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College Readiness and Middle School: To What Extent Do Middle School Data Sources Predict College Readiness as Measured by the SAT?

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COLLEGE READINESS AND MIDDLE SCHOOL:

TO WHAT EXTENT DO MIDDLE SCHOOL DATA SOURCES PREDICT COLLEGE READINESS AS MEASURED BY THE SAT?

by

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ABSTRACT

COLLEGE READINESS AND MIDDLE SCHOOL:

TO WHAT EXTENT DO MIDDLE SCHOOL DATA SOURCES PREDICT COLLEGE READINESS AS MEASURED BY THE SAT?

Matthew Sterenczak

The twenty-first century world that America's current students will find themselves in will be a world highly influenced by the knowledge economy. In this globalized world, human intelligence will be a valuable natural resource as borders and barriers across the world become less important. In order to succeed in this new world, America's students must be ready to compete with their peers all over the globe. A key feature of the twenty-first century is the increased access to college that individuals all over the world have. While the United States continues to be a global superpower, there are indications that its students are entering college ill equipped to meet the demands and rigor of higher education. An increasing number of students are requiring remediation upon entering their selected college or university. Students who require remediation are less likely to graduate from college and remedial programs costs colleges and universities billions of dollars each year.

As a result of this trend, an increased focus on what it means to be college ready has emerged. While much of the research has focused on what high schools can do to prepare college ready students, the ACT identified the level of college readiness students attain by 8th grade as having more impact than anything that happens in high school. The College Board, creators of the SAT, established college readiness benchmark scores for their exams. Students who meet these college readiness benchmark scores are more likely to be successful in college than those who do not. The current study examined 1,446 students from a suburban Pennsylvania school

district who had three pieces of data available to the researcher: 8th grade Pennsylvania System of School Assessment (PSSA) scores, 8th grade final teacher assigned grades in math and English, and SAT scores. For the purposes of this study, students' scores on their first attempt taking the SAT were used. Additional variables were controlled for including gender, IEP status, free and reduced lunch eligibility, the level of math taken in 8th grade, and when in a student's high school career they first took the SAT.

A logistic regression was run to determine to what extent 8th grade PSSA scores and final teacher assigned grades predict college readiness as measured by the SAT. The SAT college benchmark scores were made into dichotomous dependent variables, meaning that students either met the score or did not meet the score. Results from this study indicated that both student grades and PSSA scores are significant predictors of future college readiness. Additionally, the level of math students take in 8th grade is highly predictive of future college readiness. Students who take advanced math courses, Algebra I or higher, in 8th grade are significantly more likely to be college ready than students who do not. Students who have IEPs and are free and reduced lunch eligible were significantly less likely to meet the benchmarks than their peers. Gender was found, in many cases, to have statistical significance, but not pragmatic significance. Findings from this study indicate that the work done by teachers and students in the middle grades has a significant impact on developing college readiness levels in students, and efforts made to increase student performance in middle school can also improve college readiness.

CHAPTER I

Introduction

The role of public education in maintaining the global influence of the United States has long been a catalyst for government driven education reform (Brown, 2006; Davies & Bansel, 2007; Gardner, Larsen, & Baker, 1983; Graham & Bridge, 2010; Paige, 2006; Ramirez, Luo, Schofer, & Meyer, 2006). The sweeping 1983 educational reform document *A Nation at Risk* was motivated by Cold War politics and serious concerns about educational quality in the United States. Areas of concern outlined in *A Nation at Risk* included a decline in students' ability to use higher order thinking skills to solve problems, lower scores on standardized achievement tests, an increase in remedial courses offered to college students, and that when compared to students internationally, American students were performing lower than their peers (NCEEE, 1983). By identifying the need for students to attend and be successful in college without the need for remediation, *A Nation at Risk* tasked K-12 schools with producing college ready students who were equipped to handle the academic demands of higher education.

