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Examining the Effects of ACT Assessment of High School Graduates on College Enrollment and College Readiness

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by

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A Dissertation submitted to the Education Faculty of Lindenwood University

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This dissertation has been approved as partial fulfillment of the requirements for the degree of

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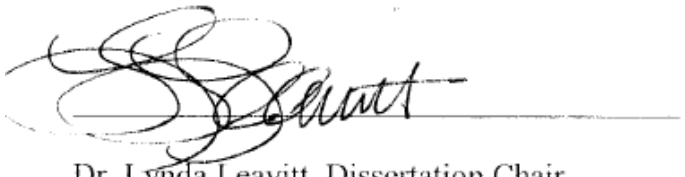

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Declaration of Originality

I do hereby declare and attest to the fact that this is an original study based solely upon my own scholarly work here at Lindenwood University and that I have not submitted it for any other college or university course or degree here or elsewhere.

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Abstract

A college education is essential to the future. Those with a college degree will make a higher income and be affected less by economic instability. Employment requiring a college degree will grow, while jobs that do not require postsecondary education will decline. Yet barriers exist that keep all students from attaining a college education.

It is the charge of schools to prepare students so they not only enter college, but also have the necessary skills to be successful in college-level courses. Federal initiatives mandate periodic assessments to ensure student learning and to hold schools accountable. However, scores from these assessments do not help students gain college entrance nor do they evaluate college readiness. Some states now provide the ACT to all high school students as part of the required state assessment. By doing so, all students will have a common measure of academic achievement in terms of college readiness in time to close achievement gaps before leaving high school.

This study examined the effects of increased ACT testing on college enrollment and readiness for students graduating in 2010. State testing percentages were obtained from the 2010 ACT Profile Reports for each state in the sample. College enrollment information was obtained from the Digest of Education Statistics. College readiness was measured by the percentage of students who met or exceeded the ACT benchmark scores in English and Mathematics.

Results revealed a relationship between increased testing and college enrollment, especially in Caucasian/White students, although the degree to which testing was responsible for this increase was limited. Strong relationships were found between

increased testing and college readiness in both English and Mathematics. A negative correlation was found between the percentage of students who took the ACT and the percentage of students who met benchmark scores. Results suggested a disconnect between what high school students are taught and what they need to know for college success. Additional study should be pursued to investigate possible reasons for these findings. Recommendations for improvement and suggestions for future research are presented.

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Chapter One: Introduction

Background of the Problem

At the time of this writing, the need for a college education continues to grow. In a Bureau of Labor Statistics (2013b) report, those holding at least a bachelor's degree earned an average weekly salary of $1,189, while those with only a high school diploma earned $651. The United States' 2008 recession affected workers at all levels, however those with less education were affected more (Borbely, 2009). In a statement made at the National Urban League Centennial Conference, President Obama (2010) said "education is the economic issue of our time," the unemployment rate was almost double for those who have never been to college, and "8 in 10 new jobs will require a higher education by the end of the decade" (p. 3). The attainment of a college degree remains a vital key to opportunity.

Despite the increased need for a college education, studies show that students are graduating unprepared for the academic demands of college. One study found approximately 50% of Texas students graduated with the appropriate level of math and reading skills to be successful in college (Moore et al., 2010). The level of academic preparation was even lower for low-income and minority students. A Massachusetts study showed that only 23% of African American students and 20% of Latino students were proficient in mathematics, as compared with 57% of White students, with similar results in Communication Arts (Roderick, Nagoaka, & Coca, 2009).

Students who enter college unprepared academically face enrollment in remediation courses. Several studies (Byrd & MacDonald, 2005; Handel & Williams, 2011; Sparks & Malkus, 2013) reported 20% to 40% of students take at least one

remedial course in college, depending on the selectivity of the institution, with courses in math, reading, and writing taken most often. Students who begin their college careers taking remedial classes were considered at-risk and had a tougher time completing their college goals (Laskey & Hetzel, 2011). A 2008 report by Strong American Schools studied the cost of remediation to colleges and families. They estimated the cost per student for remedial education was $1607 to $2531, depending on the institution, in 2004-2005, with families paying over $700 million and public colleges paying over $2 billion in remedial costs. The high enrollment numbers and cost of remedial coursework has sparked debate among educators, lawmakers, and parents who seek to put the blame somewhere for students' lack of ability (Roueche & Waiwaiole, 2009).

Even for academically prepared students, other reasons can affect college enrollment. Students who are the first in their family to go to college and low-income students had lower enrollment rates than other students, even when controlling for academic preparedness (Roksa, 2012; Tierney, Bailey, Constantine, Finkelstein, & Hurd, 2009). Parents and students may not realize what steps are needed to complete the enrollment process or may not have an understanding of the resources available to them (Bos & Berman, 2009). In a study looking at Hispanic enrollment in California, college information from high school guidance counselors and teachers was received too late and inconsistently (Zarate & Burciaga, 2010). Students may attend schools that do not identify their potential or do not provide academic stimulation, especially minority and low-income students (Sherwin, 2012). In this researcher's experience as an educator, high schools play a critical role in preparing students to enter college.

Statement of Problem

ACT, Inc., producers of the ACT test, claimed statewide administration of the test provided students with the chance to identify strengths and weaknesses and to prepare students to meet their educational and career goals (ACT, Inc., 2009c). This is especially important for students who have never considered college attendance and would otherwise have not taken the ACT (Cech, 2008). According to ACT, Inc. (2011), statewide administration of the ACT has allowed states to experience improvements in student achievement and college preparation. Exposing more students to a college entrance exam gives them a sense of how they stand in terms of admission requirements (Herbert, 2010).

College readiness is a growing concern of schools, fueled by initiatives such as *Common Core Standards*, *Race to the Top*, and *No Child Left Behind* (Zinth, 2012). The ACT provides student competency levels in core subject areas, including English and math. Benchmark scores have been established that represent the minimum score required for students to have a "high probability of success in a first-year, credit-bearing college course" (ACT, Inc., 2007, p. 24). Students who meet the benchmark score have a good chance of obtaining a passing grade in the corresponding college course (Allen & Sconing, 2005). Using subject scores obtained on the ACT can help schools determine areas of deficiency and define appropriate state standards (Barlow, 2007).

The number of ACT takers has grown rapidly (Kaw, 2010). In 2010, eight states provided ACT testing to all of their high school graduates (ACT, Inc., 2010a). If increasing ACT testing to all students had a positive effect on college enrollment and on

English and mathematics benchmark scores, this researcher believes there would be justification to increase statewide administration of the test.

Purpose of Study

The purpose of this research was to study the effects of increased ACT testing of high school students on college enrollment and readiness. The study examined the relationship of the percentage of high school graduates in a state who took the ACT test with the percentage of high school graduates who enrolled in a degree-granting postsecondary institution and the percentage of students who met the ACT benchmark scores of 18 on the English section and 22 on the mathematics section. Data was collected from the year 2010, the most recent year the National Center for Education Statistics (NCES) had collected the enrollment data used for this study. College enrollment rates were collected from the Digest of Education Statistics published by the NCES (NCES, 2012a, Table 238). The percentage of students meeting benchmark scores in English and mathematics were obtained from the ACT Profile Report-State published by ACT, Inc. for each state. A positive correlation in college enrollment rates and English and mathematics benchmark scores with the percentage of graduates tested would determine if student enrollment and readiness increased following expanded ACT administration.

States often use ACT composite averages as a means for comparison. This study did not investigate the average ACT composite score. The researcher expected that as the number of ACT participants increased within each state, the average score would be lower. In most states, only students who were college-bound and academically motivated would take the test, and therefore the average score of the group would likely be higher

(Roderick et al., 2009). In states where ACT testing was provided to all students, those who would not normally consider college and whose skills may not be adequate for college-level work were included in the average score. Therefore, it was this researcher's opinion that college enrollment and attainment of a benchmark standard was a better predictor of high school achievement and college readiness. The researcher found no research that correlated the percentage of students taking the test with college enrollment or performance towards English and mathematics benchmarks. If college enrollment and preparedness increased as more students take the test, a possible justification for administering the ACT statewide would exist.

Definition of Terms

The following terms are defined as they were used in this study.

ACT benchmark scores. The minimum scores on each subject test of the ACT that is required for students to have a high probability of success in first-year credit-bearing college courses. Students who meet the benchmark have approximately a 50% chance of obtaining a grade of *B* in the course and a 75% chance of obtaining a *C* (ACT, Inc., 2007). The ACT benchmark scores were obtained for the sample states from the ACT Profile Report-State and were used to measure college readiness.

ACT Profile Report-State. An annual report produced by ACT, Inc. (2010b) that provides information about the performance of a state's graduating seniors. Included in the report is the percentage of students who took the ACT and the percentage who met the ACT benchmark score, which was used in this study.

ACT. An assessment that provides an objective measure of students' academic achievement and readiness for college and includes four curriculum-based tests of

educational development: English, mathematics, reading, and science (Allen & Sconing, 2005). Prior to 1996, this test was named the American College Test (ACT, Inc., 2009a). All colleges that accepted placement tests for admissions or placement decisions accepted ACT test scores (Marklein, 2007).

College enrollment rate. The percentage of a state's 2009-2010 high school graduates attending a degree-granting institution as a first-time freshman in the fall of 2010, as published by the National Center for Education Statistics (2012a).

National Center for Education Statistics (NCES). The main federal institution for collecting and analyzing educational related data (NCES, 2013b). The NCES publishes the Digest of Education Statistics each year, which contains the college enrollment rate data used in this study.

Postsecondary school. For the purpose of this study, postsecondary school is a degree-granting institution that awards associate or higher degrees and participates in Title IV federal financial aid programs (NCES, 2012a).

Hypotheses

This study tests the following hypotheses:

Null hypothesis 1. There is no relationship between the college enrollment rate of first-time freshmen graduating from a state's high school in the previous 12 months, as determined by NCES, and the percentage of graduates tested, as determined by the ACT Profile Report for that state.

Null hypothesis 2. There is no relationship between the percentage of students in a state who meet or exceed the ACT benchmark for English and the percentage of graduates tested, as determined by the ACT Profile Report for that state.

Null hypothesis 3. There is no relationship between the percentage of students in a state who meet or exceed the ACT benchmark for Mathematics and the percentage of graduates tested, as determined by the ACT Profile Report for that state.

Alternate hypothesis 1. There is a relationship between the college enrollment rate of first-time freshman graduating from a state's high school in the previous 12 months, as determined by NCES, and the percentage of graduates tested, as determined by the ACT Profile Report for that state.

Alternate hypothesis 2. There is a relationship between the percentage of students in a state who meet or exceed the ACT benchmark for English and the percentage of graduates tested, as determined by the ACT Profile Report for that state.

Alternate hypothesis 3. There is a relationship between the percentage of students in a state who meet or exceed the ACT benchmark for Mathematics and the percentage of graduates tested, as determined by the ACT Profile Report for that state.

Rationale for the Study

The achievement level of United States' children has historically been publically scrutinized and criticized. International students consistently outperform American students on academic assessments, putting pressure on schools to improve learning (Hanushek, Peterson, & Woessmann, 2012). Testing has increased at all levels to measure student learning and to hold teachers and schools accountable. However, these assessments do not align with college expectations nor are scores earned useful to students outside of the classroom (Katsinas & Bush, 2006).

In the future, employment requiring a college degree will have the most openings and will provide a higher income to employees (Crosby & Moncarz, 2006). The

Department of Labor predicted that between the years 2012 and 2022, occupations that require postsecondary education would have higher wages and were projected to grow faster than jobs that did not require education past high school graduation (Bureau of Labor Statistics, 2013a). Of the 30 projected occupations with the largest decline, all 30 were jobs that did not require college (Lacey & Wright, 2009). In this researcher's opinion, if the need for a college degree is increasing, then students should leave high school with the knowledge to enroll in college and the skills needed to be successful in college-level classes. Assessments administered in high school should have a dual purpose: assess knowledge of content learned in high school and provide teachers and students with a measurement of college-ready skills so improvements could be made before graduation (Achieve, Inc., 2007). This study examined the effects of increased ACT testing on college enrollment and college readiness.

Limitations

The percentages of graduates tested in a state were obtained from the ACT Profile Report published for each state for the year 2010. Included in this figure were all students who had taken the test during their sophomore, junior, or senior year, who self-reported at the time of testing that they were graduating in the spring of 2010 (ACT, Inc., 2010a). Districts who provided ACT testing for their students during the course of the normal school day administered the test during the 11th grade year. The percentage of scores that met benchmark levels as reported by ACT, Inc. included scores from only the most recent test taken. Therefore, students taking the test more than one time only had the last administration used in all subsequent ACT reports for students graduating in 2010.

Performance levels on the test could have differed depending on when and how often a student took the test.

The college enrollment figures were collected from the Digest of Education Statistics published by the NCES (2012a) for the 2009-2010 school year. These rates included the number of 2010 fall first-time freshmen who graduated from high school during the previous 12 months. Second semester students who might have started college during the spring 2011 semester or later were not factored into this figure. Nor did it include students who may have graduated before the spring of 2010 and may have started college sooner. The college enrollment figure also did not consider the number of students who enrolled in college on a part time basis.

The total number of graduates from high schools in each state was obtained from the Digest of Education Statistics and included those students in attendance at public high schools during the 2009-2010 school year and those in attendance at private high schools during the 2008-2009 school year (NCES, 2012a). Data on private high schools located within the state were not available to NCES for the 2009-2010 school year. However, calculations completed and discussed in Chapter Three showed that the percentage of private school students was relatively consistent over the last five years. Therefore, the figure obtained from the Digest of Education was appropriate to use for this research.

Factors may prevent students from enrolling in college. The financial situation of students and the availability of financial assistance likely affect the number of students who enrolled in college (Advisory Committee on Student Financial Assistance, 2010; Lucido, 2013; Romano, 2012). Students who were traditionally underrepresented in college, such as Black, Hispanic, and low-income students (Walters & Ayodele, 2011),

may have qualified for college acceptance, but due to cost chose not to attend. The college history of the parents, the parents' involvement in school, and the family's potential lack of knowledge of enrollment procedures may keep college-ready students from attending (Baum, Ma, & Payea, 2013; Bell, Rowan-Kenyon, & Perna, 2009; Cunningham, Erisman, & Looney, 2007). Therefore, the college enrollment rate published by NCES was limited to the number of students who could afford to go to college *and* chose to go to college. The published rate at the time of this study did not necessarily include all students who met college entrance criteria. The researcher believed that by expanding ACT testing, information could be gained that provided increased opportunities for financial assistance and scholarship to all students, especially those who may not have previously been able to attend college.

The fact that more students may be enrolling in college because of increased ACT testing does not mean that students will graduate. One study stated that 29% of college students entering their first year were underprepared in at least one area of reading, writing, and math (Byrd & MacDonald, 2005). This study did not investigate the retention factors of college students, although meeting the ACT benchmark standards in English and mathematics indicated a high probability of success in the corresponding courses (Allen & Sconing, 2005).

Summary

In the future, jobs requiring a college education will grow at a faster rate resulting in higher incomes than jobs that do not require formalized postsecondary education (Crosby & Moncarz, 2006). Yet students continue to leave high school unprepared to meet the challenges of college (Moore et al., 2010), especially minority and low-income

students (Roderick et al., 2009). ACT benchmark scores were used as a means to predict postsecondary academic success (Radunzel & Noble, 2012; Uzzell et al., 2012). In 2001, Colorado and Illinois became the first states that administered the ACT to all 11th graders as part of their statewide assessment (ACT, Inc., 2009c). Ten years later, eight states had 100% of high school graduates participate in the ACT (ACT, Inc., 2010a). Proponents of statewide ACT administration hoped that by expanding the testing, students who had not considered college in the past would gain the information needed to make college a reality (Cech, 2008). This study investigated the effects of increased ACT testing on college enrollment and readiness.

Chapter Two: Review of Literature

This research studied the effect of increased ACT testing on college readiness and enrollment. The examiner measured college enrollment by the rate of high school graduates who enrolled in a postsecondary institution within 12 months of graduation as published by the NCES. College readiness was measured by the percentage of students that met or exceeded ACT benchmarks in English and mathematics. The review of literature did not reveal previous research that used statewide ACT testing percentages to measure increases in college enrollment or college readiness. The literature review focused on research published within the last 10 years, along with some key studies published earlier. Studies regarding college enrollment primarily discussed factors that kept students from enrolling, such as the financial abilities of the student and family backgrounds. Most literature concerning college readiness focused on remediation. However, the examiner found no literature that studied how increased ACT testing influenced college readiness, although limited research discussed how performance on the ACT affected college readiness and enrollment.

This literature review provides a summary of research that examined the history of placement test development, including the ACT, ACT creation, benchmark score development, and studies that noted how the ACT predicts college success. A review of the literature regarding both high school and college use of placement tests was also discussed. Studies that revealed how cost and family background affected college enrollment were reviewed as well as the effects of delayed enrollment. A summary of research regarding college readiness was presented specifically the role of the high school on college readiness and research on remediation. The last topic considered was research

conducted on college enrollment and readiness issues that specifically effected minority populations.

ACT

Early entrance exams. Prior to 1900, professors at individual institutions tightly controlled who was admitted to college (Forest & Kinser, 2002). The College Board was established in 1900 to create a uniform set of content standards and to test students' abilities that could be reported to colleges. The goal was to provide greater access to college for all students based on their merit, not their background (Epstein, 2009). This was the first assessment administered to grant college admittance (Chandler, 1999).

