computation with Fractions explained 50.7% of the total variance in eighth grade ACT Explore math test scores. Content and Organization, Homophones, and Structural Principles explained 41.3% of the total variance in eighth grade ACT Explore English test scores.

Discussion of the Findings

This study provides strong evidence that sixth grade Stanford Achievement Test 10 subtest scores are positively correlated with respective eighth grade subject matter ACT Explore test scores. It is also interesting to note that the consistency among student performance on each respective exam further contributes to the findings. Table 5.1 shows a summary of the descriptive statistics for both instruments.

Table 5.1

Summary of Descriptive Statistics

Test Topic	Valid N	Missing N	ACT Mean	Stanford Achievement Test 10 Score Range	Maximum
8th Grade Reading	123	0			
8th Grade Science	123	0	66.8118	67.8 - 80.0	100.00
8th Grade Math	123	0	64.5528	56.1 - 81.9	100.00
8th Grade English	123	0	77.8659	71.2 - 90.2	100.00

Table 5.1 illustrates that student performance on both assessment instruments is lower in math and science. Student performance on the Explore Exam in math is a full 13 points lower than English. This is similarly shown when comparing the Stanford Achievement Test 10 score ranges for math and English.

A review of the strength of correlations among the Stanford Achievement Test 10 subtests reveals that all subtests have a considerably strong correlation to the subject tests of the Explore Exam, however the correlations are not equally strong. For example, the English subtest known as Prewriting has a correlation of .242, which according to Cohen (1988) is a medium effect. However, when compared to the correlation of .50 in the Content and Organization subtest the correlation for Prewriting is relatively weak (See Table 4.9).

It is also interesting to note the relative strength of correlations among the subjects. For example, while the descriptive statistics allude to an overall weaker performance by students in the area of math (see Table 5.1), the strength of correlation is strongest in this subject area with a range on the subtests of .42 to .69 (see Table 4.8). In contrast, the strongest student performances according to the descriptive statistics were in the area of English, which only has subtest correlations ranging from .25 to .50. As stated earlier, all correlations have at least a medium effect size according to Cohen (1988), however the ranges of strengths are not equal and not necessarily what one would expect.

Similarly, an analysis of the R-square values relative to each subject continues to show somewhat unexpected results relative to overall student performance as highlighted by the descriptive statistics. The strongest R-square value is found in Math with an R-square value of .51 with the subtest Thinking Skills - Problem Solving accounting for

47% of the change (see Table 4.12). However, the weakest *R*-square value is found in science, with the subtest Physical representing 25% of the change (see Table 4.11). It is noteworthy that the subjects of math and science had the lowest student performances overall on both assessment instruments.

Implications of Findings

This study provides strong evidence that sixth grade Stanford Achievement Test 10 subtest scores are positively correlated with respective eighth grade subject matter ACT Explore test scores. Therefore, it may be possible to use sixth grade subtest performance as an early predictor of eighth grade ACT Explore test performance. The implication for schools that utilize these two assessment instruments at the sixth and eighth grade respectively include valid data for making educational decisions and greater certainty that decisions based this data will affect college readiness as defined by performance on the ACT Explore Exam.

Study Limitations and Further Study

This study was limited to a single school. Four classes of students passed through sixth grade in successive years beginning in 2005. The classes also completed eighth grade in successive years beginning in 2007. The instructional program at the school did not undergo any systemic changes, and it should be noted that there were minimal personnel changes in the instructional program. Furthermore, students in each class varied by academic ability, as would be expected among any school population. However, there are no known factors in the pedagogical program that would influence student performance in this study.

The study was limited to students who completed sixth to eighth grades at the host site. The national economic downturn during the course of this study impacted the stability of the enrollment at the tuition-based host site. While there was a transient nature to some members of the school population, the classes that were the focus of this study maintained a re-enrollment rate above 90%.

The generalizability of this study to other dissimilar populations is limited. The findings of this study are applicable only to institutions where the Stanford Achievement Exam 10 and the Explore Exam are utilized at the same grade levels. Furthermore, generalizability may be limited since the school where the study takes place is a tuition-based, predominately White, non-public setting with an admission requirement that yields a student population with above average ability. Furthermore, although the researcher went to great lengths to protect the integrity of this study, it could be limited by potential researcher bias that would threaten internal validity by virtue of the researcher's employment at the host site.