The No Child Left Behind Act (NCLB) of 2001 advanced many of the recommendations found in *A Nation at Risk*, but went beyond making policy recommendations and sought to hold schools accountable for student performance. NCLB was the reauthorization of the Elementary and Secondary Education Act (ESEA) that was first enacted in 1965 and, prior to NLCB, its most recent reauthorization occurred in 1994. While the Cold War that motivated *A Nation at Risk* was over, NCLB was motivated by a new set of challenges the United States will face in the twenty-first century. In the twenty-first century, the United States is encountering a changing world impacted by globalization. Globalization is the integration of capital, technology, and information across national borders, in a way that is creating a single global market and, to some degree, a global village (Beck, 1999; Friedman, 2000; Sassen, 1996; Scholte, 2005). This

development has led to the formation of a knowledge economy in which production and services are based on knowledge-intensive activities, leading to a greater reliance on intellectual capabilities than on physical inputs or natural resources (Dunning, 2000; Etzkowitz & Leydesdorff, 1997; Jaffe & Trajtenberg, 2002; Powell & Snellman, 2004). In a competitive global marketplace with a knowledge economy, a highly educated population is an increasingly valuable natural resource (Burton-Jones, 2003; Dale, 2007; Olssen & Peters, 2005; Powell & Snellman, 2004).

In order to ensure schools in the United States were measuring up to the changing global landscape of the twenty-first century, No Child Left Behind placed great emphasis on measuring student achievement in relation to defined academic standards through performance on high stakes standardized tests (No Child Left Behind [NCLB], 2002). These tests would also serve as a way to hold schools accountable for student achievement, levying penalties against schools and districts that failed to demonstrate Adequate Yearly Progress (AYP). The state of Pennsylvania implemented the Pennsylvania System of School Assessment (PSSA) exams to comply with NCLB regulations. The PSSA is a standards-based, criterion referenced assessment designed to measure a student's attainment of the Pennsylvania Academic Standards. The reading and mathematics assessments are administered annually to students in grades 3 through 8. These assessments categorize students based on their achievement as being Advanced, Proficient, Basic, or Below Basic in regards to state content standards. Students who receive scores in the Basic and Below Basic range are considered to have not demonstrated attainment of academic standards. An additional feature of NCLB was that every other year a sample of students in grades four and eight were to participate in the National Assessment of Educational Progress (NAEP) so that student data could be gathered for cross state comparison. As a result of the

demands placed on schools to meet NCLB requirements, K-12 schools in Pennsylvania began to alter and enhance their instructional programs and practices to increase student achievement (Hamilton, Stecher, Marsh, McCombs, & Robyn, 2007; O' Donnell & White, 2005; Pash, 2010).

Background

In an effort to improve the overall level of instruction and to target specific academic areas requiring improvement, the use of available student performance data has become a key tool for educators to drive curricular and instructional decisions (Armstrong & Anthes, 2001; Earl & Katz, 2002; Salpeter, 2004; Wayman, 2005). Positive outcomes of data use include better informed instructional decisions for school improvement and an increase in collaboration among teachers (Chrispeels, Brown, & Castillo, 2000; Symonds, 2003; Zhao & Frank, 2003). Much of the student data that are analyzed comes from standardized tests, and student results on these tests has become the primary way for schools and educational leaders to evaluate how well students are performing and how to design and implement strategies for school improvement (Bowers, 2009; Mandinach, Honey, & Light, 2006; Pellegrino, Chudowsky & Glaser, 2001; Stiggins, 2002). Standardized tests provide data on all students, but using a single test score as the most important measure of student achievement takes the emphasis away from other available student performance data and an over reliance on standardized test results may not provide an accurate report of what students know and are able to do (Guskey, 2007; Stiggins, 2002). Seemingly lost in the pursuit of examining student performance data are the grades students earn in their classes (Bowers, 2009).

Standardized tests are intended to measure what students know and are able to do in relation to specific content standards. Student performance data on standardized tests provides educators with the ability to understand general patterns of performance across schools, grade

levels, and individual classes in an effort to develop targeted, wide reaching interventions (Mandinach et al., 2006). Classroom grades demonstrate the performance of the individual student rather than the overall system. Classroom grades are influenced by many, sometimes nonacademic, factors (Cizek, 2000; Mandinach et al., 2006; Marzano, 2000; Shepard, 2006; Willingham, Pollack, & Lewis, 2002). Factors influencing student grades can include subjective measures like effort, participation, and behavior as well as factors like attendance and homework completion (Bowers, 2009). The findings of research into grading practices led some researchers (Allen, 2005; Cizek, 2000) to urge a dramatic shift in grading procedures. Inconsistencies in teacher grading practices led Brookhart (1991) to coin the term "hodge-podge" grading practices to explain the grading practices found to be employed by many teachers.