Hoping to focus more on pure intelligence rather than content acquisition, Carl Brigham developed the Scholastic Aptitude Test (SAT) in 1926 (Lemann, 1999). Brigham was a psychology professor at Princeton and had been working with the Army to test the intelligence abilities of World War I soldiers. When Harvard's president James Bryant Conant went looking for a test that could compare high school seniors, he was introduced to Brigham's SAT (Lemann, 1999). By 1935, Conant required all Harvard candidates to take the SAT (Chandler, 1999). In 2012, 1.66 million students nationwide took the SAT, the highest number of students to take the test to date (Adams, 2012).

While the purpose of the SAT was to screen college applicants uniformly, its use was originally limited to elite institutions. Colleges across the country continued to administer different types of tests to determine admissions. In 1958, E.F. Lindquist, a member of the SAT advisory's board, presented a paper that argued for widespread admissions testing that would be accepted by a variety of colleges and institutions (ACT,

Inc., 2009a). Additionally, Lindquist felt that the test should be used for placement and to assess students' readiness for college. The test should measure achievement, not IQ. In 1959, Lindquist developed the American College Test as a competitor to the SAT (Fletcher, 2009) and in 1996, the name of the test changed to simply ACT. In 2012, 1.67 million students nationwide took the ACT, surpassing the number of students taking the SAT for the first time (Strauss, 2012).

ACT development. The ACT is a measure of general educational achievement that requires students to demonstrate information and skills acquired in major curriculum areas. The test consists of four subtests: English, mathematics, science, and reading. An optional writing subtest is also available. Each subtest contains between 40 and 75 multiple-choice items and students have between 35 and 60 minutes to complete each subtest (ACT, Inc., 2007). Administration of the test to the public occurs at six scheduled Saturday test dates throughout the year. School districts that choose to provide ACT testing to an entire class of students administer the test during a weekday in March, April, or May (ACT Inc., 2013d). The score results are on a scale of 1 to 36 with 36 is being the highest. Each individual subtest receives a separate score, along with a composite score that is an average of the subtest scores ("More Students", 2009). The composite score is what students and schools report when applying for colleges, although some schools may allow students to enter into advanced level courses based on their individual subtest scores (Schmitz, 1993).

ACT, Inc. (2007) stated that the essential goal of these types of tests is to "determine how well prepared students are for further education [by measuring] as directly as possible the academic skills that students need to perform college-level work,"

(p. 5). To that end, the development of ACT questions has undergone a thorough and lengthy process. According to the ACT Technical Manual, content for test questions are developed in a three-step process. First, curriculum frameworks are collected from all states in the United States that publish such frameworks for grades seven through 12. Then textbooks on state-approved lists for courses that correspond with similar content areas are reviewed from grades seven through 12. Finally, educators from secondary and postsecondary levels assess the importance of information and skills contained in the reviewed frameworks and textbooks (ACT, Inc., 2007).

To ensure suitability for college admission use, ACT surveyed college faculty members nationwide who have knowledge of the academic skills taught in the tested content areas. Consultant panels convened requiring the experts to reach consensus about the knowledge and skills required for successful completion of freshmen courses, as well as placement into advanced courses (ACT, Inc., 2007). Content reviews are ongoing and include analyzing tests, studying curriculum guides, and meeting with experts in the field (ACT, Inc., 2007).

Each year, ACT, Inc. hires content specialists in Language Arts, mathematics, and science to write test items. Writers participate from both public and private institutions, most of which are currently teaching at various levels (ACT, Inc., 2007). An attempt is made to include writers that are representative of all demographics within the United States (ACT, Inc., 2012). During the writing and editing process, content is reviewed for subject matter and language that may not be familiar to members of certain groups (ACT, Inc., 2012). An effort is made to portray a balanced representation of society in test content by the inclusion of experts from both genders and a variety of racial and ethnic

backgrounds (ACT, Inc., 2007). Test creators ensure an equal degree of difficulty among different versions of the test using a mathematical procedure called equating (ACT, Inc., 2001). The entire development process of an ACT can take over two years (ACT, Inc., 2007).

Benchmark scores. Allen and Sconing's 2005 report explained the creation of benchmark scores in each subtest area by comparing grades in courses commonly taken by first year students and their corresponding ACT subtest scores. College courses considered were English Composition, College Algebra, a first-year social science course, and Biology (ACT, Inc., 2010e). Social Science courses were considered a measure for the reading section of the ACT since those courses tended to be reading intensive (ACT, Inc., 2010e). Data was collected from the ACT database and from colleges that participated in ACT's Course Placement Service and contained data from both two-year and four-year institutions (Allen & Sconing, 2005). The sample size ranged from 14,136 students in the Biology course to 76,122 students in the English Composition course. Allen and Sconing (2005) attempted to ensure the sample included an evenly dispersed geographical location, although this was not always possible because the ACT was used more widely in certain parts of the country. In the researcher's opinion, the study lacked an effort to ensure the sample contained a variety of ethnic and racial backgrounds or genders. All students in the sample attended college full time (Allen & Sconing, 2005).

Students were considered successful in the course if they obtained a grade of B or higher. Using a logistical regression model, Allen and Sconing (2005) compared grades with the corresponding score on the ACT subtest. The results created a benchmark score,

or a score on the ACT subtest in which a student would have a 50% chance of earning a grade of B or higher and a 75% chance of earning a C or higher in the corresponding course. These benchmark scores are shown on Table 1.

Table 1.

ACT Benchmark Scores and Corresponding College Course

ACT Subtest	Benchmark Score	College Course
English	18	English Composition
Mathematics	22	College Algebra
Reading	21	Social Science
Science	24	Biology

Note: From Allen & Sconing (2005)

Predicting college success. A review of the literature found studies that supported the claim that ACT benchmark scores predict success in college. Schmitz (1993) researched the validity of the data collected to create educational indicators for holding secondary schools accountable for student performance. Her findings concluded "the results especially confirm the average entrance test scores' ability to predict reputation and, to lesser extents, retention and graduation rates" (Schmitz, 1993, p. 518). Hoping to identify at-risk students early, another study compared performance in an introductory college course with grades and scores on standardized tests including the ACT. Results revealed ACT scores showed a significant positive correlation to college grade point averages (GPA) (Marsh, Vandehey, & Diekhoff, 2008). In a 2006 study, locus of control and ACT scores were analyzed to predict GPA at the end of the first year of college. Results showed "pre-college academic achievement as measured by ACT

scores was found to be a significant predictor of first-year academic success as measured by end-of-first-year cumulative GPA" (Gifford, Briceño-Perriott, & Mianzo, 2006, p. 23). A similar study agreed. Scott-Clayton (2012) found "placement exams are more predictive of success in math than in English and more predictive of who is likely to do well in college-level coursework than who is likely to fail" (p. 37). Additionally, students with higher ACT scores obtained a higher cumulative GPA at the end of their first year (Gifford et al., 2006).

Lichtenberger and Dietrich (2012) conducted a longitudinal study of the relationship between college readiness as determined by ACT benchmarks and postsecondary outcomes. Demographic information pertinent to this study included race, income, and selectivity of institution attended. Results showed that the greater number of ACT benchmarks met, the higher rate of enrollment at more competitive institutions and the higher rate of persisting through to a third year in college (Lichtenberger & Dietrich, 2012). Additionally, of the groups that met three out of four benchmarks, missing the mathematics benchmark had "the most detrimental effect on persistence" (Lichtenberger & Dietrich, 2012, p. 3). Of the groups that only met one ACT benchmark, meeting the benchmark in mathematics or English had a positive impact on persistence (Lichtenberger & Dietrich, 2012). Meeting all four benchmarks had an even greater impact on minority students. Minority students who met all four ACT benchmarks had considerably higher rates of enrollment at the most competitive institutions as compared with their white peers (Lichtenberger & Dietrich, 2012). According to this study, Lichtenberger and Dietrich (2012) found that performance on the mathematics and English subtests of the ACT had a large impact on college persistence.

While most literature reviewed claimed that ACT scores were good predictors of college performance, some studies disagreed. Laskey and Hetzel (2011) considered factors that influenced the GPA and retention of at-risk students in college. In their study, ACT scores were not a predictor of college achievement. However, the authors noted that in order to do well on any standardized test, students would need adequate reading skills and proper academic preparation (Laskey & Hetzel, 2011). Laskey and Hetzel (2011) cited prior research that revealed ACT scores are a good predictor of college performance, but they also noted that the study was conducted with regular or high-achieving students, not at-risk students.

Some believe that standardized testing is an inadequate predictor of college performance due to the availability of test preparation courses. Perez (2002), an advocate for Fair Test, wrote that ACT testing follows a predictable format and contains a narrow body of content, making it easy for companies to offer coaching to the financially advantaged. Because colleges are unable to tell which applicant has taken test preparation courses, the scores are not a fair way to determine which students will be successful (Rooney & Schaeffer, 1998). Research by Scholes (1997), however, showed that most test preparation methods studied had little effect on ACT scores, with only practice tests showing a small, positive impact.

Use of Placement Tests

High school use of placement tests. There is a difference in the utilization of college placement tests within the current literature including the way students seek assistance in their preparation while still in high school (Achieve, Inc., 2007). By taking the test during a student's sophomore or junior year of high school, data is collected and

available to provide academic help to students who demonstrate a need (Christie, 2007). Students underprepared for college-level work were identified and use the rest of their high school years to improve their skills (Jones, 2012; Meristois & Phipps, 2000; Tierney & Garcia, 2008). High school college counselors can use the information gained from placement tests to help students enroll in appropriate courses their senior year and assist in choosing a college major (Jones, 2012). Professional development opportunities were created to help teachers use placement test data to adjust instruction (Spence, 2009). States such as California and Texas embedded questions from placement tests into their existing statewide assessment instrument (Christie, 2007; Spence, 2009). Maine, considered using a college placement test as a required high school exit exam ("SAT as a Graduation Test," 2006). By adding ACT-type questions to existing statewide assessments, the number of tests students take can be simplified and provide students with a measure of college-readiness in time to better prepare (Achieve, Inc., 2007).

College use of placement tests. Placement exams were used to determine admission decisions and to place students in courses appropriate for their academic level. While smaller schools can look at other criteria, such as essays and interviews, to select students, larger schools must rely on admissions tests due to the large quantities of applicants and limited staff (Zwick, 2007). Colleges may use standardized tests administered in high school, such as the ACT, or tests created specifically for college placement, such as the Computerized Adaptive Placement Assessment and Support Systems (COMPASS) or the Assessment of Skills for Successful Entry and Transfer (ASSET) (ACT, Inc., 2013c). The same company that produces the ACT also develops the COMPASS and the ASSET and are similar in format, although the latter tests are

used specifically to evaluate placement into college courses (ACT, Inc., 2013c). The nonprofit, bipartisan organization ACHIEVE (Achieve, Inc., 2007) conducted a study comparing college admissions tests, such as the ACT, and tests used by colleges to place students into college-level coursework. They found that the ACT was more demanding and better balanced in the types of questions they asked than the tests colleges use for course placement (Achieve, Inc., 2007). Some schools allowed students to retake placement tests frequently, which threatened the validity of the tests to assess accurately students' abilities (Calcagno & Long, 2008). Students who did not perform at a college's predetermined level in a subject were assigned to remedial courses (Bettinger & Long, 2005; Katsinas & Bush, 2006). Students may be exempt from taking a college-administered placement test and placed into a college-level course if they scored at a certain level on the ACT subject test (Calcagno & Long, 2008).

College Enrollment Studies

The researcher examined the correlation of the percentage of students taking the ACT and the number of students enrolled in college in a state. A review of the literature did not yield any research that studied the relationship of increased ACT testing and college enrollment. Related research involving college enrollment focused on cost, family background, and the impact of delaying college entrance.

College enrollment and cost. The cost of college continues to increase each year. According to the NCES (2011), prices for undergraduate tuition, room, and board at public colleges increased by 42% between 2000 and 2011. One study compared the cost of college among nations around the world. The United States ranked number one in terms of cost at an average of $24, 370 per student, but was 10th in the percent of

workers, age 25-34, that had any degree (Hauptman & Kim, 2009). Despite the increase in cost, financial aid budgets have shrunk. States have decreased the amount of money given to colleges by $15 billion since 2007, but the number of students enrolled in college has increased by 12% (Clark, 2012). In 2012, 60% of students who earned a bachelor's degree graduated with an average debt of $26,500 (Associated Press, 2013).

Higher tuition, lower financial aid funds, and increased student enrollment has changed the characteristics of the student that can attend college. Several studies confirmed that due to cost, enrollment has shifted from four-year colleges to two-year colleges even though students who started at two-year colleges were far less likely to experience degree completion (Advisory Committee, 2010; Durham & Westlund, 2011). There was conflicting research regarding individuals who had received benefits from financial aid funds (Baird, 2006; James, 2012). Studies noted that aid was given to students who showed academic ability or as a strategy to keep talented students in the state, rather than students who demonstrated need (Advisory Committee, 2010; Lucido, 2013). Other studies claimed that a lack of ability was considered to receive aid, enabling more academically unprepared students to attend college (Vedder & Gillen, 2011) and with the increased enrollment of students, funds were diverted to build facilities and to hire faculty (Romano, 2012). Dynarski (2002) studied the effects of financial aid on the level of schooling. Her findings showed that eligibility of aid increased college attendance, but not necessarily completion and the effects of aid increased when income increased (Dynarski, 2002). Other studies revealed the cost of tuition had a minimal effect in enrollment decisions as compared with other factors (Cameron & Heckman, 2001; Ellwood & Kane, 2000).

Reviewing literature regarding the effects of cost on college enrollment was relevant to this research in several ways. Scores obtained on the ACT were used to earn scholarship funds, therefore decreasing the financial obligation of families (ACT, Inc., 2007). Test scores obtained helped to identify areas of concern that students could prepare for while in high school, avoiding the cost of remediation in college (ACT, Inc., 2006; Allensworth, Correa, & Ponisciak, 2008). ACT scores prevented disparities between "the aspirations and qualifications of high school graduates and where they are able financially to enroll" (Advisory Committee, 2010, p. 33). Information gained from ACT scores allowed funds to be appropriately spent by colleges so that more money could be used to help students with financial need (Lucido, 2013; Vedder & Gillen, 2011).

College enrollment and family background. A review of the literature showed that the decision to go to college is highly influenced by a family's background; a greater influence than financial characteristics (Baird, 2006; Ellwood & Kane, 2000; Perna & Titus, 2005). Parents who never attended college lacked the financial, admission, and enrollment knowledge needed to assist their children (Baum et al., 2013; Bell et al., 2009; Cunningham et al., 2007). Children of parents who attended college were more likely to attend college (Attewell, Lavin, Domina, & Levey, 2009; Ryan, 2012). The odds of college enrollment greatly increased if parents were actively involved in their child's school in a positive way, yet significantly decreased if a parent's involvement was restricted to behavioral issues (Perna & Titus, 2005).

A family's income level played a significant role in determining if a student attends college and where they go to school. The rate of academically qualified low-

income students dropped from 54% to 40% between 1992 and 2004 (Advisory Committee, 2010), with students from the lowest income bracket having the lowest college enrollment rate (Baum et al., 2013). Students from lower income families were more likely to attend two-year and less selective four-year institutions (Baum et al., 2013; Roderick, Coca, & Nagaoka, 2011; Sherwin, 2012) even though they were qualified to apply to a more selective four-year college (Bos & Berman, 2009; Roderick et al., 2011; Sherwin, 2012).

The researcher found conflicting results regarding a family's knowledge of financial aid opportunities and enrollment rates. Many studies suggested if low-income families were more aware of financial assistance, more students would attend college (Bettinger, Long, & Oreopoulos, 2007; Bos & Berman, 2009; Council of Economic Advisers, 2009). Yet other research stated that families have a general understanding of what financial assistance is but they lack the knowledge regarding specific procedures to apply it (Bell et al., 2009; Cunningham et al., 2007).

Impact of delaying college enrollment. Most high school students enter college immediately after graduation (James, 2012; Niu & Tienda, 2013). Other students choose to wait to enroll in college for varying lengths of time. One example of delayment was referred to as a "gap year." Approximately 2-10% of students in the United States take a gap year, although the percentage rises to more than 50% in countries such as Denmark and Norway (Krogstad, 2013). Students take this time to determine life goals, volunteer, or travel. However, most students who delayed entering college were from low socioeconomic families, suggesting motives other than traveling or volunteering (Goldrick-Rab & Han, 2011). Approximately 90% of students who delayed entering

college immediately said that working was the reason (James, 2012). Other studies stated that having children contributed to the delay in entering college (Goldrick-Rab & Han, 2011; Horn, Cataldi, & Sikora, 2005). James (2012) observed that those who delayed college enrollment by at least a year were less likely to have taken the ACT or SAT and those that did scored lower than students who attended college directly after college.

One study showed a positive correlation between taking a year off and increased motivation in college (Shellenbarger, 2010). Most research reviewed found a serious threat to degree completion when college was delayed after high school graduation (Berkner, He, & Cataldi, 2002; Goldrick-Rab & Han, 2011; Horn et al., 2005; Niu & Tienda, 2013). One study reported that those who delayed starting college were five times less likely to earn a bachelor's degree (James, 2012). Several findings noted those who delay enrollment are likely to attend two-year rather than four-year institutions (Bozick & DeLuca, 2005; Horn et al., 2005; James, 2012; Niu & Tienda, 2013).