For further study, it would be interesting to determine if the correlations found in this study are consistent across various demographic subgroups mentioned in the literature review such as gender, ethnicity, socio-economic status, non-native English speakers, and students with learning disabilities. In addition, the results of this study would benefit greatly from being placed in a broader context. Therefore, further study is needed with other standardized achievement tests in order to determine if the correlations of the Stanford Achievement Test 10 are the strongest available for measuring college readiness. With a myriad of K-8 achievement tests available for educators, it would seem unlikely this study utilizing the Stanford Achievement Test 10 offered the highest

correlations of available instruments to college performance. When considering additional research on this topic, it would be important to consider increasing the sample size and the aforementioned diversity of the student population. Furthermore, additional research would be benefitted by the removal of the researcher bias that is inherent with studying a school that is one's own workplace.

Perhaps the most interesting study could be done on the effects on eighth grade student scores by implementing curricular changes and teaching strategies in sixth grade based upon the correlations found in this study. Furthermore, additional correlational studies need to be accomplished using a variety of achievement tests in a wide array of grade levels. If college readiness is the goal of a particular school, the school must utilize intermittent assessment instruments that gauge proficiency in age-appropriate objectives that will promote college readiness. This can only be done through additional research that quantifies the statistical relationship between a given achievement assessment and student performance on college readiness exams with proven correlation to college performance.

Conclusion

This study provides strong evidence that sixth grade strand test scores are positively correlated with respective eighth grade subject matter ACT Explore test scores. Therefore, it may be possible to use sixth grade strand test performance as an early predictor of eighth grade ACT Explore test performance. A major limitation of this study was that it consisted of students from only one school. Therefore, this study needs to be replicated at other schools to determine if the findings are consistent in other geographic areas and in different types of schools in terms of socio-economic factors. Also, for

further study, it would be interesting to determine if the correlations found in this study

are consistent across various demographic subgroups such as gender, ethnicity, and

socio-economic status and at various grade levels.

References

ACT Corporation. (2007). *Explore technical manual*. Iowa City, IA: Author.

ACT Corporation. (2009). *Connecting college readiness standards to the classroom.* Retrieved from http://www.act.org/standard/guides/explore/pdf/ EXPLORE_Admin.pdf

ACT Corporation. (2010a). *The condition of college and career readiness 2010*. Retrieved from http://www.act.org/research/policymakers/cccr10/page_9.html? utm_campaign=cccr10&utm_source=random_fact&utm_medium=web

ACT Corporation. (2010b). *2010 ACT college and career readiness report*. Retrieved from http://www.stateuniversity.com/blog/permalink/2010-act-college-and-career-readiness-report.html

ACT Corporation. (2010c). *EPAS*. Retrieved from http://www.act.org/epas/index.html

ACT Corporation. (2010d, June 6). *ACT's college readiness standards.* Retrieved from http://www.act.org/standard/index.html

AP Courses as Predictors of College Success. (2005). *Recruitment & Retention in Higher Education, 19*(2), 5.

Armstrong, A. (2010). Myths of poverty: Realities for students. *Education Digest, 75*(8), 49-53.

Association of Christian Schools International. (n.d.). *About ACSI*. Retrieved from http://www.acsi.org/About/AboutACSI/tabid/870/Default.aspx

Association of Christian Schools International. (2009a). *2009 ACSI annual report*. Colorado Springs, CO: ACSI.

Association of Christian Schools International. (2009b). *Membership directory*. Retrieved from http://www.acsi.org/www.acsi.org/FooterLinks/MemberDirectory /tabid/577/Default.aspx

Altshuler, S., & Schmautz, T. (2006). No Hispanic student left behind: The consequences of "high stakes" testing. *Children & Schools, 28*(1), 5-14.

Anderson, G., Whipple, A., & Jimerson, S. (n.d.). *Grade retention: Achievement and mental health outcomes*. Retrieved from http://www.cdl.org/resource-library/articles/grade_retention.php

Antonak, R. F., King, S., & Lowy, J. J. (1982). Otis-Lennon Mental Ability Test, Stanford Achievement Test, and three demographic variables as predictors of achievement in grades 2 and 4. *Journal of Educational Research, 75*, 366-374.

Baker, M., & Johnston, P. (2010). The impact of socioeconomic status on high stakes testing reexamined. *Journal of Instructional Psychology, 37*(3), 193-199.