Proponents of standards-based grading practices believe that the most important purpose for grades is to provide information and feedback to students and parents about what a student knows and is able to do (Guskey 1994; Marzano, 2000). Grades, Marzano (2000) argued should be based on a criterion referenced approach that measures student performance in relation to content specific learning goals and should not factor in nonacademic behaviors. Guskey and Bailey (2001) identified most grading practices to be influenced by teachers' opinions and not on thoughtful analysis of student performance. Similar findings were echoed in other literature (Allen, 2005; Cizek & McMillan, 2007; Guskey & Bailey, 2001; O' Connor, 2002) in an attempt to limit the subjectivity of grading by encouraging teachers and school systems to only tie grades to student performance on specific standards and to remove evaluating students based on attendance, behavior, and homework completion. Standards based grading strategies are more in line with providing feedback similar to standardized tests, as they seek to remove the omnibus grade comprised of a single letter and look to report student performance on individual academic

standards (Marzano & Heflebower, 2011). Bowers (2009), however, challenged this notion and found that grades which take factors like effort and behavior into account reflect student ability to perform well at the process of schooling and can provide important data that can be used to guide school improvement that would be otherwise unavailable through student standardized test data.

In addition to providing a measure of student performance to schools, students, and parents, grades also serve to inform external audiences like college admissions officers of a student's school performance (Bowers, 2009). Student grades make up one of the two key academic measures of student performance that determine college admissions decisions (Geiser & Santelices, 2007). In addition to using student grades, colleges and universities also examine admissions tests like the SAT and ACT to determine a student's ability to be successful in college (Camara & Echternacht, 2000). These admissions tests work much like standardized tests do in that they provide objective measures of student academic knowledge and skills.

College Entrance Exams

The SAT is designed by the College Board, a not for profit organization that was created in 1900 to expand access to higher education. Over 6,000 educational institutions make up the College Board. The SAT has historically been the most widely used college admission exam in the United States (Noftle & Robins, 2007). The SAT test, which is taken during either a student's high school junior or senior year, consists of three sections: math, reading, and writing. The maximum score in each section is 800 comprising a total of 2400 for all three sections when taken together. The exam is designed to provide high school students with the opportunity to demonstrate to colleges what knowledge they have attained and how they are able to apply that knowledge. When taken together with high school grades, SAT scores have been found to

predict student success in college in the areas of academic performance, nonacademic accomplishments, leadership, and post college income (Burton & Ramist, 2001). Camara and Echternacht (2000) identified over one hundred studies that proved the validity of combined high school grades and SAT scores as substantial and significant predictors of achievement in college. They did report, however, that when examined individually, most studies found that high school grades have a better predictive value than SAT scores. Other researchers have come to similar conclusions, finding the predictive ability of students' high school grades to be more effective than SAT scores (Geiser & Santelices, 2007; Hoffman, 2002; Zheng, Saunders, Shelley, & Whalen, 2002). Bridgeman, Pollack, and Burton (2004) did find, however, that after controlling for high school grades students with higher SAT scores earn higher college grades than those with lower SAT scores, demonstrating and reinforcing the predictive ability of the SAT.

The ACT, like the College Board, is a not for profit organization that designed a college entrance exam. It was established in 1959 in Iowa by professor Everett Franklin Lindquist as an alternative to the SAT. The ACT has grown in popularity in recent years. In 2011, for the first time, more students took the ACT than the SAT (Bettinger, Evans, & Pope, 2013). The ACT describes their exam as being more focused on practical knowledge than cognitive reasoning. Areas covered on the ACT exam are English, math, reading, science reasoning, and an optional writing component. While the ACT features a science component that the SAT does not have, this extra component has been found to have little to no predictive value of students' college performance (Bettinger et al., 2013). The same was found for the reading section. This same study did, however, find that the English and math sections are highly predictive of positive college outcomes (Bettinger et al., 2013). Like the SAT, extant research indicates that when

used with high school grades, the ACT is a valid predictor of college success (Radunzel & Noble, 2012; Sawyer, 2010).

The ACT uses a longitudinal assessment system to measure and monitor student achievement over time in an effort to provide feedback and recommendations to students about high school course work and to support student success on the ACT exam (ACT, 2012). The ACT's longitudinal assessments consist of EXPLORE, PLAN, and the ACT TEST. EXPLORE is a test used in 8th and 9th grade to provide baseline information about students' academic preparation in order to help plan future academic coursework. PLAN is designed for 10th graders as a way to monitor student ability levels and recommend interventions if needed. The ACT test is designed for students in 11th and 12th grade as a way to measure students' academic readiness as they prepare to enter college and the workforce. EXPLORE and PLAN can provide students the opportunity to address areas of academic need in advance of taking the ACT test. EXPLORE and PLAN can also serve as valuable data for educators to examine in their efforts to implement targeted instructional interventions to help students develop the knowledge and skills required for postsecondary education (ACT, 2012).