College Readiness Studies

Studies under this topic examined the correlation of the percentage of students taking the ACT and the percentage of students who met the benchmark scores in English and mathematics on the ACT as a measure of college readiness. A review of the literature did not yield any research that studied the relationship of increased ACT testing and college readiness. However, limited research was found regarding performance on the ACT as it related to college readiness. Related research involving college readiness included the role of the high school and solutions based on research to increase preparedness.

College readiness and the role of the high school. A student's high school plays a significant role in determining college enrollment by preparing students for college. In fact, studies revealed that high school achievement was the single most important factor in deciding college enrollment, even more important than tuition and financial aid availability (Cameron & Heckman, 2001; Ellwood & Kane, 2000). Similarly, another study showed that high school achievement had a "strong direct relationship" with composite scores on the ACT and that other factors, such as family income and parents' level of education, only had a small indirect effect (Noble, Roberts, & Sawyer, 2006). A review of the literature found research linking the quality of high school curriculum (Pathways to College Network, 2007; Byrd & MacDonald, 2005; Marklein, 2007; "Unlocking Doors," 2011; Zagier, 2011) and misalignment of curriculum (Green & Forster, 2009; Spence, 2009) to college readiness.

The *No Child Left Behind Act* requires periodic testing of students throughout their school careers. In high school, students are assessed on content attainment when they complete certain courses (Dolezalek & Sayre, 2009). These assessments were designed to measure student's knowledge of high school content and may be used to measure teacher accountability (McNeil & Maxwell, 2013). However, performance on these assessments do not impact college enrollment decisions or affect their placement into college level courses (Katsinas & Bush, 2006). Colleges use scores from placement tests, such as the ACT, to determine the level of coursework a student is prepared to take. A 2008 report by Tierney and Garcia claimed that legislators agreed "underprepared college students are a problem inherited from the K-12 sector" (p. 3). Some state officials

were even considering requiring secondary schools to fund remedial courses for their students (Bettinger & Long, 2005).

A review of the literature found many studies discussing the impact of the high school curriculum on college readiness. Some studies found that high school curriculum was not challenging enough and did not prepare students for college-level work (Pathways to College Network, 2007); Byrd & MacDonald, 2005; Marklein, 2007; "Unlocking Doors," 2011; Zagier, 2011). Other studies found that the high school curriculum was not aligned with college curriculum (Greene & Forster, 2003; Spence, 2009) so students graduate with skills that do not attribute to their success in college-level courses (Bettinger & Long, 2005; Durham & Westlund, 2011; Khan, Castro, Bragg, Barrientos, & Baber, 2009).

High performance in high school does not necessarily mean students are ready for college. In a study by Greene and Forster (2003), 70% of all students graduated from high school, but only 32% were qualified to attend a four-year college. Some studies claimed that high school grades were not consistent positive indicators of college performance (Randunzel & Noble, 2012; Spence, 2005) and even highly ranked students were required to take remedial courses in college (Attewell et al., 2006). Woodruff and Ziomek (2004) conducted a study that claimed, in an effort to improve college enrollment, high schools possibly inflated student grades, which could be one reason high performing students were underprepared for college.

The role of the high school in preparing students for college had an even greater impact on minority students. Greene and Forster (2003) found the following:

> Based on the overall findings of our study, we conclude that by far the most important reason black and Hispanic students are underrepresented in college is the failure of the K12 education system to prepare them for college, rather than insufficient financial aid or inadequate affirmative action policies. (para. 71)

Other studies cited the lack of resources available in high schools as a reason minority students were underprepared for college (ACT, Inc., 2010d; Bos & Berman, 2009; Perna & Titus, 2005). Studies showed that minority students were less likely to attend high schools that offered high-level mathematics courses (Adelman, 2005) and duel-enrollment options (Planty, Provasnik, & Daniel, 2007). Additionally, a 2011 study showed that in advanced classes that were predominantly minority in composition, teachers spent more time covering basic skills than rigorous material as compared to classes that were predominantly white (Covay, 2011). Roderick et al. (2009) discussed the "Aspirations-Attainment Gap". This term claimed that the desire to go to college had increased in minority populations yet these students had difficulty completing college because of a lack of preparation by high schools. Baird's (2006) work revealed that there was strong evidence of a link between "educational outcomes and the quality of high schools" (p. 20).

Improving college readiness. A review of the literature revealed research suggesting methods of improving college readiness. One solution suggested was to align state assessments to what colleges expect or to use college placement tests as the actual measure of student and teacher accountability (Christie, 2007). By doing this, less instructional time was spent on assessments that do not provide teachers the type of information needed to prepare students for college (Christie, 2007). There was evidence

that some secondary schools were making changes to ensure students were prepared. In 2006, Dounay published a lengthy examination of how states were embedding "college readiness indicators" into the required high school curriculum, including adding content to curriculum, adding college placement items to existing state assessments, and requiring all students to take a college placement exam before graduation. Research by Howell, Kurlaender, and Grodsky (2010) showed that by participating in early college assessment, the probability of a student needing remediation lowered approximately 4 to 6%. Many states now use part or all of a college placement exam as the statewide accountability measure (ACT, Inc., 2009; Christie, 2007; Dounay, 2006; Froman, 2008). By giving a college placement measure to students at the beginning of their high school years, gaps in achievement can be identified and improved before entering college-level courses (Spence, 2009; Tierney & Garcia, 2008).

Remediation

To ensure student success, colleges assess a student's knowledge of a content area before allowing enrollment into a college-level course (ACT, Inc., 2009b). If increased ACT testing improves college readiness, the negative effects of remedial courses could be prevented. A review of the literature revealed conflicting outcomes for those taking remedial courses. Relevant literature included studies that identified characteristics of typical students taking remedial courses, the effects of enrolling in remedial courses, and the cost of remediation to stakeholders.

Remedial statistics. Data on the number of students who take remedial coursework varies. Studies reported figures ranging from 29 to over 60% of students at four-year institutions took at least one remedial course (Byrd & MacDonald, 2005; Khan

et al., 2009; Radford, Pearson, Ho, Chambers, & Ferlazzo, 2012; Strong American Schools, 2008). This figure was even higher for students attending community college (Charles A Dana Center et al., 2012; Khan et al., 2009) and minority students (Attewell et al., 2006; Bettinger & Long, 2005; McClenney, 2009). Mathematics is the most common area of remediation (Attewell et al., 2006; Parsad & Lewis, 2003). Students who attended public colleges were required more often to take remedial courses than students who attended private colleges (Attewell et al., 2006; Radford et al., 2012; Sparks & Malkus, 2013). Research claimed that the reason more students were placed into remedial courses were that there was a perception that everyone must attend college to succeed economically in this labor market and students did not realize what they needed to do to be prepared for college (Howell et al., 2010; Rosenbaum & Person, 2003). More students are entering college, but fewer are graduating (Bound, Lovenheim, & Turner, 2009).

Remedial courses are defined as "courses for students lacking skills necessary to perform college-level work at the degree of rigor required by the institution" (Parsad & Lewis, 2003). The level of coursework a student may enroll in is determined by scores from placement exams (ACT, Inc., 2009b). If a student lacked a minimum level of achievement, colleges have required remedial coursework in that content area. National college placement exams, such as the ACT and SAT, are accepted as proof of college-level skills at all United States colleges (College Board, 2013; Marklein, 2007). Colleges can administer commercially created college placement exams, such as the ASSET or COMPASS, or use tests created by state or local agencies (Horn, McCoy, Campbell, & Brock, 2009). Some colleges established hard cut-off scores (Bettinger & Long, 2005)

but those scores varied among institutions (Attewell et al., 2006; Noble, Roberts, & Sawyer, 2003) with each college creating their own set of rules.

Remedial education outcomes. The researcher found conflicting studies regarding the outcome of students enrolled in remedial courses. Some studies showed that students who were assigned to remedial courses did not complete them (Bettinger & Long, 2005; Smith, 2012; Vandal, 2011). Students who completed one remedial course may not have completed the entire sequence of courses assigned to them and a large portion never enrolled in remedial courses at all (Bailey & Cho, 2010; Vandal, 2011). However, other studies showed that 2/3 of students who enrolled in remedial reading, writing, or math completed the courses (Education Commission of the States [ECS], 2013) and females were more likely to complete coursework than males (Bettinger & Long, 2005). Students who completed remedial English courses received high grades in their first college-level course, "indicating that some remedial courses are indeed helpful in preparing students for college-level work" (Boatman & Long, 2010, p. 21).

The research regarding degree completion and remedial coursework was also inconsistent throughout the current literature. Previous studies revealed that the number of semesters a student took beyond entry to college had a major negative association with college performance (Horn et al., 2009; Smith, 2012). Students "who are required to take remedial courses ... before they can sign up for credit-bearing ones often get discouraged and drop out" (Mangan, 2012, para. 3). Those taking remedial courses were 15% more likely to stop attending college before a two-year degree and approximately 4% more likely to stop without completing a four-year degree (Bettinger & Long, 2005). A study completed in Texas showed a small negative effect on the number of college credits

attempted and the likelihood of completing at least one year of college (Martorell & McFarlin, 2009). Other studies showed that less than one quarter of community college students that enrolled in remedial courses completed a degree within eight years (Bailey & Cho, 2010; Vandal, 2011). Deli-Amen (2011), however, was quick to point out in her study that both students who had taken remedial courses and those who had not both "fail to persist at very high rates" (p. 67).

Other studies noted a positive effect on college completion. Students who completed remedial courses had increased probability of earning credit in higher-level courses (Adelman, 2005). One report indicated that 45% of students who took two remedial courses achieved at least an associate's degree (ECS, 2013). When students completed a remedial writing course and then passed the subsequent college-level composition course their odds of graduating more than doubled (Calcagno, Crosta, Bailey, & Jenkins, 2007). Taking some remedial courses had no effect on two-year college degree completion, but it did decrease the likelihood of finishing a four-year degree by 6-7% (Attewell et al., 2006). Participation in remedial courses had a positive impact on college outcomes and participants were more likely to persist and obtain a degree (Bettinger & Long, 2005; Martorell & McFarlin, 2009; Calcagno & Long, 2008).

Cost of remedial education. The cost of remediation is expensive. A Strong American Schools (2008) study reported that the cost of remedial education to students was over 700 million dollars per year in tuition and fees and costs colleges over 435 million dollars. Additionally, taking extra courses lengthens the time a student is in college and could have negative implications on a students' financial aid package (Bettinger & Long, 2005). States spend tens of millions of dollars on remediation (Bailey

& Cho, 2010). The Education Commission of the States (2010) report concluded that remedial education takes up less than one percent of the total annual higher education budget, with no more than 4% of financial aid granted to freshmen and sophomore to pay for remedial courses.

To reduce the cost of remedial education, some states have regulated what institutions can offer remedial courses. Between five (Bettinger & Long, 2005) and 21 (Smith, 2012) states either prohibit remedial work to be offered at four-year colleges or strongly discourage it by limiting funding. Remedial courses are available in reading, writing, and math at approximately 95% of two-year institutions (Parsad & Lewis, 2003). Some colleges have found success by placing students in college-level courses, but require them to meet with a cohort of similar students periodically, work in special computer labs, and attend tutoring sessions (Adams, 2010; Laskey & Hetzel, 2011; Smith, 2012). The cost for these programs may be worth it if it prevents students from dropping out of college (Mangan, 2012).

One study researched remediation with ACT testing specifically. A 2005 study by Bettinger and Long (2005) analyzed remedial course participation in community colleges using data from the Ohio Board of Regents. Their study revealed that students who do not take the ACT were more than likely placed in remedial courses. Students who had taken the ACT completed remedial courses at a higher rate (71%) than those who had not taken the test (56%). Not surprisingly, students in math and English remediation courses scored lower on the ACT than students not placed in remedial courses (Bettinger & Long, 2005).

College Implications for Minorities

This study examined the effects of increased ACT testing on college enrollment and college readiness. One major advantage, claimed by ACT, Inc. (2009c), was the increased testing benefits to minority students. In states where districts provided ACT testing to all students, students who were not originally planning to go to college might consider attending when their level of college-readiness was learned (ACT, Inc., 2009c; Zinth, 2012). Research conducted by ACT of the minority college-readiness levels in Illinois and Colorado, two states that have mandated ACT testing for students the longest, found improvements in college readiness by minorities at greater levels in these states than in states where testing was optional (ACT, Inc., 2009c). Minorities performed better on the ACT when it became part of the routine (Galuszka, 2010). Because of the benefits claimed by increased testing, a review of the literature regarding implications for minorities on college enrollment and readiness follows.

Population forecasts. Research concerning the college enrollment and readiness conditions of minorities is relevant to study.

Table 2

Estimated Population Forecast of 2019-2020 High School Graduates

	Growth	
Race	Number	Percentage
African American/black	- 41,000	- 9%
Asian/Pacific Islander	+ 49,000	+ 30%
Caucasian/white	- 228,000	- 12%
Hispanic	+ 197,000	+ 41%

Note: From Western Interstate Commission for Higher Education, 2012.

According to a 2012 study by the Western Interstate Commission for Higher Education, 45% of the nation's public high school graduates will be non-white by the year 2019-20. Specific population predictions are shown in Table 2.

High school graduates of Hispanic descent are expected to increase notably in all states (Prescott & Bransberger, 2012). The increased numbers of minority students in the next 10 years highlights the importance of preparing all students for college.

College enrollment and minorities. The need for college will continue to increase. Bureau of Labor statistics show that 8 out of 10 jobs in the future will require a college education and college-educated workers make substantially higher salaries than non-educated workers (2013a). Yet minority students have enrolled in college at much lower rates than white students. In 2005, less than 1/3 of Latino young adults had attended some type of college (Roderick et al., 2009). A study in 2010 showed that, despite almost equal numbers of students who said they were planning to go to college, 70% of White students actually enrolled as compared to 56% of African American students (Quay, 2010). Another study reported that, in 2008, only 26% Hispanic and 32% African American college age young adults enrolled in degree-granting institutions and among the students who started at a community college, African American and Hispanic students were less likely to transfer to a four-year college (Liu, 2011). The National Association for College Admission (2008) Counseling stated one reason that minority enrollment rates may be lower than other groups is that they may be less informed about the testing process or lack knowledge about becoming prepared for college (2008).

College readiness and minorities. A lack of readiness was noted as a major reason minority enrollment rates and persistence rates were lower than their White

counterparts. Studies indicated that minority students often lack the academic preparation that allow them to be successful in postsecondary courses (McPherson, 2011) and are almost twice as likely to take one or more remedial courses as compared to White students (Parsad & Lewis, 2003). Barriers to preparing minority high school students were noted as cyclical. An Arbuthnot (2011) study stated African American students tend to go to high poverty schools, which receive less funding, and less funding affects teacher quality, school facilities, technology, and college resources. Arbuthnot (2011) advised these schools to lower the amount of college prep courses offered, affecting the level of rigor and affecting college readiness.

In an Education Sector report, Carey (2008) warned that schools may be tempted to lower the expectations for minority students to improve graduation rates, making entering college easier. He stated "the most important thing a college can do to help students graduate is often to ask more of them, not less, and provide more in return in the form of better teaching" (Carey, 2008, p. 8). Maintaining a high level of rigor and providing support was recommended by many as a means of preparing minority for college (ACT, Inc., 2010d; Dervarics, 2005; McGlynn, 2009).

College persistence and degree attainment. The college graduation rate for minority students was noted as much lower than the rate for White students. The graduation rate for African Americans who enter college was less than 50% (Quay, 2010). Roderick et al. (2009) stated that approximately 17% of African American young adults had earned a bachelor degree, while Carey's (2008) study claimed only 4% of the African American males in his study earned a bachelor's degree. The graduation rates for Hispanic students were only slightly better at about 50% (Knapp, Kelly-Reid, & Ginder,

2012; Quay, 2010). Despite increased college enrollment by minority students, gaps in degree attainment continue to grow (McPherson, 2011; Roderick et al,. 2009). The researcher believes advanced knowledge of college abilities, as discovered by ACT results, may help students prepare for college-level work, decrease knowledge gaps, and increase college degree attainment.

Minority performance on college placement tests. There is much debate about the validity of standardized tests and minority performance. Opponents of high stakes testing claim that material on tests are biased against minority students because of the different life experiences of people living in different cultures (Ford & Helms, 2012) or to maintain a certain status quo in higher education (Micceri, 2009). Other studies claimed in order for some colleges to ensure a diverse student population, minority applications were reviewed for criteria other than test scores in order to boost numbers (Alon & Tienda, 2007; Kahlenberg, 2012). However, studies on the performance of minorities on standardized college placement tests revealed contrary results. According to the National Association for College Admission (2008), there was substantial research that indicated individual item bias had been diminished in college admission tests due to the thorough research and development of questions by both SAT and ACT. The ACT organization boasted a two-year process for creating new tests and ensured item fairness by consulting with national associations of all cultures at every step of development (ACT, Inc., 2012). In Arbuthnot's (2011) book, *Filling in the Blanks; Standardized Testing and the Black-White Achievement Gap*, the author provided a summary of studies that researched test item bias. Findings revealed areas of strength for both Blacks and Whites. On mathematical problems, Black students performed better on "more difficult

quantitative items and on pure mathematics items," (Arbuthnot, 2011, p. 50), while White students performed better on problems that involved real settings and questions that required a visual solution (Arbuthnot, 2011). On verbal items, Whites performed better with items that contained "high frequency" (easier) words and Blacks performed better on "low frequency" (harder) words (Arbuthnot, 2011, p. 51). Arbuthnot (2011) also noted that African Americans left more questions blank at the end of tests and there was reason to think that if those questions occurred earlier in the test they may be answered. The lower score implied difficulties with time management and may not have indicated lower ability (Arbuthnot, 2011). Geiser (2008), in his study on the effects of using achievement tests for college admission, showed that scores on achievement tests, such as the ACT, had less adverse effect on minority students than ability tests, like the SAT.