Barnes, J. (2002). The SAT revolution. *U.S. News & World Report, 133*(18), 50.

Berninger, V., Rutberg, J., Abbott, R., Garcia, N., Anderson-Youngstrom, M., Brooks, A., & Fulton, C. (2006). Tier 1 and Tier 2 early intervention for handwriting and composing. *Journal of School Psychology, 44*(1), 3-30. doi: 10.1016/j.jsp.2005. 12.003

Beyer, C. H., Gillmore, G. M. (2007). Longitudinal assessment of student learning: Simplistic measures aren't enough. *Change, 39*, 43-47.

Black, S. (2005). Acing the exam. *American School Board Journal, 192*(1), 35-46.

Bracey, G. (2001). Test scores in the long run. *Phi Delta Kappan, 82*, 637-638.

Bleyaert, B. (2010). *Act and college success*. Retrieved from http://www.principals partnership.com/ACTandCollegeSuccess.pdf

Brimijoin, K. (2005). Differentiation and high-stakes testing: An oxymoron? *Theory Into Practice, 44*(3), 254-261. doi:10.1207/s15430421tip4403_10

Burgess, L. A., & Samuels, C. (1999). Impact of full-time versus part-time instructor status on college student retention and academic performance in sequential courses. *Community College Journal of Research & Practice, 23*(5), 487-498. doi: 10.1080/106689299264684

Bussert-Webb, K. (2009). ¿Que Hago? Latino/a children describe their activities in an "exemplary" school. *Journal of Latinos & Education, 8*(1), 38-54. doi: 10.1080/15348430802466753

Capraro, M., Capraro, R., Yetkiner, Z., Rangel-Chavez, A., & Lewis, C. (2010). Examining Hispanic student mathematics performance on high-stakes tests: An examination of one urban school district in Colorado. *Urban Review, 42*(3), 193-209. doi: 10.1007/s11256-009-0127-0

Carter, E., Wehby, J., Hughes, C., Johnson, S., Plank, D., Barton-Arwood, S., & Lunsford, L. B. (2005). Preparing adolescents with high-incidence disabilities for high-stakes testing with strategy instruction. *Preventing School Failure, 49*(2), 55-62.

Cheek, J., Reynolds, J., & Coy, D. (2002). An intervention for helping elementary students reduce test anxiety. *Professional School Counseling*, *6*(2), 162-164.

Chenoweth, K. (2000). Judge's ruling effectively acquits high-stakes test. *Black Issues in Higher Education, 16*(25), 12.

Chudowski, N., & Chudowski, V. (2010, September, 15). *State test score trends through 2008-09, Part 1: Rising scores on state tests and NAEP.* Retrieved from www.cep-dc.org/

Cloud, J. (1997). What does SAT stand for? *Time, 150*(20), 54.

Cohen, A., Gregg, N., & Meng, D. (2005). The role of extended time and item content on a high-stakes mathematics test. *Learning Disabilities Research & Practice, 20*(4), 225-233. doi: 10.1111/j.1540-5826.2005.00138.x

Cohen, J. (1988). *Statistical power analysis for the behavioral science.* Hillsdale, NY: Lawrence Erlbaum Associates.

College Board. (2010). *About us*. Retrieved from http://www.collegeboard.com/about /index.html

Contreras, F. (2005). Access, achievement, and social capital: Standardized exams and the Latino college-bound population. *Journal of Hispanic Higher Education*, *4*(3), 197-214.

Creswell, J. (2008). *Research design: Qualitative, quantitative, and mixed methods approaches.* Thousand Oaks, CA: Sage Publications.

Crow, S. R., & Small, R. V. (2011). Developing the motivation within: Using praise and rewards effectively. *School Library Monthly, 27*(5), 5-7.

Darling-Hammond, L. (2007). Race, inequality and educational accountability: The irony of No Child Left Behind. *Race, Ethnicity & Education, 10*(3), 245-260. doi: 10.1080/13613320701503207

DeGregorio, J., & Bartosiewicz, P. (2007). SAT? ACT? NP! *U.S. News & World Report, 143*(6), 88.

Dickinson, D. & Neuman. S. (2006). *Handbook of Early Literacy Research.* New York, NY: The Guilford Press.

Dobbs, M. (2003, November 14). Students fare well in national math tests; but lag in reading skills is questioned. *Washington Post*, p. A3.