Predicting collegiate academic success began to take on greater significance when an increasing number of colleges found that the students they were admitting were not measuring up to their academic expectations. Conley (2007) argued that the act of graduating from high school does not necessarily mean that a student is ready to meet the demands of postsecondary education. This is reflected by the fact that a significant number of high school graduates require remedial courses upon entering college (Greene & Forster, 2003; Hoyt & Sorenson, 2001; Merisotis & Phipps, 2000). Evidence of this need was reported by The National Center for Education Statistics (NCES) when they found that in 2001 nearly one third of first year college

students had to enroll in remedial courses in reading, writing, or mathematics (Parsard, Lewis, & Greene, 2003). The cost for colleges to provide remedial courses is substantial and offering these courses requires taking resources that could be used elsewhere and allocating them to remedial programs in order to develop the skills incoming college students should already have (Bettinger & Long, 2009; Breneman & Haarlow, 1998). It has also been found that students who are required to take remedial courses in college are less likely to graduate than students who do not take remedial courses (Adelman 1999, 2006). Research into the effectiveness of college remediation has yielded mixed results as to how effective remedial programs are at getting students on track for college success (Bettinger & Long, 2007; Calcagno & Long, 2008; Martorell & McFarlin, 2011).

The increasing number of students who have to take remedial courses upon entering college, as well as the discovery that students who were enrolled in remedial courses did not graduate led to a growth in literature on the topic of college readiness. A considerable focus of college readiness research emphasizes the need for K-12 education systems to better prepare students for the academic and nonacademic skills required for college success (Conley, 2007). The academic and nonacademic skills required for college success include possessing the cognitive strategies, content knowledge, academic behaviors, and contextual skills and knowledge of the college process necessary for meeting the academic demands of higher education (Conley, 2007). Developing college readiness, researchers argue, is critical at all levels of K-12 education (ACT, 2008; Conley, 2007; Venezia, Kirst, & Antonio, 2003; Wimberley & Noeth, 2005). Both the College Board and ACT acknowledged the importance of college readiness by establishing college readiness benchmark scores for their exams (ACT, 2010; Wyatt, Kobrin, Proestler, Camara, & Wiley, 2011). Students who meet the college

readiness benchmarks on either the SAT or ACT exams have been found to have a significantly better chance of being successful in college than those who do not.

Research (ACT, 2008) has demonstrated the need to develop college readiness skills at all levels of K-12 systems, especially in middle school students. An ACT study found that students who met certain college readiness benchmarks by the end of 8th grade were significantly more likely to remain college ready through high school. Wimberley and Noeth (2005) also found that middle school was a critical time to develop college readiness skills in students.

Schools in the United States must develop students who are college ready in addition to being able to meet the achievement demands placed upon schools by NCLB. If schools are able to use middle school performance data as a way of evaluating students' college readiness levels, school systems will be better able to design programs and provide necessary interventions for students so that they have a higher likelihood of meeting the SAT college readiness benchmarks.

Purpose

The purpose of this study was to examine the extent to which 8th grade student data sources predict college readiness as measured by the SAT. The 8th grade student data examined in this study was 8th grade PSSA scores in math, reading, and writing and 8th grade teacher assigned final grades in math and English. Students who are on a college ready track by 8th grade are far more likely to stay college ready than those who are not, and for students who are not college ready it is of critical importance that interventions be put in place to support students through high school (ACT, 2008). This study determined how effective existing middle school data sources are for predicting the ability of students to meet the SAT college readiness benchmarks. This study has implications for teachers, school and district level leaders, state

education agencies like the Pennsylvania Department of Education (PDE), university admission's directors and professors, parents, and policy makers concerned with developing college ready students who can succeed in the twenty-first century.

Research Questions

Extant research (ACT, 2008) has emphasized academic success in middle school as a key factor in students being college ready at the time of their high school graduation. As more school districts are examining student data sources to track student performance and implement effective interventions, the ability for schools to utilize existing data sources to identify students who are and are not on a college ready path is of great importance. Therefore, this study was guided by the following research questions:

Question 1a: To what extent does the 8th grade math PSSA predict college readiness as measured by the SAT?