Summary

A review of the literature lacked research that focused on the relationship between increased ACT testing rates with college enrollment or college readiness. However, there were studies that focused on the use of placement tests, such as the ACT, and factors that affect college enrollment (ACT, Inc., 2006; Advisory Committee, 2010; Allensworth et al., 2008; Lucido, 2013; Vedder & Gillen, 2011) and college readiness (ACT, Inc., 2009; Christie, 2007; Dounay, 2006; Froman, 2008; Spence, 2009; Tierney & Garcia, 2008). Most related research discussed the impact of remediation on college completion rates. Some studies indicated a negative effect of taking remedial courses on college completion (Bailey & Cho, 2010; Horn et al., 2009; Mangan, 2012; Smith, 2012; Vandal, 2011). Other studies revealed a positive effect (Adelman, 2005; Attewell et al., 2006; Bettinger & Long, 2005; Calcagno & Long, 2008; Calcagno et al., 2007; ECS, 2013).

The literature review also yielded research discussing college enrollment (ACT, Inc., 2009c; Liu, 2011; Quay, 2010; Roderick et al., 2009) and readiness factors (Carey, 2008; McPherson, 2011; Parsad & Lewis, 2003) specifically affecting minorities.

Several studies validated the use of the ACT benchmark scores as a predictor of college success for most students (Gifford et al., 2006; Lichtenberger & Dietrich, 2012; Marsh et al., 2008; Schmitz, 1993), especially in math (Scott-Clayton, 2012). Taking the ACT in high school was advantageous because it increased the awareness of students and teachers regarding achievement gaps while there was still time to improve those skills prior to college enrollment (Christie, 2007; Jones, 2012; Meristois & Phipps, 2000; Spence, 2009; Tierney & Garcia, 2008).

Both the need for and the cost of college has continued to increase. College enrollment studies showed that higher tuition, lower financial aid funds, and increased student enrollment affected the type of student that can attend college (Advisory Committee, 2010; Durham & Westlund, 2011). Family background had a large role in the college enrollment decision (Attewell et al., 2006 Baird, 2006; Baum et al., 2013; Bell et al., 2009; Cunningham et al., 2007; Ellwood & Kane, 2000; Perna & Titus, 2005; Ryan, 2012). Working (James, 2012), having children (Goldrick-Rab & Han, 2011; Horn et al., 2005), and taking time off to volunteer or travel (Krogstad, 2013) were evidence to delay college enrollment. However, students who did not immediately go to college after high school were much less likely to complete a degree (Berkner et al., 2002; Goldrick-Rab & Han, 2011; Horn et al., 2005; James, 2012; Niu & Tienda, 2013).

A student's high school played a significant role in preparing students for college. More than any other factor, high school achievement determined college enrollment

(Cameron & Heckman, 2001; Ellwood & Kane, 2000). Although students are frequently assessed during their K-12 school years due to federal mandates, such as *No Child Left Behind*, performance on these assessments do not affect college enrollment decisions or determine college readiness. The researcher believes this result is due to unchallenging secondary curriculum leaving high school graduates unprepared to take college-level work. Much of the research suggested embedding college placement-type questions into existing high school assessments to better prepare students (Achieve, Inc., 2007; Christie, 2007; Dounay, 2006). Thirteen states administered the ACT as part of the state mandated high school assessments (ACT, Inc., 2014a).

Most research involving college readiness discussed the impact of remedial courses on colleges and students. The researcher found the number of students taking remedial coursework to be staggering, highlighting the need for students to graduate prepared for college. There was conflicting research on the outcome of students placed in remedial courses. Many studies showed a decreased likelihood of completing a degree if remedial courses were required (Bailey & Cho, 2010; Bettinger & Long, 2005; Horn et al., 2009; Mangan, 2012; Martorell & McFarlin, 2009 Smith, 2012; Vandal, 2011). Other studies showed an increased probability of earning a degree after passing remedial courses (Adelman, 2005; Calcagno et al., 2007; ECS, 2013). A review of the literature revealed the cost of remediation to students, schools, and taxpayers (Bettinger & Long, 2005; Bailey & Cho, 2010; Mangan, 2012; Smith, 2012; Strong American Schools, 2008). Students who had taken the ACT were less likely to participate in remedial coursework than those that did not take the test (Bettinger & Long, 2005). The methodology for this study is described in the following chapter.

Chapter Three: Methodology

Introduction

This quantitative study analyzed the possible relationships between the percentage of students who took the ACT in a state with the first-time freshman college enrollment rate and the percentage of students who met or exceeded the benchmark in English and Mathematics on the ACT. One purpose of this study was to identify a correlation between the percentages of students taking the ACT in a state with the percentages of students entering college. The second purpose was to determine if college readiness, as measured by the percentage of students who met the benchmark scores on the English and mathematics subtests of the ACT, increased in a state when there was an increase in percentage of students who took the test.

The ACT is an assessment of skills in English, mathematics, science, and reading. The test measures college readiness and is used to make placement decisions. At the time of this writing, all four-year colleges and universities that utilize college placement tests for enrollment decisions accept the ACT (Marklein, 2007). Approximately 1.8 million 2013 high school graduates took the ACT (ACT, Inc., 2013a) and in most states, taking the ACT is optional. However, 13 states had 100% of 2013 graduates participate in the ACT by mandating it as part of the state assessment requirement (ACT, Inc., 2014a).

Exposing more students to a college entrance exam provides them with a sense of their standing in terms of admission requirements (“Admission Tests,” 2010). Students who were not planning to attend college may reconsider once they become aware of their abilities and realize scholarship potential based on their performance on the ACT (ACT, Inc., 2009c). A positive relationship between the percentage of high school graduates

enrolling in college and the percentage of students taking the test in a state could indicate having knowledge of college abilities that might encourage more students to pursue college.

According to ACT, Inc. (2011), statewide administration of the ACT has led to state improvements in student achievement and college preparation. School districts can use student information gained from taking the ACT to adjust instruction and prepare students for the rigor of college-level courses, therefore reducing enrollment in remedial courses (Achieve, Inc., 2007). A positive relationship between the percentage of students meeting ACT benchmarks in English and mathematics and the percentage of students taking the test in a state could indicate that knowing student skill levels could prepare students for college-level work.

The *No Child Left Behind Act* required that schools assess all students in grades three through eight each year in reading and math, periodically in science, and at the end of certain courses in high school (Dolezalek & Sayre, 2009). Additionally, students take other assessments to determine course placement, to qualify for educational programs, and for district and state comparison purposes. The adoption of the *Common Core State Standards* refocused the utilization on state assessments to college and career readiness. However, the scores of these assessments do not help students gain college entrance or allow them to be placed into college-level coursework. In fact, research published by Katsinas and Bush (2006) stated five possible outcomes of students when they leave school: incarceration, unemployment, entrance into the military, entrance into the workforce, or college. There was no linkage to K-12 assessments for any of these outcomes. If taking the ACT increases college enrollment and readiness, the researcher

believes there is a reason to increase its administration and incorporate the test into state mandated assessments, such as many states have already done.

Independent Variables

First-time college freshmen. The number of first-time college freshmen was an independent variable in this study. This figure was the number of fall 2010 first-time freshmen that graduated from a high school located within the researched state in the previous twelve months. Information was obtained from the 2012 Digest of Education Statistics published by the National Center for Education Statistics. The most recent data in the Digest was for the 2009-2010 high school year.

Percentage of students meeting ACT English benchmarks. The percentage of students meeting the ACT English Benchmark in the researched state, as determined by the 2010 ACT Profile Report-State, was used as an independent variable in this study.

Percentage of students meeting ACT mathematics benchmarks. The percentage of students meeting the ACT Mathematics Benchmark in the researched state, as determined by the 2010 ACT Profile Report-State, was used as an independent variable in this study.

Dependent Variable

Percentage of graduates tested. The percentage of graduates who took the ACT in a state, as determined by the 2010 ACT Profile Report-National, was used as the dependent variable and compared with each of the independent variables in the study.

Hypotheses

Null hypothesis 1. There is no relationship between the college enrollment rate of first-time freshmen graduating from a state's high school in the previous 12 months, as

determined by NCES, and the percentage of graduates tested, as determined by the ACT Profile Report for that state.

Null hypothesis 2. There is no relationship between the percentage of students in a state who meet or exceed the ACT benchmark for English and the percentage of graduates tested, as determined by the ACT Profile Report for that state.

Null hypothesis 3. There is no relationship between the percentage of students in a state who meet or exceed the ACT benchmark for Mathematics and the percentage of graduates tested, as determined by the ACT Profile Report for that state.

Participants

The population for this study included students from all 50 states and the District of Columbia who participated in the ACT as reported in the ACT Profile Report-State for 2010. Approximately 1.5 million students were included in the report (ACT, Inc., 2010c). The report provided information about the performance of students who graduated high school in 2010. Students took the ACT as sophomores, juniors, or seniors and self-reported, at the time of testing, that they were planning to graduate in 2010. Students took the test under standard time conditions. Demographics of students whose results were included in the report are shown on Table 3.

This study examined the relationship of the percentage of students who met the ACT benchmarks for English and mathematics and the percentage of students who participated in the ACT in the researched state. According to the ACT Profile Report-National, 66% of the students included met the benchmark score of 18 in English, while 43% met the benchmark score of 22 in mathematics (ACT, Inc., 2010c).

Table 3.

Student Demographics:2010 ACT Profile Report-National

Race	Number of Students	Percentage
All Students	1,568,835	100%
African American/Black	214,382	13.7%
American Indian/Alaska Native	16,383	1.0%
Caucasian/White	979,329	62.4%
Hispanic	157,579	10.0%
Pacific Islander /Asian American	65,362	4.2%
Other/No Response	135,347	8.6%

Note: From ACT, Inc., (2010c)

The researcher constructed a histogram to determine if the population (the percentages of ACT taker in a state) was normally distributed. Figure 1 displays the results.

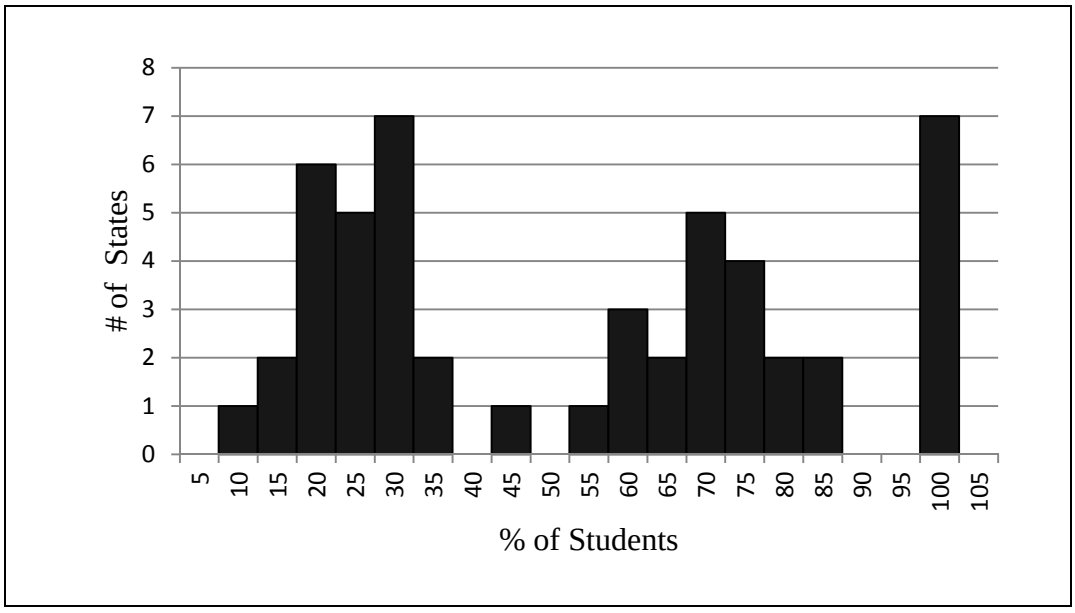

Figure 1. Distribution of the percentage of 2010 high school graduates that took the ACT in the 50 states and District of Columbia.

A bimodal distribution appeared. This often occurs when data from different types of groups are combined and displayed together (Midas Strait Solutions Group, 2012). The researcher believed the cause of the bimodal distribution was the popularity of certain placement tests throughout different regions in the country. Two national college placement tests existed for high school students: the ACT and the SAT. While students could take either or both of the tests all colleges accepted both tests (Marklein, 2007), each test has in increased popularity depending on the region of the state. The Midwest and South regions of the United States had historically preferred the ACT, while the Northeast and West regions favored the SAT (Fletcher, 2009; Kaw, 2010). Histograms were constructed for each of the regions to determine distribution (see Figures 2-5). States were divided into regions as described in "World Studies: The United States and Canada" (Jacobs & LeVasseur, 2008).

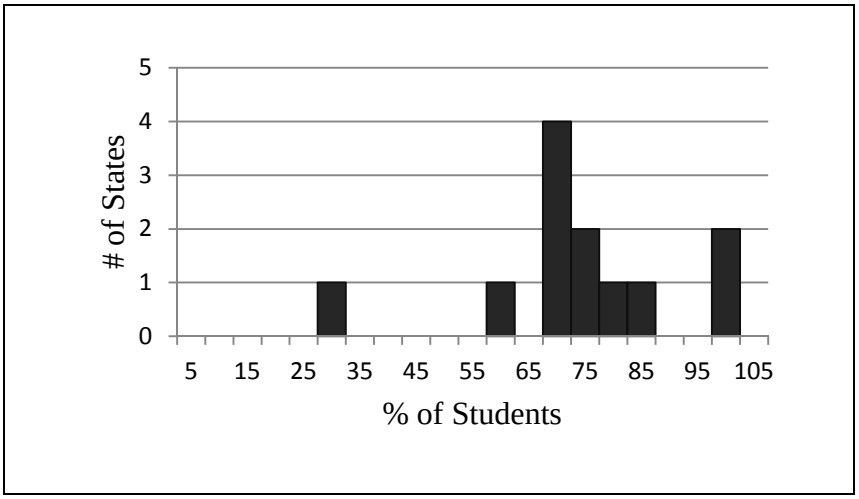

Figure 2. Graph showing distribution of the percentage of 2010 high school graduates that took the ACT in the Midwest region. $\overline{x}$ = 72.33.

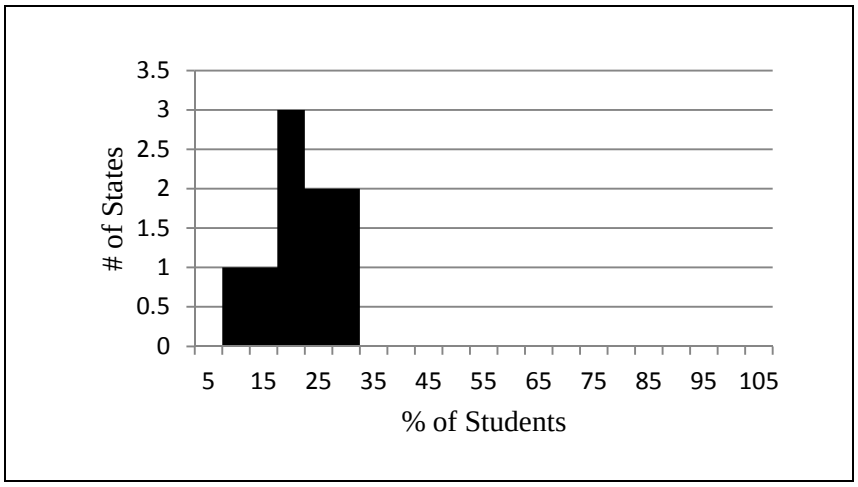

Figure 3. Graph showing distribution of the percentage of 2010 high school graduates that took the ACT in the Northeast region. $\overline{x}$ = 18.88.

After separating the states according to region, normal distribution occurred in most cases. The exceptions were the South (Figure 4) and West (Figure 5) regions, where outliers skewed the results. The Midwest (Figure 2) region was negatively skewed; the West region was positively skewed.

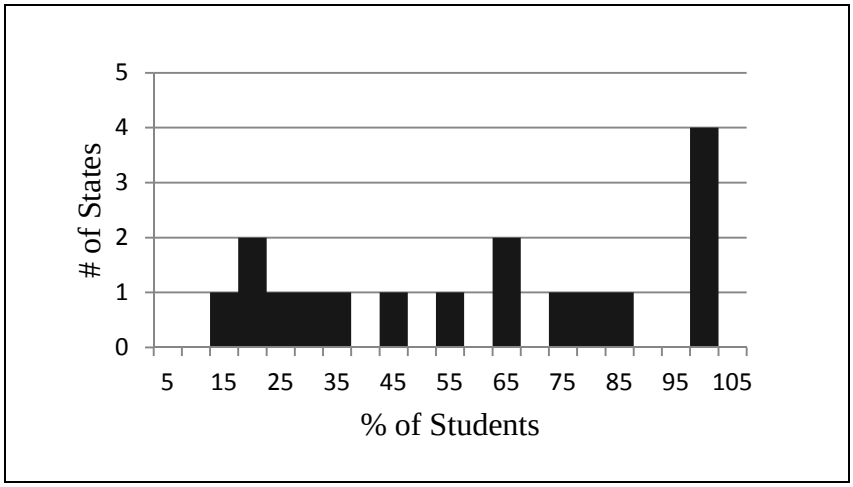

Figure 4. Graph showing distribution of the percentage of 2010 high school graduates that took the ACT in the South region. $\overline{x}$ = 57.76.