Does AP predict college success? (2006). *CQ Researcher, 16*(9), 208.

Doyle, W. (2006). Adoption of merit-based student grant programmes: An event history analysis. *Educational evaluation and Policy Analysis, 28*(3), 259-285.

Educational Testing Service. (2001). *A measured response: Americans on speak on education reform.* Retrieved from www.ets.org/americans_speak/education _reform/

Federal News Service. (2010). *Act assessments of college, career readiness to be made available to Kansas junior high, high school students.* Retrieved from http://global.factiva.com.ezproxy.liberty.edu:2048/ga/default.aspx

Fiske, E. B. (1978, July 9). College entry test scores drop sharply. *New York Times*, pp. 47, 49.

Fletcher, D (2009). Brief history of standardized testing. *Time Magazine.* Retrieved from http://www.time.com/time/nation/article/0,8599,1947019,00.html

Fletcher, J., Francis, D., O'malley, K., Copeland, K., Mehta, P., Calowell, C. . . . Vaughn, S. (2009). Effects of a bundled accommodations package on high-stakes testing for middle school students with reading disabilities. *Exceptional Children, 75*(4), 447-463.

Frederick, S. (2005). Cognitive reflection and decision making. *Journal of Economic Perspectives*, *19*(4), 25-42.

Fremmer, J. & Wall, J. (2003). *Why use test and assessments?* Greensborough, NC: Counseling and Student Services.

Friedman, L., & Wall, M. (2005). Graphical views of suppression and multicollinearity in multiple linear regression. *The American Statistician,* 59(2), 127.

Gabriel, T (2010, June 10). Pressed to show progress, educators tamper with test scores. *New York Times*, p. A1.

Galuska, P. (2010). For good measure. *Diverse: Issues in Higher Education, 27*(5), 16-17.

Garcy, A. (2009). The longitudinal link between student health and math achievement scores. *Journal of Education for Students Placed at Risk, 14*(4), 283-310. doi: 10.1080/10824660903448755

Gay, G. (1990). Standardized tests: Irregularities in administering of tests which affect test results. *Educational Test & Measurements, 17*(2), 93-103.

Goldenberg, M. (2005). *Losing students to high-stakes testing. Education Digest, 70*(7), 10-19.

Gregg, N., Coleman, C., Davis, M., & Chalk, J. (2007). Timed essay writing: Implications for high-stakes tests. *Journal of Learning Disabilities, 40*(4), 306-318.

Grodsky, E., Warren, J., & Felts, E. (2008). Testing and Social Stratification in American Education. *Annual Review of Sociology, 34*(1), 385-404.

Gronna, S., & Chin-Chance, S. (1998). *The performance of students with disabilities in norm-referenced, statewide standardized testing program. Journal of Learning Disabilities, 31*, 482-493.

Haladyna, T., & Haas, N. (1998). Continuing tensions in standardized testing. *Childhood Education, 74*(5), 262.

Hintze, J. (2008). *PASS 2008*. Kaysville, UT: NCSS.

Hoffman, L., & Nottis, K. (2008). Middle school students' perceptions of effective motivation and preparation factors for high-stakes tests. *NASSP Bulletin, 92*(3), 209-223.

Howe II, H. (1985). Let's have another SAT score decline. *Phi Delta Kappan, 66*(9), 599-602.

Huber, P. (1993). The lie of averages. *Forbes, 152*(14), 252.

Hunt, J. (2008). A nation at risk and No Child Left Behind: Déjà vu for administrators? *Delta Kappan, 89*(8), 580-585.

Jones, M. G., Jones, B. D., Hardin, B., Chapman, L., Yarbrough, T., & Davis, M. (1999). The impact of high-stakes testing on teachers and students in North Carolina. *Phi Delta Kappan, 81*(3), 193-203.

Judson, E. (2007). Retaking a high stakes mathematics test: Examination of school interventions and environments. *American Secondary Education, 36*(1), 15-30.

Kahn, D. S. (2006, May 26). How low can we go? *Wall Street Journal*, p. W11.

Karantonis, A., & Sireci, S. G. (2006). The bookmark standard-setting method: A literature review. *Educational Measurements: Issues & Practice, 25*(1), 19–20.

Kelleher, M. (2011). Head start supporters fear impact of threatened cutbacks. *Education Week, 30*(24), 18.

Kirby, E., White, S., & Aruguete, M. (2007). Predictors of white and minority student success at a private women's college. *College Student Journal, 41*(2), 460-465.