Question 1b: To what extent does the 8th grade reading PSSA predict college readiness as measured by the SAT?

Question 1c: To what extent does the 8th grade writing PSSA predict college readiness as measured by the SAT?

Question 2a: To what extent do 8th grade teacher assigned final grades in math courses predict college readiness as measured by the SAT?

Question 2b: To what extent do 8th grade teacher assigned final grades in English courses predict college readiness as measured by the SAT?

Significance

The results of this study are significant to middle school and high school administrators and teachers as it demonstrates the ability of already existing data to examine the college readiness rates of their students. This knowledge can foster continued curricular development and interventions for all students based on their needs. K-12 educational leaders can use the results of this study to design curriculums that emphasize placing students on a college ready track in 8th grade. All school districts have the data that was analyzed in this study readily available to them and can use their own existing data to implement interventions to ensure that all students can have the opportunity to meet and exceed the college readiness benchmarks on the SAT exam.

Definition of Variables

SAT College Readiness Benchmarks: The ability of students to meet the SAT college readiness benchmark scores in math, reading, and writing are the dependent variables. The SAT college readiness benchmark scores were determined by College Board to be scores that indicate a high probability of student success in postsecondary institutions. The SAT college readiness benchmarks scores are a score of 500 in each of the three areas of the test, math, reading, and writing. The SAT composite score benchmark is a total score of 1550.

Teacher Assigned 8th Grade Final Grades: One of the two independent academic predictor variables in this study were teacher assigned 8th grade final grades in math and English. These letter grades represent the final average performance of students during their 8th grade year.

8th Grade PSSA Performance: The second independent academic predictor variable in this study was 8th grade PSSA performance in math, reading, and writing. Students who are considered to have demonstrated attainment of state standards on the PSSA are classified as advanced or

proficient while students who failed to demonstrate attainment of the state standards are classified as basic or below basic. PSSA performance in this study consisted of a student's raw scaled score divided by 10.

Definition of Terms

College Readiness: Conley (2007) operationally defined college readiness as the level of preparation a student needs in order to enroll and succeed—without remediation—in a credit-bearing general education course at a post-secondary institution that offers a baccalaureate degree or transfer to a baccalaureate program. This study included the ability of a student to meet the established college readiness benchmark scores on the SAT as part of its definition of college readiness.

Grade: Teacher assigned measure of student achievement in mathematics and English courses based on a variety of factors including, but not limited to, academic knowledge, effort, participation, attendance, and behavior as it appears on a student's transcript. Grades used in this study were the year-end course grade, which is an average of all four marking period grades. Year-end course grades are reported out by letter A, B, C, D, and F on student transcripts.

Pennsylvania System of School Assessment (PSSA): A standards based, criterion referenced assessment designed to measure a student's attainment of Pennsylvania Academic Standards. Students in this study who took the PSSA in 8th grade were assessed in math, reading, and writing.

Student: For the purposes of this study, the term student referred to an individual who attended the participant school district and had the following data available: SAT scores, 8th grade final grades in math and English, and 8th grade PSSA scores in math, reading, and writing.

CHAPTER II

Literature Review

This literature review is organized according to the variables of this study: college readiness benchmarks, teacher assigned grades, and standardized test scores. Each section will first offer a definition of each variable that is supported by theory and prevailing research. The focus will then turn to the components of each variable that are of particular importance to this study.

College Readiness

Conley (2007) defines college readiness as "the level of preparation a student needs to enroll and succeed- without remediation in a credit bearing general education course at a postsecondary institution that offers a baccalaureate degree or transfer to a baccalaureate program" (p.5). It is important to note that Conley's definition of college readiness is not predicated on students entering a four year institution and includes schools such as community colleges that offer the ability to transfer into a baccalaureate program. The economic recession that impacted the United States in 2008 has led to increased enrollment in community colleges as college ready students are deciding to save money by attending community colleges and then transferring into four year colleges (Carlson, 2013; Fry, 2010; Mullin & Phillipe, 2011). Conley's definition was influenced by a two year study involving over 400 faculty and staff members from twenty research universities. The goal of this research was to discover what skills and attributes higher education faculty believe students need to possess in order to succeed in entry level courses at the university level. Conley's target audience was students, parents, and educators so that they could use his findings to gain a better understanding of what is required of students to be college ready. Faculty from a wide range of academic disciplines including