Thes results shown in Figures 2 through 5 confirmed the claims by Fletcher (2009) and Kaw (2010) of the popularity of the ACT by region and

allowed the researcher to use the Pearson Product Moment Correlation Coefficient to test the hypotheses.

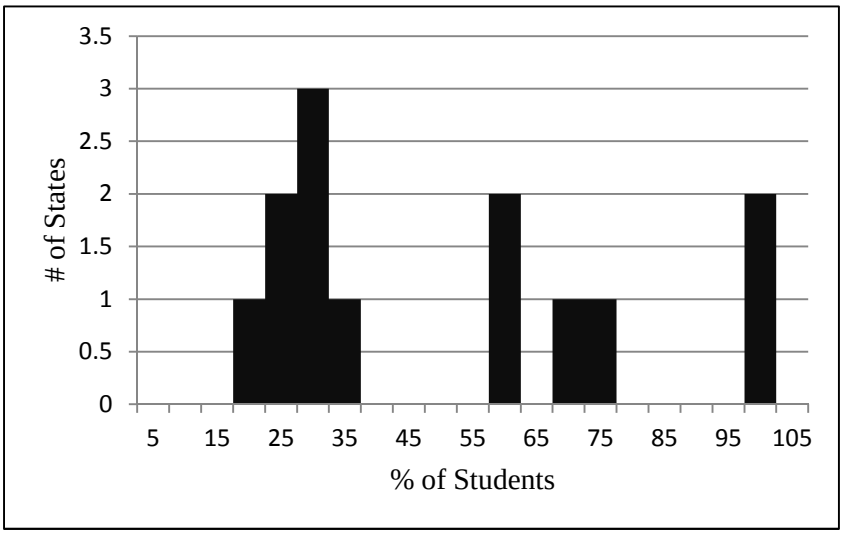

Figure 5. Graph showing distribution of the percentage of 2010 high school graduates that took the ACT in the West region. $\overline{x}$ = 49.07.

This study also examined the relationship of the college enrollment rate of first-time freshmen and the percentage of students that took the ACT in that state. The researcher collected college enrollment rate from data published in the 2012 Digest of Education Statistics. The table included the number of graduates from high schools located in the state, both public and private, and the number of fall 2010 first-time freshmen that graduated from high school in the previous 12 months (NCES, 2012a). This information was used to measure how many students enrolled in a postsecondary degree-granting institution in each researched state. The total number of graduates from high schools was 3,436,835 students (Digest of Education Statistics, Table 238). This figure included students who graduated from public schools in the 2009-2010 school year and students who graduated from private schools in the 2008-2009 school year. Private school data was not available for the 2009-2010 school year. The estimated rate of United

States high school graduates going to college in any state and in their home state was 62.8% and 51.4% respectively. Students who were attending U.S. Service Academies in their home state were included. A degree-granting institution was defined as an institution that granted associates or higher degrees and participated in Title IV federal aid programs.

A histogram was constructed to determine if this population (the rate of 2010 high school graduates that enrolled in college fall of 2010) was normally distributed. Figure 6 displayed the results.

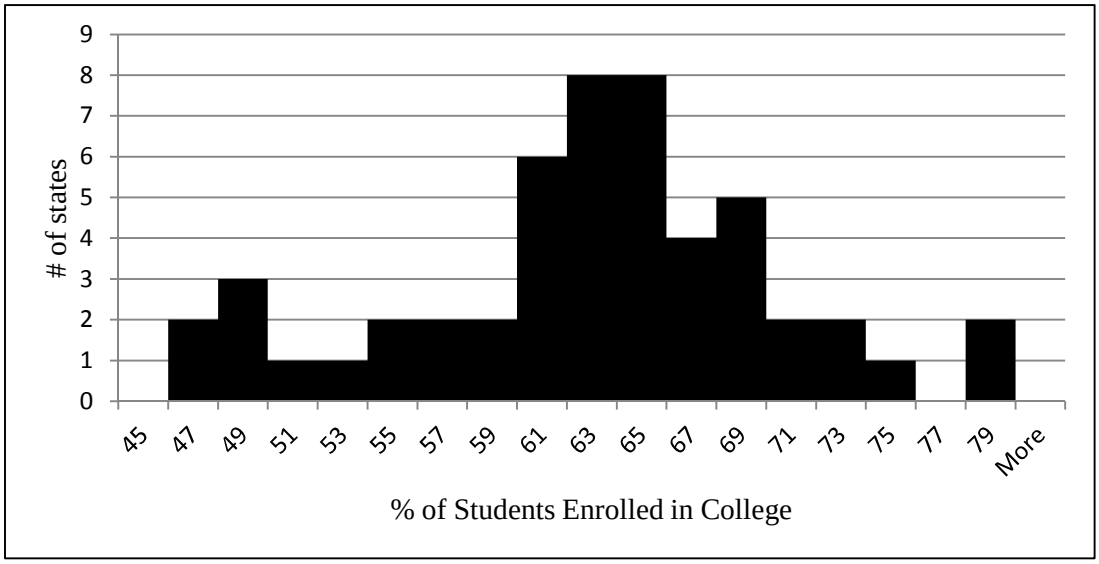

Figure 6. Bar graph showing distribution of the percentage of 2010 high school graduates that enrolled in college fall 2010. $\mu = 62.01\%$.

The population was normally distributed and allowed the researcher to use the Pearson Product Moment Correlation Coefficient to test hypotheses.

Sample

The population for this study included the 50 United States and the District of Columbia. The sampling design was selected based on the percentage of students who participated in the ACT within each state according to the 2010 Profile Report-State

(ACT, Inc., 2010a). A stratified random sample ensured the representation of all groups and to reduce variability from systematic sampling (Acharya, Prakash, Saxena, & Nigam, 2013). The 50 states and District of Columbia were placed on a list and sorted by percentages from lowest to highest. A range was calculated and sample groups were formed based on evenly distributed levels of the percentages of students taking the test. Table 4 shows the distribution of sample groups.

Table 4.

Distribution of States Into Sample Groups

Range of % of graduates who took ACT	# of states in range[a]	# of states in sample
0-17%	7	2
18-22%	6	2
23-28%	6	2
29-58%	7	2
59-66%	6	2
67-73%	6	2
74-96%	6	2
97-100%	7	2
TOTAL	51	16

Note: From ACT, Inc., (2010a) [a] includes District of Columbia

Each state and District of Columbia received a number within each of the eight sample groups. Using a number generator, two states were randomly selected from each of the eight groups (Urbaniak & Pious, 2013). These states became the sample used for

analysis. With a population of 51, a sample size of 16 yielded a confidence interval of plus or minus 20 at the 95% confidence level (Creative Research Systems, 2012).

Procedures

Once sample selection took place, data was collected for each of the states in the sample. A Pearson Product Moment Correlation analysis was conducted to produce a correlation coefficient. A *t*-test for Independent Means was used to test the significance of the correlation coefficient.

Pearson correlation coefficient. To describe a relationship between two random variables, a Pearson Product Correlation Coefficient (PPCC) was used and tested the strength of the relationships between data (Kreinovich, Hung, & Berlin, 2013). The PPCC measured a linear relationship between two variables and provided the magnitude and direction of the relationship (Sapp, 2006). It was appropriate to use since the data for both variables was quantitative (Fraenkel & Wallen, 2009). After applying this statistical treatment, a value of -1 to +1 was obtained. A strong positive relationship was indicated by how close the value was to +1. A strong negative relationship was indicated by how close the value is to -1. If a value was close to zero, the relationship between the variables was weak or nonexistent (Bluman, 2010).

t-test for independent means. A *t*-test measured the significance of the correlation coefficient, which was suitable to compare the means of two groups (Trochim, 2006). In this study, the number of first-time college freshmen and benchmark attainment rates were examined for students in different sample groups based on the number and percentage of students who took the ACT. The results of the *t*-test analysis

evaluated if any difference was caused by chance or by the increase in ACT taking in a state, the dependent variable.

Internal Validity

Internal validity ensured the quality of this research design (Sapp, 2006). Maria and Miller (2010) wrote if research lacks internal validity, the independent variable may not be the cause of the effect on the dependent variables. Threats to internal validity to consider in this study included location and testing.

A location threat could occur if the ACT was inconsistently administered or if problems occurred during testing that affected scores. Over 7,500 test centers administered the ACT and to limit variability of testing conditions, locations interested in administering the ACT must apply and be approved. In the researcher's experience the ACT paid staff to proctor the test and monitor testing conditions. The 2010 ACT Profile Report-State, included data from students tested under standard time conditions (ACT, Inc., 2010a).

A testing threat refers to changes in scores that may occur in subsequent test administrations due to previously taking the test (Sell & Webster, 2007). The independent variable may not be the cause of the effect on the dependent variable in these cases. ACT testing was more likely to occur when the assessment involved the recall of information and when the time between test administrations were short (Onwuegbuzie, 2000). In this research, the independent variable was the ACT. The ACT is an achievement test that measures student mastery of state learning standards and college readiness (ACT, Inc., 2007). According to the ACT website, test scores take between three and eight weeks to be reported (ACT, Inc., 2013g). Because of registration deadlines, if a student wished to

retake the test, they must wait for a test date that would occur between two and four months later depending on the time of the year. Although the exact size of the question pool not available, the process for creating test questions was rigorous and took several years (ACT, Inc., 2007). Different forms of the test are administered at different times throughout the year and contain different sets of questions (ACT, Inc., 2001). These steps help prevent test scores from being affected by participating in previous test administrations.

External Validity

External validity determines if results from one study can be applied to other situations (Sapp, 2006). Factors were considered regarding the external validity of this research. The frequency of testing, self-reporting of data, and inclusion of private school data were elements to be studied before applying the same procedures to different populations.

Data for this research was obtained from the 2010 Profile Report-State for each state included in the sample. The report included data for students who participated in the ACT test as a sophomore, junior, or senior (ACT, Inc., 2010a). Students may take the test up to 12 times; however, the report only considers the last test administration (ACT, Inc., 2013e). ACT has not reported the number of times a student has taken the ACT or during which high school year the last test was administered. Several sources stated the best time to take the test was during the junior year, when coursework had been taken to best prepare and time remained to retake the test if the needed score was not obtained (ACT, Inc., 2013h; TPR Education, 2013a; University Language Services, 2013). Research

showed students increased their composite score when the test was taken a second time (ACT, Inc., 2013e; Andrews & Ziomek, 1998; Lanier, 1994).

The data from the 2010 Profile Report-State included data from students who self-reported that they would graduate in 2010. Without checking the actual status of 2010 graduates, this data may be incorrect. No research was found discussing the accuracy of self-reported graduation years; however research was found that studied the accuracy of self-reported grades and test scores. Students were more likely to inflate information related to their grades than nonacademic information (Kuncel, Crede, & Thomas, 2005; Maxey & Ormsby, 1971). Several studies found that underachieving students were more likely to over-report scores related to academics (Anaya, 1999; Cole & Gonyea, 2010; Maxey & Ormsby, 1971; Schiel & Nobel, 1991). Research does support the use of self-reported scores and reports their validity to be overall high (Cole & Gonyea, 2010).

A key data point used in this research was the rate of high school graduates attending a degree-granting institution as obtained from the National Center for Education Statistics (2012a). The number of high school graduates included students who graduated from public high schools during the 2009-2010 school year and the number of students who graduated from private high schools during the 2008-2009 school year. The report did not state why the private high school graduate numbers were included from the previous year, only that 2009-2010 graduate rates were not available (NCES, 2012a). This system of reporting was consistent with earlier reports. It was not possible to separate the private school data from the public school data on the rate of high school graduates going to college. However, it was possible to review private high school data from past reports to determine if the data used in this research was typical. The estimated

rate of high school graduates attending a degree-granting institution report is published every two years, with annual updates to the data if necessary. The first report was published in 2007 and contained data from private school students graduating during the 2002-03 school year and public school students graduating during the 2003-04 school year. Table 5 notes the percentage of private school graduates included in the digest report over time. The percentage decreased but was relatively consistent over time. The researcher found this data to be typical of past report findings.

Table 5.

Percentage of Private School Graduates Included in Estimated Rate of High School Graduates

Year	Total # of Private School Graduates	Private School Graduation Year	Total # of Public School Graduates	Public School Graduation Year	Total # of Graduates	% of Private School Graduates
2007	295,790	2002-03	2,753,438	2003-04	3,049,226	9.7%
2008	295,790	2004-05	2,815,544	2005-06	3,111,324	9.5%
2009	295,790	2004-05	2,815,544	2005-06	3,111,324	9.5%
2010	306,610	2006-07	2,999,508	2007-08	3,306,118	9.3%
2011	306,610	2006-07	3,001,337	2007-08	3,307,947	9.3%
2012	308,813	2008-09	3,128,022	2009-10	3,436,835	9.0%

Note: From Digest of Education Statistics, NCES, 2007-2012

It was possible to determine the average percentage of private school graduates in each of the sample groups see Table 6. The average percentage of 2008-2009 private school graduates ranged from 7 to 13%, with the national average being 9%.

Table 6.

Average Percentage of Private School Graduates by Sample Group

Range of Percentage of Graduates That Took the ACT[a]	Average Percentage of Private Graduates[b]
0-17%	13%
18-22%	11%
23-28%	10%
29-58%	9%
59-66%	7%
67-73%	7%
74-96%	8%
97-100%	8%
United States	9%

Note: [a]Data from ACT, Inc., (2010a). [b]Data from Digest of Education Statistics, NCES, 2007-2012.

Threats to the external validity in most educational studies include population validity, ecological validity, and temporal validity (Onwuegbuzie, 2000). Population validity is the ability to generalize research results to other subjects (Sapp, 2006). The sample was selected from stratified groups based on the percentage of students who took the ACT in a state. Demographics of the population varied depending on the state. The researcher concluded that states with a higher percentage of high school graduates taking the ACT would have demographics that best match other populations.

Ecological validity is the ability to generalize results to other settings (Sapp, 2006). The setting for this research included high schools from all 50 states and the District of Columbia. Specific demographics of the high school students were unknown;

however the results from states that administer the ACT to all students would be best to generalize to other settings. In states where ACT testing is limited, results would be applicable to academically motivated populations, since that is who is likely to have taken the ACT in states where testing is optional (Roderick et al., 2009).

Temporal validity is the ability to generalize results across time (Onwuegbuzie, 2000). This study examined the effects of increased ACT testing in a state on college enrollment and college readiness. ACT testing is administered six times throughout the year (TPR Education, 2013b) with additional times in March and April for school districts and states that provide ACT testing for their total population (ACT, Inc., 2013f). Testing conditions are standardized and time-regulated. Results from this study are easily transferable to future populations due to strict administration procedures, standardized scoring, and consistent test development (ACT, Inc., 2007). Temporal validity threats are minimized due to strict administration guidelines and efforts to standardized test items.

Instrumentation

Data for this study was obtained from two sources: the ACT and the Digest of Education Statistics. Reliability and validity of the ACT and data collection procedures by the NCES follows.

Reliability is defined as “Degree of freedom from measurement error,” and the “consistency of test scores” (Neukrug & Fawcett, 2006, p. 52). Ideally, if testing conditions, quality of the test, and characteristics of the test taker were always consistent, scores from the test would be the same whether the test was taken once or a thousand times. However, the researcher recognized there are no perfect conditions or perfect tests. Results always contain measurement error, or “factors that affect one’s score on a test”

(Nuekrug & Fawcett, 2006, p. 53). Causes of measurement error can be attributed to the test taker or test maker. The goal of test creators is to reduce the amount measurement error as much as possible to ensure consistent test results each time (Fraenkal & Wallen, 2009). Reliability coefficients "typically range from zero to one, with values near one indicating greater consistency and those near zero indicating little or no consistency" (ACT, Inc., 2007, p. 49). The standard error of measurement describes the range of scores "where we would expect a person's score to fall if he or she took the instrument over and over again" (Neukrug & Fawcett, 2006, p. 95). It is important that researchers choose instruments that produce consistent, reliable results (Fraenkel & Wallen, 2009). .

Validity is defined as "test items [that] measure what they purport to measure," (Sapp, 2006, p. 29). The researcher has found in an education instrument, validity has often been described as subjective. What some researchers may seem is important and valid, other researchers may not (Sapp, 2006, p. 29). It is desired to have instruments that have both high reliability and high validity (Fraenkel & Wallen, 2009).

Reliability and validity of the ACT. Reliability and validity information was obtained from the ACT Technical Manual. ACT, Inc. (2007) reported that scale scores for the ACT were established to have "approximately constant standard errors of measurement for all true scale scores" (p. 49). The standard error of measurement for any ACT score or subscore (i.e. the English and mathematics benchmark scores used in this research) was "approximately the same for low-scoring examinees as it was for high-scoring examinees" (ACT, Inc., 2007, p. 49). Extensive computation was presented confirming the reliability of the test. Reliability results were based on six national administrations of the ACT. Data came from "2,000 examinees per national

administration who took the ACT in the 2005-2006 school year" (ACT, Inc., 2007, p. 51). Equal weight was given to each of the four subtests when computing the composite score, therefore students with higher ability in a certain content area were not unfairly advantaged (ACT, Inc., 2007). Median scale score reliability for the English and Mathematics subtests were 0.91 for both (ACT, Inc., 2007, p. 59) indicating greater consistency and reliability.