Kirst, M. (2005). Most college-bound students underprepared, studies say. *Recruitment & Retention in Higher Education, 19*(11), 6.

Koenig, K., Frey, M., & Detterman, D. (2008). ACT and general cognitive ability. *Intelligence, 36*(2), 153-160. doi: 10.1016/j.intell.2007.03.005

Kruger, L., Wandle, C., & Struzziero, J. (2007). Coping with the stress of high stakes testing. *Journal of Applied School Psychology, 23*(2), 109-128. doi: 10.1300/J370v23n02_07

Lattimore, R. (2005). African American students' perceptions of their preparation for a high-stakes mathematics test. *Negro Educational Review, 56*(2/3), 135-146.

Lattimore, R. (2001). The wrath of high-stakes tests. *Urban Review, 33*(1), 57.

Lay, J., & Stokes-Brown, A. (2009). Put to the test: Understanding differences in support for high-stakes testing. *American Politics Research, 37*(3), 429-448.

Linn, R, & Kiplinger, V. (1995). Linking statewide tests to the national assessment of education of education progress: Stability of results. *Applied Measurement in Education, 10*, 145-159.

Mackey, B., Pitcher, S., & Decman, J. (2006). The influence of four elementary principals upon their schools' reading programs and students' reading scores. *Education, 127*(1), 39-55.

Marklein, M. B. (2010, September 14). College board encouraged by lack of change in SAT results. *USA Today*, p. 2A.

Maxwell, L. (2010). Union takes on high-stakes test in running troubled L.A. schools. *Education Week, 29*(24), 10-11.

McNeil, M. (2008). Exit scramble. *Education Week, 27*(45), 21-23.

Mercogliano, C. (2004). No Child Left Behind. *Paths of Learning, 22*, 7.

Motley-King, J. V. (2008). *Perception of the high school exit examination and its alternatives from African American parents with children in special education.* Available from ProQuest Dissertations and Theses database. (UMI No. 3374316)

Napoli, A., & Raymond, L. (2004). How reliable are our assessment data: A comparison of the reliability of data produced in graded and un-graded conditions. *Research in higher Education, 45*(8), 921-929.

National Poverty Center. (2008). *Poverty in the United States.* Retrieved from
http://www.npc.umich.edu/poverty/

Newman, K. S., & Chin, M. M. (2003). High stakes: Time poverty, testing, and the
children of the working poor. *Qualitative Sociology, 26*(1), 3.

Newton, P. E. (2005). The public understanding of measurement inaccuracy. *British
Educational Research Journal, 31*, 419-442.

Noble, J., & Sawyer, R. (2002). *Predicting different levels of academic success in college
using high school GPA and act composite score.* Retrieved from
http://www.act.org/research/reports/pdf/ACT_RR2002-4.pdf

North Central Texas Council of Governments. (2009). *Population estimates.* Retrieved
from http://www.nctcog.dst.tx.us/ris/demographics/population.asp

O'Leary, P., Cockburn, M., Powell, D., & Diamond, K. (2010). Head start teachers' views
of phonological awareness and vocabulary knowledge instruction. *Early
Childhood Education Journal, 38*(3), 187-195. doi:10.1007/s10643-010-0394-0

Olson, L. (2006). Report finds Connecticut high school test a strong predictor of college
success. *Education Week, 25*(22), 21.

Ornstein, A. (2010, September). Achievement gaps in education. *Society,* 424-429. doi:
10.1007/s12115-010-9354-y

Pine, P. (2008). *Master the SAT.* Princeton, NJ: Peterson's.

Popham, M. L. (2003). *Raising standards or raising barriers? Inequality and high-stakes
testing in public education.* New York, NY: The Century Foundation Press.

Randolf, J. J. (2007). Meta-analysis of the research on response cards: Effects on test
achievement, quiz achievement, participation, and off-task behavior. *Journal of
Positive Behavior Interventions*, *9*, 113-128.

Ravitch, D. (2010). *The death and life of the great American school system.* New York,
NY: Basic Books.

Ravitch, D., & Cortese, A. (2009). Why we're behind: What top nations teach their
students but we don't. *Education Digest, 75*(1), 35-38.

Reynolds, A., & Temple, J. (1998). Extended early childhood intervention and school
achievement: Age thirteen findings from the Chicago longitudinal study. *Child
Development, 69*(1), 231-246.