English, math, natural sciences, social sciences, second languages, and the arts were sought out for this study. The need for students to possess habits of mind such as critical thinking skills, analytical thinking, problem solving, the ability to accept feedback, and the ability to persevere through challenging tasks emerged as dominant themes across all disciplines (Conley, 2003). Conley used this data and organized his findings into the four facets of college readiness. These facets include cognitive and metacognitive thinking skills referred to as key cognitive strategies, a strong grasp of academic content, or key content knowledge, positive attitudes and behavioral attributes known as academic behaviors, and a working knowledge of the higher education system described as contextual skills and awareness. These facets are described as not being mutually exclusive from one another, but rather interact and affect one another. Conley's four facets of college readiness, he believes, can be most directly influenced by high quality instruction in K-12 schools.

SAT College Readiness Benchmarks

As the importance of identifying and developing college readiness became a central focus for schools in the twenty-first century, the College Board, creators of the SAT, took the step of determining the scores on their SAT that would represent the benchmark score for college readiness (Wyatt et al., 2011). The College Board's work was influenced by Conley (2007) in that it acknowledged that college readiness goes beyond merely being accepted into college and requires that students demonstrate success once they enter college. These benchmark scores inform students, teachers, parents, and counselors as to whether or not students possess the requisite academic knowledge needed to succeed in college and, if necessary, give an indication of what academic areas require interventions. Data used to establish the benchmarks consisted of the SAT scores and the college freshman year grade point averages of graduating high school

seniors in 2007. The sample was limited to students who attended one of the 110 higher education institutions that had participated in a national validity study for the SAT. The total sample size consisted of 67, 644 students. With this data, a logistic regression was used to establish the SAT benchmark scores. A logistic regression is a statistical method that can predict the probability of success based on one or more predictor variables and a dichotomous dependent variable. In this case of the College Board study, SAT scores were used to predict the likelihood that a student would earn a freshman year grade point average (FYGPA) of at least a 2.67 or B- (Wyatt et al., 2011). The FYGPA of 2.67, or B-, being indicative of college readiness was determined by a committee of educators and policymakers assembled by the College Board in 2008. The SAT college readiness benchmark was identified as a composite score of 1550 and a score of 500 in each of the three tested areas: math, reading, and writing.

Wyatt et al. (2011) found that the mean FYGPA for students who met the SAT college readiness benchmark scores was 3.12 and that 79.3% of students who met the SAT benchmark score had a FYGPA of 2.67 or higher. For students who did not meet the SAT college readiness benchmark scores their likelihood of success proved to not be as strong, as their mean FYGPA was 2.57 and only about half, 50.4%, of students had a FYGPA of 2.67 or higher.

Students who met the college readiness benchmarks also demonstrated higher rates of retention (Wyatt et al., 2011). 91.4% of students who met the benchmark scores went on to a second year of college and 84.7 % of students went on to a third year of college. Students who failed to meet the benchmarks still demonstrated retention rates of over 50% but their rates were not as high as those who met the benchmarks. Of the students who failed to reach the benchmarks 81.3% went on to a second year of college, but only 69.3% made it to their third year of college.

A second sample was also included in the study to examine the relationship between students who took the SAT and went on to enroll in college (Wyatt et al., 2011). This second sample consisted of 1,419,714 students who graduated from high school in 2007. In this sample, more students did not meet the established SAT college readiness benchmark N= 790,162 than did meet the benchmark N= 629,552. Data analysis found that 78% of students who met the SAT college readiness benchmark went onto enroll in a four year college. The number of students who met the SAT benchmark and enrolled in a two year college was significantly lower at 8% and 14% of students who met the benchmark did not enroll in any type of higher education institution. Of the students who did not meet the SAT college readiness benchmarks, 46% still went on to enroll in a four year university, while 29% of those failing to meet the benchmark enrolled in a two year institution, and 25% did not enroll in any type of higher education institution. These findings indicate that students who meet the SAT college readiness benchmarks are more likely to enroll in college than those who do not.