As the purpose of the ACT is to measure a student's knowledge in specific content areas and to determine future success in college-level courses, content validity is extremely important. ACT, Inc. (2007) stated "tasks presented in the tests must therefore be representative of scholastic tasks" (p. 62). Tasks should be "intricate in structure, comprehensive in scope, and significant in their own right, rather than narrow or artificial tasks that can be defended for inclusion in the tests solely on the basis of their statistical correlation with a criterion" (ACT, Inc., 2007, p. 62). Content assessments are focused on major areas of college and high school instruction, that are mostly problem solving in nature with a measure of basic skills. The Technical Manual stated the importance of the standardization ability of the ACT. Because ACT scores have "the same meaning for all students, test forms, and test dates, they can be interpreted without reference to these characteristics" (ACT Inc., 2007, p. 62). Grades earned in high school are not standardized because of the variation of grading and curriculum in high schools across the country. Scores from ACT testing can be more easily understood (ACT, Inc., 2007).

Data collection procedures by NCES. College enrollment rates used in this study were obtained from Table 238 titled "Estimated Rate of 2009-2010 High School Graduates Attending Degree-granting Institutions, by State: 2010," within the Digest of

Education Statistics developed by the National Center for Education Statistics (NCES). The NCES created the Integrated Postsecondary Education Data System (IPEDS) that surveys "approximately 7,500 postsecondary institutions, including universities and colleges, as well as institutions offering technical and vocational education beyond the high school level" at designated times throughout the year" (NCES, 2013a, para. 1). Fall 2010 enrollment data in Table 238 was collected by IPEDS in the spring of 2011. Data included students enrolled as first-time freshmen in an institution that awards an associate's or higher and participates in Title IV federal financial aid programs (NCES, 2013a, Table 238). Data collection methods were entirely web-based and data was provided by "institutional representatives appointed by campus chief executives" that were responsible for ensuring the data was correct (NCES, 2013a, para. 13). Response rates were high because institutions that participate in Title IV were required to contribute; response rates were at 100% (NCES, 2103a).

Data was obtained for this study from the ACT and Table 238 of the Digest of Education Statistics. The researcher found the reliability and validity of the ACT well documented with high consistency. Data collected by NCES followed strict federal procedures and had 100% response rates (NCES, 2013a, para. 13). The researcher determined the data used in this study was appropriate for its intended use.

Limitations of Study

Limitations of study are those "characteristics of design or methodology that impacted or influenced the application or interpretation of the results" of a study (USC, 2014, para. 1). Potential limitations of this study included frequency of testing, self-

reported data, and characteristics of students taking the ACT. The reasons for these limitations were predominately due to the unavailability of particular data sets.

A frequency of testing limitation arose from data included in the report that possibly originated from a student who took the test once or up to 12 times, the limit imposed by ACT (ACT, Inc., 2013e). ACT, Inc. (2013e) stated that students who take the test more than once improve their composite score 57% of the time. Students who are more academically motivated or are of a certain financial means may inflate the benchmark scores if they have taken the test more than once (Cole & Gonyea, 2010; Maxey & Ormsby, 1971). ACT does not provide the frequency of test administrations.

The 2010 Profile Report-State was the source used to obtain the percentage of students that contributed to the ACT and benchmark scores in English and mathematics. Students participating in the ACT self-reported an anticipated year of graduation (ACT, Inc., 2007). This information was used to place students into groups according to graduation year for reporting purposes (ACT Inc., 2007). Data in the report could also include students who graduated early, students who should have graduated in 2009 but were delayed, and students who did not finish high school. If these groups of students attended college, their data would still be included in the Digest of Education Statistics, the source used to measure college enrollment in this research.

Several student characteristics included in this study were limited. The 2010 Profile Report included data on race and gender, while The Digest of Education Statistics, did not include specific data on race or gender. The researcher believes information that would have been helpful in measuring the benefit of increased ACT testing on college enrollment for those groups. Neither source included information

regarding the socioeconomic status of students. Chapter Four of this dissertation provided comparisons of student characteristics of the states included in the sample.

Summary

This study investigated the relationship between the percentage of students in a state that participated in the ACT with the college enrollment rate and percentage of students that met or exceeded the ACT benchmark in English and mathematics. The percentage of students within each state that participated in the ACT was obtained from the 2010 ACT Profile Report-National. ACT benchmark percentages were obtained from the 2010 ACT Profile Report for each state in the sample. The college enrollment rate for each state was obtained from the 2012 Digest of Educational Statistics,published by the National Center for Education Statistics for the school year 2009-2010 (Digest of Educational Statistics, Table 238).

The population for this study included 50 states and the District of Columbia. The population set was divided into ranges based on the percentage of students that took the ACT in 2010 and each range contained six to seven states. Two states from each range were randomly selected using a number generator to create a sample of 16 states.

This study was limited by the frequency of testing, self-reported data, and characteristics of students taking the ACT. Threats to internal validity included location and testing. Threats to external validity included the frequency of testing, self-reporting of data, and inclusion of private school data.

A Pearson Product Moment Correlation Coefficient was used to determine the relationship between the percentage of students who participated in the ACT, college enrollment and benchmark attainment. This allowed a value between -1 and +1 to be

obtained to describe the type and strength of the relationship between the variables. A *t*-test for Independent Means was used to test the significance of the correlation coefficient and determined if any difference was caused by chance or by the increase in ACT taking in a state (Fraenkel & Wallen, 2009). Analysis of the data continues in the next chapter.

There are special concerns regarding college and minority students. The need for college continues to increase (Bureau of Labor Statistics, 2013a), yet minorities enroll in college at a much lower rate than White students (Quay, 2010; Roderick et al., 2009). Minority students are almost twice as likely to take remedial courses (Parsad & Lewis, 2003) and have lower college completion rates (Carey, 2008; McPherson, 2011; Roderick et al., 2009). There is inconsistent research regarding the performance of minority students on standardized tests. Some studies claimed that high-stakes tests contain questions that are biased against minorities (Ford & Helms, 2012; Micceri, 2009), yet other researchers claimed that bias on standardized testing has diminished in recent times (National Association for College Admission, 2008) and Blacks outperformed Whites on several areas of standardized achievement tests (Arbuthnot, 2011). States that administered the ACT to all high school students have seen improvements in college readiness by minorities at higher levels that states where testing is optional (ACT, Inc., 2009).

The review of the literature and the findings of studies mentioned provide the rationale for studying the impact of increased ACT testing on college enrollment and college readiness. The results of this study are described in the following chapter.

Chapter Four: Results

This study analyzed the relationship between increased ACT testing in a state and college enrollment and college readiness. College readiness was measured by the percentage of students who met the English and mathematics benchmark on the ACT. A positive correlation in college enrollment rates and English and mathematics benchmark scores with the percentage of graduates tested could determine if student enrollment and readiness improves from expanded ACT administration.

The independent variables in this research were college enrollment rates and the percentage of students who met the English and mathematics benchmark scores on the ACT. The dependent variable was the percentage of graduates who took the ACT in a state. The college enrollment rate was obtained by dividing the number of fall, first-time freshmen graduating from high school in the previous 12 months enrolled in any degree-granting institution with the total number of graduates from high schools located in the state (NCES, 2012a). Data was obtained from the 2012 Digest of Education Statistics published by the National Center for Education Statistics for the 2009-2010 school year, the most recent year data was available at the time of this study. Benchmark scores were obtained from 2010 ACT Profile Report-State. The percentage of graduates who took the ACT in a state was obtained from the 2010 ACT Profile Report-National. Data from college enrollment rates and benchmark scores were compared with the percentages of students who took the ACT in the states selected for the sample.

Participants

There were no participants in this study. The secondary data for this research was generated from a population of students from all 50 states and the District of

Columbia who took the ACT as reported in the ACT Profile Report-State for 2010. The data-generating research population included students who took the ACT as sophomores, juniors, or seniors and self-reported at the time of testing that they were planning to graduate in 2010, approximately 1.5 million students (ACT, Inc., 2010c).

Table 7.

Random Sample Distribution: States Selected by Percentage Range

Percentage Range	State	# of Students
0-17%	Maine	1,611
	New Hampshire	2,685
18-22%	Virginia	19,236
	Washington	12,897
23-28%	Alaska	2,228
	Connecticut	10,453
29-58%	District of Columbia	1,523
	Nevada	6,656
59-66%	Florida	113,480
	Iowa	22,943
67-73%	Nebraska	16,172
	Wisconsin	47,755
74-96%	Alabama	36,624
	Arkansas	24,578
97-100%	Michigan	120,930
	Tennessee	66,552

Note: From ACT, Inc., (2010c)

Ethnic distribution for the population was 13.7% African American/Black, 1.0% American Indian/Alaska native, 62.4% Caucasian/White, 10% Hispanic, and 4.2% Pacific Islander/Asian American, with 8.6% classified as "other" or did not respond to the question.

Sixteen states were randomly selected from a stratified sample, two from each group. Sample groups were formed based on the percentage of 2010 high school graduates that took the ACT in each state. The states selected for study and the number of students who took the test in each state are indicated on Table 7.

Descriptive Statistics

Table 8 displays the descriptive statistics for the independent and dependent variables used in this study. The standard deviation for the percentage of students that took the ACT in a state indicated a large spread of percentages among the sample.

Table 8.

Random Sample Descriptive Statistics

Variable	Mean	SD
% of students that took the ACT	50.31	30.97
% of students that enrolled in college	60.81	8.4
% of students that met the English benchmark	70.18	10.92
% of students that met the mathematics benchmark	46.87	12.84

Note: From ACT, Inc., (2010c); n = 16 Confidence Level = 0.95

On the contrary, the standard deviation of the percentage of students that enrolled in college was much smaller, which indicated that the percentages included in the sample were closer to the mean. The averages of the percentage of students who met the English

and mathematics benchmarks are close to the national averages of 66% and 43% respectively (ACT, Inc., 2010c).

Distribution of the sexes among the sample groups were summarized in Table 9. The percentage of females taking the ACT was higher in every sample state except Virginia, in which case the percentage was equal.

Table 9.

Distribution of Sexes in Sample States

Population Range	State	Percentage of Students	
		Male	Female
0-17%	Maine	40.2	59.8
	New Hampshire	43.6	56.3
18-22%	Virginia	42.6	42.6
	Washington	43.1	56.9
23-28%	Alaska	43.4	56.6
	Connecticut	44.0	55.8
29-58%	District of Columbia	46.2	53.8
	Nevada	43.4	56.6
59-66%	Florida	42.9	57.1
	Iowa	45.7	54.1
67-73%	Nebraska	46.9	53.0
	Wisconsin	46.1	53.8
74-96%	Alabama	45.2	54.8
	Arkansas	45.2	54.3
97-100%	Michigan	49.1	50.8
	Tennessee	48.1	51.6

Note: From ACT, Inc. (2010c)

[a] Percentages may not add up to 100% due to student non-response

The states with the smallest difference of male and female percentages taking the test occurred in states that also had the highest overall percentage of students taking the test.

Table 10.

Distribution of Races in Sample States

	Percentage of Students by Race [a]					
Sample States by Range	African American /Black	American Indian/ Alaska Native	Cauc. /White	Hispanic	Asian American/ Pacific Islander	Other/ No Response
0-17%						
Maine	2.2	0.5	83.2	0.1	0.2	9.7
New Hampshire	1.6	0.3	83.6	2.4	3.1	9.1
18-22%						
Virginia	19.6	0.4	61.2	4.3	5.9	8.6
Washington	4.0	1.1	64.9	7.5	11.3	11.1
23-28%						
Alaska	3.2	15.8	54.5	2.2	6.8	17.5
Connecticut	5.2	0.2	75.7	4.6	4.4	9.9
29-58%						
Dist/Columbia	57.1	0.4	24.6	5.1	2.4	10.5
Nevada	8.7	1.5	53.8	16.8	10.0	9.2
59-66%						
Florida	23.6	0.4	42.3	21.4	3.1	9.2
Iowa	2.5	0.4	87.0	3.1	2.3	4.7
67-73%						
Nebraska	4.2	0.6	82.7	5.7	1.9	4.9
Wisconsin	7.0	0.7	79.1	4.0	3.6	5.6
74-96%						
Alabama	28.0	0.9	64.2	1.7	1.6	3.7
Arkansas	18.0	1.1	69.3	4.5	1.9	5.2
97-100%						
Michigan	14.7	0.8	66.3	3.6	2.4	12.1
Tennessee	19.9	0.4	69.1	3.1	1.7	5.8

Note: From ACT, Inc., (2010c)

[a] Percentages may not add up to 100% due to student non-response and/or rounding.

Table 10 introduces the demographic information for the data-generating population.

Caucasian/White students were the highest demographic represented population for all states except for the District of Columbia. Higher populations of African American/Black students took the ACT in the District of Columbia and the southern states of Alabama, Arkansas, Florida, and Virginia. Higher Hispanic populations of students took the ACT in Florida and Nevada. The demographic of American Indian/Alaska Native students were highest in Alaska among the sample states. The demographic information for 2010 high school graduates who took the ACT correlated with the total population of each state according to the 2010 census (U.S. Department of Commerce, 2010) (see Table 10).

ACT composite scores are often used as a basis for comparing groups and individuals when colleges are considering students for admittance and for scholarship opportunities. This researcher chose not to compare ACT composite scores as part of the study. It was expected that as more students in a state participated in the test, the average composite score would be lower. Students who resided in states where testing was optional and chose to take the ACT were likely college-bound and academically motivated (Roderick et al., 2009) therefore the average composite score could be higher. In states where ACT testing was provided to all students, the scores of those who were not planning to go to college and whose skills may be ready for college-level work were included in the average composite score. The average score for those states would likely be lower. Figure 7 compared the average composite scores with the percentage of students who took the ACT in each state in the sample.

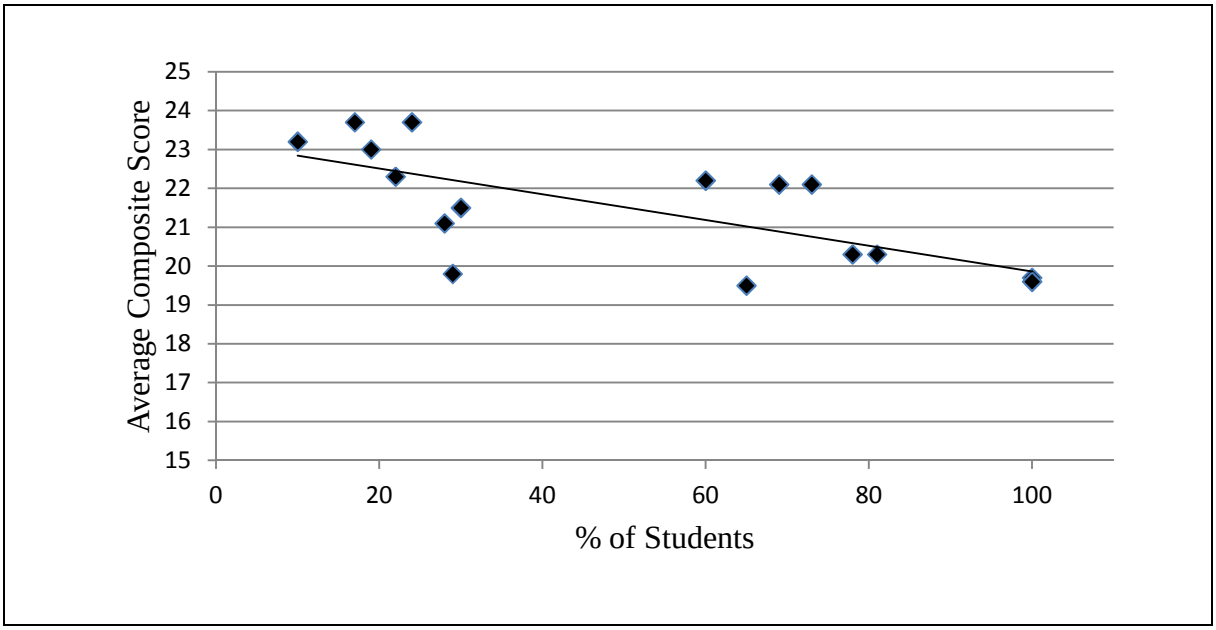

Figure 7. Scatterplot comparing the 2010 state average composite scores with the percentage of 2010 high school graduates who took the test in each state.

Results from Figure 7 confirmed the researcher's expectations. The higher the percentage of students who took the ACT in a state, the lower the average composite score. The researcher believes that the college enrollment rate and attainment of the benchmark score in English and mathematics was a better predictor of college readiness than the average composite scores in a state.

College Enrollment Findings

One focus of this study was to examine the impact of increased ACT testing in a state on the percentage of students enrolled in college. The hypotheses were addressed.

Null hypothesis 1: There is no relationship between the college enrollment rate of first-time freshmen graduating from a state's high school in the previous 12 months as determined by NCES and the percentage of graduates tested as determined by the ACT Profile Report for that state.

A Pearson Product Moment Correlation Coefficient tested the strength of the relationship between the percentage of 2009-2010 high school graduates in a state that were first-time college freshmen in the fall of 2010 and the percentage of 2010 high school graduates that participated in the ACT in a state. The correlation value (R) of 0.317 indicated a significant, mild relationship between the variables and regression coefficients indicated a 95% confidence level. The researcher concluded that 10% of the variation in the dependent variable (college enrollment rate) was explained by the independent variable (the percentage of students who took the ACT in a state). A scatterplot summarized the results (see Figure 8). Comparison of the test value of 0.317 to the critical value of 0.195 yielded a rejection of the null hypothesis. Therefore, the alternative hypothesis was concluded to be true.