Richard, A. (2003). Florida leaders respond to NAACP bias complaint. *Education Week, 23*(3), 22.

Rise of Testing. (2001). *CQ Researcher, 11*(15), 330.

Robelen, E. (2000). Parents seek civil rights probe of high-stakes tests in LA. *Education Week, 20*(6), 14.

Robert J. S. (1997, August 25). Extra credit for doing poorly. *New York Times*, p. 23.

Ross, S. M., Nunnery, J. A., Goldfeder, E., McDonald, A., Rachor, R., Hornbeck, M., & Fleischman, S. (2004). Using school reform models to improve reading achievement: A longitudinal study of direct instruction and success for all in an urban district. *Journal of Education for Students Placed at Risk, 9,* 357-388.

Rothstein, M., & Jesse, J. (2004). College performance predictions and the SAT. *Journal of Econometrics*, *121*(1-2) 297-317.

Rutchick, A., Smyth, J., Lopoo, L., & Dusek, J. (2009). Great expectations: The biasing effects of reported child behavior problems on educational expectancies and subsequent academic achievement. *Journal of Social & Clinical Psychology, 28*(3), 392-413.

Shavelson, R. (2007). Assessing student learning responsibly: From history to an audacious proposal. *The Magazine of Higher Learning*, *39*(1), 26-33.

Steele, M. (2010). High school students with learning disabilities: mathematics instruction, study skills, and high stakes tests. *American Secondary Education, 38*(3), 21-27.

Stein, L. (2008, February 24). Merit pay flows to affluent schools. *St. Petersburg Times*, p. 1A.

Strage, D. (2000). Predictors of college adjustment and success: Similarities and differences among Southeast-Asian-American, Hispanic and White students. *Education, 120*(4), 731-721.

Strauss, V. (2011, January 10). The American disdain for children. *Washington Post*, p. B02.

Stutz, T. (2005, Sept., 25). Study faults high-stakes testing, authors cite low rate of improvement, effect on minorities. *The Dallas Morning News*, p. 4A.

Swain, K. (2006). Students with disabilities meeting the challenge of high-stakes writing assessments. *Education, 126*(4), 660-665.

Technical Manual: Stanford Achievement Test Series (10th ed.). (2003). San Antonio, TX: Harcourt Publishing.

Tehrani, A. (2007, May 24). How to fix No Child Left Behind. *Time*. Retrieved from http://www.time.com/time/magazine/article/0,9171,1625192,00.html

Tuerk, P. W. (2005). Research in the high-stakes era. *Psychological Science, 16*(6), 419-425. doi: 10.1111/j.0956-7976.2005.01550.x

U.S. Department of Education. (1983). *A nation at risk.* Retrieved from http://www2.ed.gov/pubs/NatAtRisk/findings.html

Viadero, D. (2010). Researchers argue head start study delayed, ignored. *Education Week*, 29(28), 12.

Voyager Launches Multimedia Adolescent Reading Intervention Program. (2006). *Electronic Education Report, 13*(2), 1-2.

Welshman, J. (2010). From Head Start to Sure Start: Reflections on Policy Transfer. *Children & Society, 24*(2), 89-99. doi:10.1111/j.1099-0860.2008.00201.x

Widemuth, H., Madaus, G. F., & Haney, W. (1994). Competency testing and dropouts. *Dropouts from school: Issues, dilemmas, and solutions*. Albany, NY: State University of New York Press.

Zimmerman, B., & Dibenedetto, M. (2008). Mastery learning and assessment: Implications for students and teachers in an era of high-stakes testing. *Psychology in the Schools, 45*(3), 206-216.

Appendix

Dear Jeff,

We are pleased to inform you that your above study has been approved by the Liberty IRB. This approval is extended to you for one year. If data collection proceeds past one year, or if you make changes in the methodology as it pertains to human subjects, you must submit an appropriate update form to the IRB. Attached you'll find the forms for those cases.

Thank you for your cooperation with the IRB and we wish you well with your research project. We will be glad to send you a written memo from the Liberty IRB, as needed, upon request.

Sincerely,

Fernando Garzon, Psy.D.
IRB Chair, Liberty University
Center for Counseling and Family Studies Liberty University
1971 University Boulevard
Lynchburg, VA 24502-2269
(434) 592-4054
Fax: (434) 522-0477