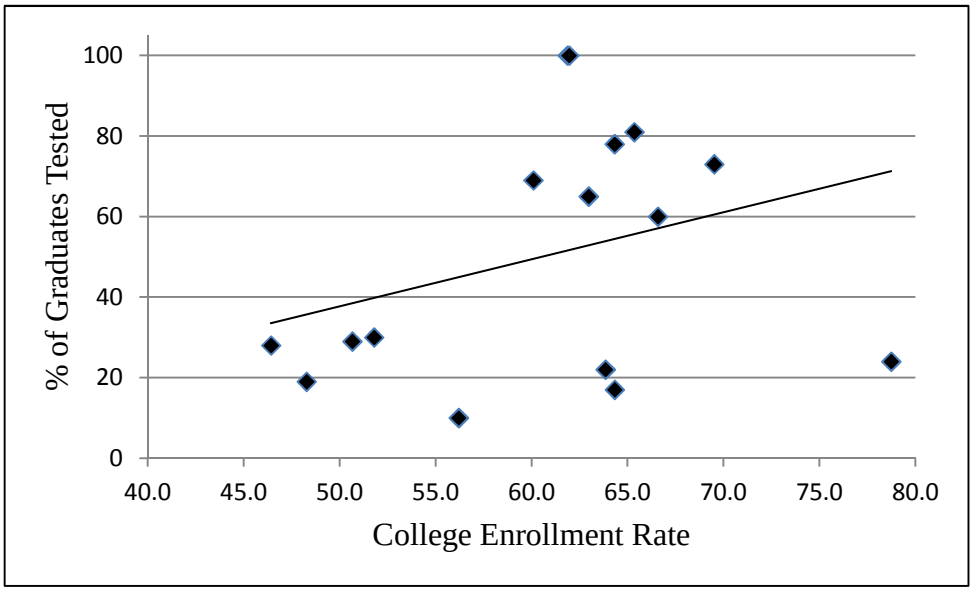

Figure 8. Scatterplot comparing the college enrollment rate with the percentage of 2010 high school graduates who took the test in each state.

Table 11 displayed the correlation coefficients for the percentage of graduates that participated in the ACT in a state and college enrollment rates by gender. A moderate relationship was evident for both males and females.

Table 11.

Correlation between the Percentage of Students That Took the ACT in a State and College Enrollment Rate by Gender

	R	R^2
Males	0.429	0.184
Females	0.422	0.178

Note: From NCES (2012b; 2012c), Table 246 & 247
Data includes only students enrolled full-time.
R = Correlation Value. R^2 = Coefficient of Determination

Table 12 notes the correlation coefficients for the percentage of graduates that participated in the ACT in a state and college enrollment rates by race.

Table 12.

Correlation between the Percentage of Students That Took the ACT in a State and College Enrollment by Race

	R	R^2
African American/black	0.395	0.156
American Indian/Alaska Native	0.223	0.049
Caucasian/white	0.484	0.234
Hispanic	0.108	0.01
Pacific Islander /Asian American	-0.037	0.001

Note: From NCES (2012d), Table 266
R = Correlation Value. R^2 = Coefficient of Determination

Observable mild relationships were indicated between the independent variable and college enrollment rate of American Indian/Alaska Native students, Pacific Islander/Asian American, and Hispanic students. Analysis between the independent variable and college enrollment rate of Caucasian/White students and African American/Black students revealed a significant, moderate relationship.

Table 13 notes the correlation coefficients for the percentage of graduates that participated in the ACT in a state and college enrollment rates by public and private institutions. A significant, moderate association existed between the percentage of graduates that participated in the ACT in a state and enrollment in a public institution, while an observable, mild association existed for private institutions.

Table 13.

Correlation between the Percentage of Students That Took the ACT in a State and College Enrollment Rate by Public and Private Institutions

	R	R^2
Public	0.421	0.177
Private	0.277	0.077

Note: From NCES (2012b; 2012c), Table 246 & 247
Data includes only students enrolled full-time.
R = Correlation Value. R^2 = Coefficient of Determination

English Benchmark Findings

This study also examined the impact of increased ACT testing in a state on the percentage of students who met or exceeded the ACT English benchmark. The following hypotheses were addressed.

Null hypothesis 2: There is no relationship between the percentage of students in a state who met or exceeded the ACT benchmark for English and the percentage of graduates tested as determined by the ACT Profile Report for that state.

A Pearson Product Moment Correlation Coefficient tested the strength of the relationship between the percentage of 2010 high school graduates in a state that met or exceeded the English benchmark score of 18 on the ACT and the percentage of 2010 high school graduates that participated in the ACT in a state. The correlation value (R) of -0.562 indicated a significant, moderate negative relationship between the variables. Regression coefficients indicated at the 95% confidence level that 32% of the variation in the dependent variable (English benchmark attainment rate) can be explained by the independent variable (the percentage of students who took the ACT in a state). A scatterplot summarized the results (see Figure 9). Comparison of the test value of negative 0.562 to the critical value of 0.195 yielded a rejection of the null hypothesis. Therefore, the alternative hypothesis was concluded to be true.

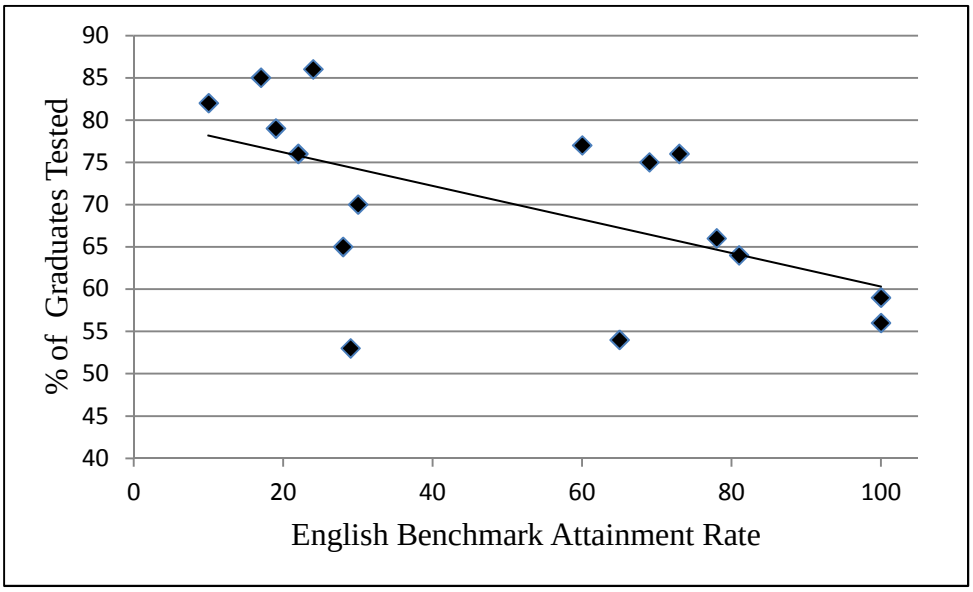

Figure 9. Scatterplot comparing the English benchmark attainment rate with the percentage of 2010 high school graduates who took the test in each state.

A moderate relationship was indicated in the English benchmark attainment rates of both males and females when analyzing for the percentage of graduates that took the ACT in a state and English benchmark attainment rates by gender (see Table 14).

Table 14.

Correlation between the Percentage of Students That Took the ACT in a State and English Benchmark Attainment Rate by Gender

	R	R^2
Males	-0.673	0.453
Females	-0.440	0.193
Total	-0.562	0.316

Note: From ACT Inc., (2010c), Table 2.8
R = Correlation Value. R^2 = Coefficient of Determination

Table 15 displays the correlation coefficients for the percentage of graduates that took the ACT in a state and English benchmark attainment rates by race.

Table 15.

Correlation between the Percentage of Students That Took the ACT in a State and English Benchmark Attainment Rate by Race

	R	R^2
African American/black	-0.658	0.433
American Indian/Alaska Native	-0.311	0.096
Caucasian/white	-0.816	0.666
Hispanic	-0.705	0.497
Pacific Islander /Asian American	-0.496	0.246

Note: From ACT, Inc., (2010c), Table 3.1

A significant, moderate relationship was found between the percentage of students that took the ACT in a state and Pacific Islander/Asian American students and African American/Black students. A significant, mild relationship existed between the independent variable and English benchmark attainment rates of American Indian/ Alaska Native students. Data analysis revealed a significant, strong relationship between the independent variable and Caucasian/White students and Hispanic students.

Mathematics Benchmark Findings

The final focus of this research was to examine the impact of increased ACT testing in a state on the percentage of students who met or exceeded the ACT Mathematics benchmark. The following hypotheses were addressed.

Null hypothesis 3: There is no relationship between the percentages of students in a state who meet or exceed the ACT benchmark for Mathematics and the percentage of graduates tested as determined by the ACT Profile Report for that state.

A Pearson Product Moment Correlation Coefficient tested the strength of the relationship between the percentage of 2010 high school graduates in a state that met or exceeded the Mathematics benchmark score of 22 on the ACT and the percentage of 2010 high school graduates that participated in the ACT in a state. The correlation value (R) of -0.757 indicated a significant, strong relationship between the variables. Regression coefficients indicated at the 95% confidence level that 57% of the variation in the dependent variable (Mathematics benchmark attainment rate) was explained by the independent variable (the percentage of students who took the ACT in a state). A scatterplot summarized the results (see Figure 10). Comparison of the test value of -

0.757 to the critical value of 0.195 yielded a rejection of the null hypothesis. Therefore, the alternative hypothesis was concluded to be true.

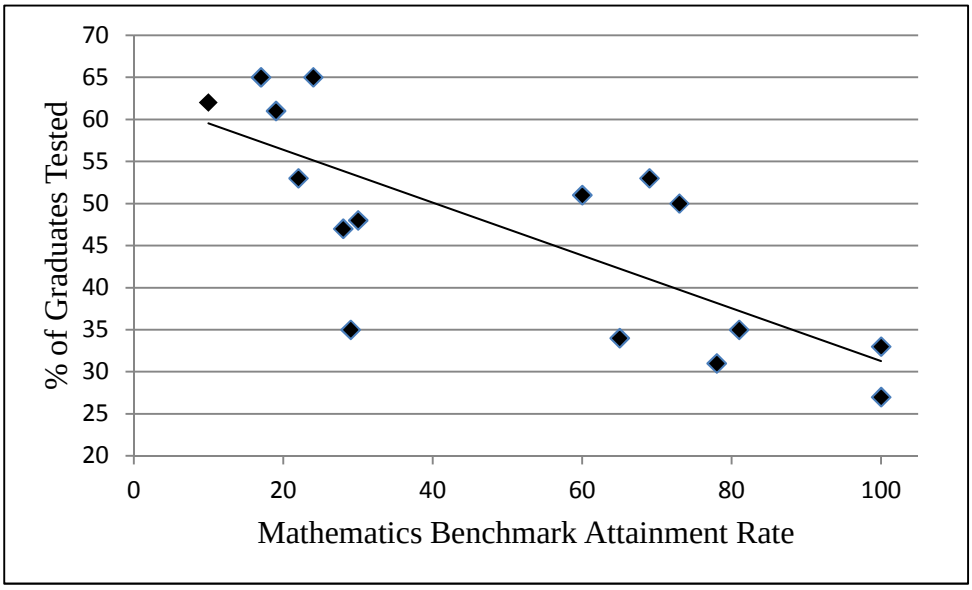

Figure 10. Scatterplot comparing the mathematics benchmark attainment rate with the percentage of 2010 high school graduates who took the test in each state.

A significant, moderate relationship was indicated between the independent variable and the mathematics benchmark attainment rates of females. A significant, strong relationship was indicated for males (see Table 16).

Table 16.

Correlation between the Percentage of Students That Took the ACT in a State and Mathematics Benchmark Attainment Rate by Gender

	R	R^2
Males	-0.815	0.664
Females	-0.667	0.458
Total	-0.757	0.574

Note: From ACT, Inc., (2010c), Table 2.8
R = Correlation Value. R^2 = Coefficient of Determination

A significant, moderate relationship was evident between the independent variable and Mathematics benchmark attainment rate of African American/Black students and Pacific Islander/Asian American students. A significant, mild relationship was indicated between the independent variable and Mathematics benchmark attainment rates of American Indian/Alaska Native students. A strong relationship existed between the independent variable and Caucasian/White and Hispanic students (see Table 17).

Table 17.

Correlation between the Percentage of Students That Took the ACT in a State and Mathematics Benchmark Attainment Rate by Race

	R	R^2
African American/Black	-0.627	0.393
American Indian/Alaska Native	-0.384	0.147
Caucasian/White	-0.815	0.664
Hispanic	-0.831	0.690
Pacific Islander /Asian American	-0.540	0.292
Total*	-0.757	0.574

Note: From ACT, Inc., (2010c), Table 3.2
R = Correlation Value. R^2 = Coefficient of Determination
* Total includes students that indicated "other" for race or did not respond to question. Benchmark attainment of this group was not reported by ACT, Inc.

Summary

This chapter presented the analysis of the quantitative data gathered for this research project. After completing calculations, all three null hypotheses were rejected. The researcher concluded that the three alternative hypotheses were true. There was a mild positive relationship between the percentage of 2010 high school graduates that participated in the ACT in a state and the percentage of 2009-2010 high school graduates

that enrolled in college in the fall of 2010. While the significance of the relationship was not strong, enough of a relationship existed to consider that increased ACT testing may have caused more students to enroll in college. The researcher believes states and school districts should consider the benefits to their students when contemplating expanded ACT testing.

The significance of the relationship between increased ACT testing and benchmark attainment rates was stronger. There was a moderate negative relationship between the percentage of 2010 high school graduates that participated in the ACT in a state and the percentage of students who met or exceeded the English benchmark score. A strong negative relationship was found between the percentage of students who took the ACT and the percentage of students who met or exceeded the Mathematics benchmark scores. The researcher believes the greater significance of these relationships highlighted deficiencies in the current high school curriculum that should be considered when states and school districts evaluate current teaching practices and contemplate changes.

This study established a significant correlation between the percentage of students that participated in the ACT in a state and college enrollment and readiness. The following chapter discusses implications based on research results and recommendations for additional investigations.

Chapter Five: Discussion and Recommendations

A college education is essential for success in the future. Those with a college degree will make more money (Bureau of Labor Statistics, 2013b) and will be less affected by economic instability (Borbely, 2009). Employment requiring a college degree will grow, while jobs that do not require postsecondary education will decline. The attainment of a college degree will remain important to a society's future (Obama, 2010).

Despite the increased need for a college education, ongoing roadblocks currently prevent students from enrolling and completing college. Family experiences with college and cost are factors that have inhibited college enrollment (Baird, 2006; Ellwood & Kane 2000; Perna & Titus, 2005). Additionally, students continue to graduate from high school lacking the skills needed to be successful in college-level courses. Statistics claimed the rate of students required to take remedial coursework ranged from 20% to 60% (Byrd & MacDonald, 2005; Khan et al., 2009; Radford et al., 2012; Strong American Schools, 2008) and taking remedial classes greatly affected a student's chance of completing a degree (Horn et al., 2009; Mangan, 2012; Smith, 2012).

Additional barriers to a college degree exist for minority students. In the past minorities enrolled in college at a much lower rate than White students (Liu, 2011; Quay, 2010; Roderick et al., 2009) and were required to take remedial courses at a higher rate than White students (Arbuthnot, 2011; McPherson, 2011; Parsad & Lewis, 2003), while the minority graduation rate was lower than that of White students (Carey, 2008; Knapp et al., 2012). Throughout the current literature, the researcher found the quality of school facilities, the skill of teachers, and family background were factors contributing to the lower minority enrollment and completion rate.

Purpose of the Study

The purpose of this study was to examine the effects of increased ACT testing in a state on college enrollment and readiness. The researcher used existing secondary data to assess if taking the ACT could lead more students to attend college and enable them to be better prepared for college-level work. The percentage of high school graduates in a state who participated in the ACT and the percentages of students who met or exceeded the English and mathematics benchmark scores were obtained from the ACT Profile Report-State published by ACT, Inc. for each state (ACT Inc., 2012b, 2012c). The college enrollment rate was obtained from the Digest of Education Statistics, published by the National Center for Education Statistics (NCES, 2012a, Table 238). Data was collected from the 2009-2010 school year, the most recent year that NCES collected the enrollment data during the timeline for this study.

Results

ACT, Inc. (2009c) claimed that statewide administration of the test provided students with the opportunity to identify strengths and weaknesses and prepared students to meet their educational and career goals. This was especially important for students who had never considered going to college and would otherwise have not taken the ACT (Cech, 2008). Results from this study supported some aspects of this claim.

College enrollment results. The percentage of 2010 high school graduates taking the ACT in a state was compared with the percentage of 2009-2010 high school graduates that enrolled in college in the fall of 2010. Percentages of students who participated in the ACT in a state were obtained from the ACT National and State data. Only first-time freshmen enrolled in college full time were included in the data. The correlation

coefficient results indicated a mild positive correlation (R = 0.317) indicating that the percentage of students enrolling in college did increase as the percentage of students participated in the ACT increased. However, the coefficient of determination (R^2 = 0.101) revealed that only 10% of the variation in the college enrollment rate could be explained by increased ACT testing. The claim that statewide administration of the ACT "increases the number of students considering college" may be true (ACT, Inc., 2009c, p. 1) but additional research is needed to fully support this claim.

The percentage of students who participated in the ACT in a state and the number of students enrolled in college by gender were analyzed to find a possible relationship to ACT participation. College enrollment numbers by gender were obtained from the Digest of Education Statistics, Table 246 and Table 247 (NCES, 2012b, 2012c). A positive moderate association was shown in both males (R = 0.429) and females (R = 0.422). The coefficients of determination (R^2 = 0.184 & 0.178, respectively) indicated that approximately 18% of the variation in college enrollment of males and females was possibly due to increased ACT testing. Enrollment did increase for both genders as ACT testing increased, but no cause-effect relationship appeared to exist with this data.

The researcher collected data and analyzed the possible relationship between increased ACT testing on public and private institution numbers. College enrollment by type of institution was obtained from the Digest of Education Statistics, Table 246 and Table 247 (NCES, 2012b, 2012c). The correlation value was higher for students attending public institutions (R = 0.421) than private ones (R = 0.277). However, the coefficient of determination for each is still low (R^2 = 0.177 & 0.076). In other words, increased ACT testing appeared to affect enrollment in public institutions at a higher rate.

As more students apply for colleges, financial aid resources would be stretched (Romano, 2012), causing students with limited college funds to search for the least expensive option. Public colleges are often less expensive than private colleges, at least before considering any financial assistance (Bettinger & Long, 2005; Hauptman & Kim, 2009). Additionally, some public colleges, such as community colleges, do not have competitive academic entrance requirements (Horn et al., 2009). Students lacking college-level skills are accepted as evidenced by the increased number of public college students who must take remedial coursework (Attewell et al., 2006; Radford et al., 2012; Sparks & Malkus, 2013).

The effect of increased ACT testing on college enrollment by race was also examined. College enrollment figures by race were obtained from the Digest of Education Statistics, Table 266 (NCES, 2012d). The researcher found interesting discoveries within the data analysis although cause and effect could not be proven. The highest correlation coefficient found was for Caucasian/White students ($R = 0.484$), with 23% of the variation possibly due to increased ACT testing. This would seem to support the claim that increased ACT testing does improve college enrollment to at least a small extent. However, ACT, Inc. stated that an important benefit of providing testing to all students was to reach underrepresented populations that would otherwise not consider going to college (ACT, Inc., 2009c). In looking at those groups of students, this study cannot support that claim. A moderate positive correlation was seen in the enrollment numbers of African American/Black students ($R = 0.395$), with a coefficient of determination of 0.156. While an increase in college enrollment was good, increased ACT testing could not be solely credited as the cause. Mild to very mild associations

were observed between the percentage of students taking the ACT in a state and other minority populations. The correlation coefficients for American Indian/Alaska native students and Hispanic students were 0.223 and 0.108, respectively. Pacific Islander/Asian American students showed a mild negative correlation (R = -0.037). This study showed correlation, but not to the degree that any cause could be attributed to it. The researcher found this to be disappointing, since reaching minority groups was a goal of increased testing.

English benchmark results. A second focus of this research was to analyze a possible relationship between increased ACT testing in a state with the percentage of students who met or exceeded the ACT English benchmark score of 18. Benchmark scores indicated the minimum scores on each subject test of the ACT that was required for students to have a high probability of success in first-year credit-bearing college courses. Students who met the benchmark had approximately a 50% chance of obtaining a grade of *B* in the course and a 75% chance of obtaining a *C* (ACT, Inc., 2007). Another benefit claimed by ACT, Inc. (2010d) for expanding testing was if students and teachers know areas of academic deficiencies before leaving high school, there would still be time to fill the gap before entering college-level courses. An increase in students meeting the English benchmark score as testing increases would support that claim.

When comparing the percentages of students who participated in the ACT in a state with the percentages of students who met the English benchmark score, a correlation coefficient of -0.562 was found. This indicated a significant, negative, moderate relationship between the variables. Regression coefficients indicated that 32% of the variation in the English benchmark attainment rate was possibly explained by the

percentage of students who took the ACT in a state. The relationship was negative, or fewer students met the benchmark score as more students took the test. In states where testing is optional, only college-bound students would take the test and it would be expected that more students would meet the benchmark score. In states where all students were assessed, it is logical that the percentage of students who met the benchmark score would be lower. Research by Roderick et al. (2009) also found this correlation to be true, although it was in reference to state average composite scores being lower for states that gave the test to all students instead of benchmark scores.

English benchmark attainment rates were compared by gender. A negative, moderate relationship was found in both males (R = -.673) and females (R = -0.440), that indicated the percentages of males and females that met the benchmark score decreased as ACT testing increased. What is noteworthy was the coefficient of determination. While ACT testing seemed to have a very small effect on female performance (R^2 = 0.193), a much larger impact was observed on male performance (R^2 = 0.453). That is to say, 45% of the variance in English benchmark scores could possibly be explained by increased ACT testing.

Benchmark attainment rates were also compared by race. Negative relationships were found among all races, meaning fewer students met the English benchmark as ACT testing increased. Moderate relationships were indicated for Pacific Islander/Asian American students and African American/Black students (R = -0.496 and -0.658, respectively). A mild relationship was indicated for American Indian/Alaska Native students (R = -0.311). A strong relationship was indicated for Hispanic students (-0.705), which appeared to the researcher as logical. Hispanic students whose first language is

other than English would not be expected to perform as high as native English speakers. A noteworthy finding occurred in the relationship between increased testing and attainment of the English benchmark score for Caucasian/White students. A correlation coefficient of -0.816 was found, with 67% of the variation in English benchmark attainment rates possibly being explained by increased testing. This seemed to indicate that a large English achievement gap existed in Caucasian/White students, as well as moderate gaps for the other races.

Mathematics benchmark results. A final focus of this study was to find a possible relationship between increased ACT testing in a state with the percentage of students who met or exceeded the ACT mathematics benchmark score of 22.

When comparing the percentages of students who took the ACT in a state with the percentages of students who met the mathematics benchmark score, a correlation value of -0.757 was found. This indicated a significant, strong relationship between the variables. Regression coefficients indicated that 57% of the variation in the mathematics benchmark attainment rate could possibly be explained by the percentage of students who participated in the ACT in a state. The relationship was negative, meaning fewer students met the benchmark score as more students took the test. As stated previously, in states where all students are assessed, it appears logical to the researcher that the percentage of students who meet the benchmark score would be lower as compared to other states where only college-bound students take the test.

Mathematics benchmark attainment rates were compared by gender. Negative correlations were found for both males and females. A moderate relationship was found for females (R = -.667), with a regression coefficient of 0.445. For males, however, a

strong relationship was found (-0.815) with a regression coefficient indicating that 66% of the variation in the Mathematics benchmark attainment rate could possibly be attributed to increased ACT testing.

Mathematics benchmark attainment rates were also compared by race. Just as in the English benchmark attainment rates, negative relationships were found among all races. This meant that fewer students met the Mathematics benchmark as ACT testing increased. A mild relationship was again found for American Indian/Alaska Native students (R = -0.384). Moderate relationships were evident for Pacific Islander/Asian American students and African American/Black students (R = -0.540 and -0.627, respectively). Strong relationships were found for both Hispanic students (R = -0.831) and Caucasian/White students (R = -0.815). Regression coefficients were in 60% range for both groups of students. This indicated to the researcher that a large mathematics achievement gap existed in Caucasian/White and Hispanic students. Since limited English proficiency would seem to have the least amount of impact in the mathematics content area, it was surprising that such a large negative correlation existed for Hispanic students.

Conclusion

This research examined the effects of increased ACT testing in a state on college enrollment and college readiness. When comparing figures for increased testing and college enrollment, positive moderate relationships were found among males, females, those that attended public institutions, and Caucasian/White students. Mild positive relationships were found among African American/Black students, American Indian/Alaska Native students, Hispanic students, and those that attended private

institutions. A mild, negative relationship was found among Pacific Islander/Asian American students. Overall, a mild, positive relationship was indicated for all students. Regression coefficients were minimal for all students and special populations.

College readiness was measured by the percentages of students who met or exceed the ACT benchmark score in English and Mathematics. When comparing figures for increased testing and attainment of English benchmark scores, negative relationships were found for all students, as well as for special populations. Moderate negative relationships were found for males, females, African American/Black students, and Pacific Islander/Asian American students. Mild negative relationships were found for American Indian/Alaska Native students and strong, negative relationships were found for Caucasian/White students and Hispanic students. Overall, a moderate negative relationship was indicated for all students. Regression coefficients were highest for Caucasian/White students at 66%.

When comparing figures for increased testing and attainment of Mathematics benchmark scores, correlation coefficients were much stronger than what was indicated with English correlations but again, all were negative. Moderate negative relationships were found for females, Pacific Islander/Asian American students, and African American/Black students and a mild negative relationship was found for American Indian/Alaska Native students. Strong negative relationships were found for males, Caucasian/White students, and Hispanic students. Overall, a strong negative relationship was indicated for all students. Regression coefficients were highest for Caucasian/White students (66%) and Hispanic students (69%). Results from the correlation between increased ACT testing and the attainment of benchmark scores in both English and

Mathematics suggested a disparity between what is being taught in high school and what is needed to be successful in college-level work.

Recommendations for Improvement

The purpose of this study was to examine the effects of increased ACT testing on college enrollment and readiness. By exposing more students to a college entrance exam, they can gain a sense of how they stand in terms of admission requirements (Herbert, 2010). The researcher believes this is important for students who have never considered college as an option and would otherwise have not taken the ACT (Cech, 2008). ACT, Inc. (2009c) claimed that statewide administration of the test provided students with the chance to identify strengths and weaknesses and to prepare students to meet their educational and career goals. Data analysis conducted in this study has guided the researcher to make the following recommendations to improve instruction and achievement.

Increased ACT testing did seem to have a positive impact on college enrollment, although the degree to which testing was responsible for this increase was uncertain. The researcher recommended that the implementation of ACT occur for all students, which would provide every student consistent and fair access to information about their level of college readiness. The ACT should supplement existing statewide assessments as is done in some states, or replace statewide testing altogether. In the opinion of the researcher, this would increase the availability of information but would not overburden students who are already tested often.

As evidenced in this study, a large achievement gap appeared to exist between what students learn in high school and what they are expected to know when entering

college. This was especially true for underrepresented students. In the experience of the researcher, knowing the gap exists is the first step towards a solution. In the opinion of the researcher, high schools should be supplied student achievement data from the ACT in a timely manner and in a way that is meaningful and applicable to classroom instruction. Teachers should be trained to analyze student data for areas of improvement and learn instructional strategies that will narrow the gaps and embedded time should be provided for this training to take place. Administration should provide support to teachers to this end.

ACT, Inc. (2009c) claimed that reaching underrepresented students was a reason to give the ACT to all students. Findings in this study verified the discrepancy in learning among minority students. By expanding ACT testing to all students, learning deficits can be learned early; however, states and school districts must be prepared with a solution. Organized collaboration among school districts would address this problem. Critics of standardized testing claimed that results are invalid because some students have access to test preparation courses and texts that give them an advantage on the test (Perez, 2002; Rooney & Schaeffer, 1998). Currently, limited preparation is available free of charge in some areas and online (ACT, Inc., 2014). It is the researcher's belief that ACT, Inc. should fund assistance in all states that provide the ACT to all high school students.

Some states have special councils created for the alignment of curriculum from kindergarten through college (K-16) (Callan et al., 2009). This should be required for all states to ensure smooth transitions from high school to college and to prevent achievement gaps. It is the researcher's opinion that state governments have the authority

and responsibility to ensure every school district prepares their students for postsecondary education.

Although education is a state's right and responsibility (Dennis, 2000), in the researcher's experience the federal government has issued directives that greatly affected what schools can do. Colleges do not acknowledge current state mandated assessments as acceptable proof of ability nor do scores from these assessments earn college entrance or financial help. The researcher's final recommendation was that the federal government change its existing assessment requirements to allow ACT testing to be given in high schools in lieu of other state requirements. The information gleaned from the ACT is valuable, relevant, and useful to students and parents when contemplating college. In the researcher's opinion, the current testing requirements are not.

Recommendations for Future Study

This study revealed new information and confirmed findings claimed by others. However, as is often the case with research, new opportunities for study become known as investigations deepen. Data analysis conducted in this study has guided the researcher to make the following recommendations for future study.

This study focused on student enrollment data and ACT information from students who graduated in 2010. This was the most recent year that college enrollment data was available. The researcher recommends replicating this study using older data as well as more current data as it becomes available. Repeating this study would either confirm or invalidate results; the researcher believes either outcome would be beneficial.

This study examined increased ACT testing on college enrollment and readiness. While research has indicated a correlation between increased college readiness and

degree completion (Bailey & Cho, 2010; Horn et al., 2009; Mangan, 2012; Smith, 2012; Vandal, 2011), no research has been found that examined the impact of increased testing on degree completion. A future study recommendation would be to look at how ACT testing rates affect persistence.

This study investigated college enrollment rates. All postsecondary schools that offer at least an associate's degree and participate in Title IV financial aid were included. The researcher recommends further study to identify the effects of increased testing on college enrollment, comparing two-year schools and four-year schools. A review of the literature revealed differences in the type of student who attends both types of schools (Baum et al., 2013; Bozick & DeLuca, 2005; Horn et al., 2005; James, 2012; Niu & Tienda, 2013; Roderick et al., 2011; Sherwin, 2012). The researcher believes that discovering how those differences impact college enrollment and degree completion would be relevant and useful.

This study used statewide data to examine the effects of increased ACT testing. However many school districts choose to provide ACT testing to all students, even in states where it was not mandated. The researcher recommends a similar study be conducted using school district data. These findings might increase their relevancy at the local level resulting in an easier implementation of improvements.

Finally, this study revealed a discrepancy between what students are learning in high school and what they were expected to know when entering college. There have been studies that connect the misalignment of high school curriculum to college readiness (Greene & Forster, 2009; Spence, 2009). There is no shortage of available achievement data on students (Achieve, Inc., 2007). Teachers have access to their students' data,

leaving the researcher to question how teachers are using this data to make instructional decisions. A significant research opportunity exists to study how achievement test data is being used in the classroom and how these instructional methods affect college readiness.

Summary

The need for a college degree will continue to grow in the future (Bureau of Labor Statistics, 2013b). Employment opportunities requiring a postsecondary education will grow (Bureau of Labor Statistics, 2013a), as jobs that do not require additional education will not (Lacey & Wright, 2009). Despite the increased need for college, students continue to graduate high school unprepared for college-level work (Bettinger & Long, 2005; Durham & Westlund, 2011; Khan et al., 2009).

Federal initiatives mandate periodic assessments to ensure student leaning and to hold schools accountable (Zinth, 2012). However, scores from these assessments do not help students get into college nor do they evaluate college readiness (Katsinas & Bush, 2006). Thirteen states now provide the ACT to all high school students as part of the required state assessment (ACT, Inc., 2014a). By doing so, all students will have an accurate measure of where they stand in terms of college readiness in time to close achievement gaps before leaving high school (ACT, Inc., 2010d).

Even though postsecondary education continues to be important to gaining employment (Crosby & Moncarz, 2006), factors prevent students from going to college. Studies revealed that cost (Advisory Committee, 2010; Baum et al., 2013; Durham & Westlund, 2011; Dynarski, 2002) and family background (Baird, 2006; Ellwood & Kane 2000; Perna & Titus, 2005) effect college enrollment. In this study, the researcher found

a relationship between increased ACT testing and college enrollment, although the extent of which testing was responsible for the increase was limited.

Research on college readiness focused on the role of the high school and the effects of remediation. High school curriculum was not challenging enough to prepare students for college (Pathways to College Network, 2007; Byrd & MacDonald, 2005; Marklein, 2007; “Unlocking Doors,” 2011; Zagier, 2011) or was not aligned with college curriculum (Greene & Forster, 2009; Spence, 2009). Studies indicated between 29% and 60% of students are required to take at least one remedial course in college (Byrd & MacDonald, 2005; Khan et al., 2009; Radford et al., 2012; Strong American Schools, 2008). In this study, the researcher found strong, negative relationships between increased testing and college readiness in both English and mathematics. Results suggested a disparity between what high school students have learned and what they need to know in order to be successful in college. The researcher believes additional research should be pursued to investigate the cause(s) of findings.

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Vitae

With more than 15 years of experience, Diana H. Iborg has a varied and extensive background in the education field. After graduating from Lindenwood University with a bachelor's degree in history, Iborg began her teaching career in the Troy R-3 school district. For eight years, she taught Civics, Geography, and Economics at the middle school level. During her time as a Social Studies teacher, Iborg earned two school board grants, was awarded the Mastering American History grant by the state of Missouri, and was invited twice to participate in the Library of Congress' Summer Institute as a consultant. Iborg returned to Lindenwood University to earn a master's degree in education, with an emphasis in gifted education. She taught gifted education at the secondary level before earning certification as a school psychological examiner.

In 2008, Iborg joined the Center for Creative Learning. As lead psychometrist, Iborg assesses hundreds of students annually for the Rockwood School District's gifted program, grade acceleration program, and for Missouri Scholars. She has given numerous presentations, both locally and nationally, on assessment methods, underrepresented students, and early ability indicators. Iborg has also taught assessment methods courses for Truman State University and is a Rockwood Administrative Leadership Development graduate. Iborg is a member of the National Association of Gifted Children, ASCD, Missouri Association of School Psychologists, and Missouri Association of Secondary School Principals. In 2011, Iborg earned a specialist degree in Educational Administration from Lindenwood University. She anticipates earning her Doctor of Education degree in the Spring of 2014, also from Lindenwood University.