A third sample, consisting of 1,457,489 students who graduated from high school in 2010, was used to examine the relationship between the SAT benchmark scores and overall student performance, demographic characteristics, and other high school performance measures such as GPA and number of Advanced Placement (AP) courses taken. This study found that there was a strong relationship between the SAT college readiness benchmarks and measures of high school performance. Student grades proved to be a reliable predictor of students' ability to meet the readiness benchmark (Wyatt et al., 2011). Students who reported earning a high school grade point average (HSGPA) of an A+ met the college readiness benchmark 84% of the time, while those reporting a HSGPA of an A met the benchmark 71% of the time. Students who reported HSGPA of A- met the college readiness benchmark at a rate of 57%. A significant drop

off in meeting the readiness benchmark did occur as student grades went below the grade of A. Students reporting a HSGPA of B+ met the benchmark 38% of the time, students who reported a B met the benchmark 27% of the time, and students who reported a B- met the benchmark 18% of the time. The percentages were even lower for students in the C range as students who reported a C+ met the benchmark at a rate of 12%, students who reported a C met the benchmark 10% of the time, and students who reported a C- met the benchmark 9% of the time. This indicates that the higher a student's HSGPA, the more likely they are to meet the SAT college readiness benchmark.

The College Board identified students who participate in a strong core curriculum at the high school level were more likely to meet the SAT benchmarks (Wyatt et al., 2011). The College Board identified a core curriculum as four years of English, three years of mathematics, science, and social studies. Of the students who were enrolled in a high school core curriculum, 50% met the readiness benchmarks compared to 29% who met the benchmarks and did not enroll in a core curriculum.

Academic rigor also proved to be predictive of student ability to meet the readiness benchmark (Wyatt et al., 2011). An academic rigor index (ARI) with a score range of 0-25 was developed to measure the challenge associated with high school course work. In research that was in progress but not yet published when the college readiness benchmarks were released, Wyatt, Wiley, Proestler, and Camara (2012) developed the College Board's ARI by examining the relationship of students' high school course work and their college freshman year grade point average. Points were awarded to students based on the level of rigor of the high school courses they took and at what point students took specific courses. There was a total possible score range of 0-25 with students being able to earn anywhere from 0-5 points in the following content

areas: English, math, science, social science, and foreign and classical language. Students who took courses in high school with a high ARI were far more likely to meet the readiness benchmark than those who did not. Students with the highest level on the ARI, 21-25, met the readiness benchmarks 95.1% of the time, while students with the lowest score from 0-5 met the benchmarks 13.2% of the time. Students with an ARI between 6-10 met the benchmark 29.2% of the time. A significant increase in students meeting the benchmark was found once the ARI score went above 10. Students with an ARI in the range of 11-15 met the benchmarks 60% of the time and student with an ARI of 16-20 met the readiness benchmarks at a rate of 82.9%. Advanced Placement (AP) courses are viewed as very rigorous and students who participated in AP courses were far more likely to meet the benchmarks than those who did not (Wyatt et al., 2012).

ACT College Readiness Benchmarks

The ACT, like the SAT, established college readiness benchmark scores. The ACT benchmark scores are the minimum ACT college readiness assessment scores required for students to have a high probability of success in credit bearing college courses (ACT, 2013). The ACT benchmark scores are linked with Conley's (2007) notion that college readiness is defined by being successful in college and not just getting accepted into a college. The ACT established benchmark scores in the area of English, reading, math, and science. The content on the ACT exams corresponds to the knowledge and skills students would need to possess to be successful in like courses in college. Students who meet the ACT college readiness benchmarks are reported to have a 50% chance of earning a B or better and a 75% chance of earning a C or better in college courses. To establish the benchmarks, ACT collected data from over 230,000 students at 214 colleges and universities. The ACT is scored on a scale from 1-36. The ACT subject area

college readiness benchmarks are 18 for English, 22 for reading, 22 for math, and 23 for science (ACT, 2013).

Research into the performance of students on the ACT has illustrated a need for more K-12 institutions to promote the development of college readiness skills and to provide interventions that will ensure students get and stay on a college ready track (ACT, 2013). In the ACT's 2013 report *The Condition of College and Career Readiness* student ability to meet ACT college readiness benchmarks was not promising. Of the four tested areas on the ACT, English, math, science, and reading, only 26% of all students met or exceed all four college readiness benchmarks. When each area is examined individually, 64% of students met the English benchmark, 44% met the reading benchmark, 44% met the math benchmark, and 36% met the science benchmark score (ACT, 2013). It is worth noting that the most students met the benchmark with the lowest score, English, while the least amount of students met the benchmark with the highest score, science. In an examination of student performance on ACT benchmarks overtime, student results have been mixed in individual content areas, but overall since 2009 there has been an increase from 23% to 26% in students meeting all four ACT benchmarks. During the same time period, however, overall ACT scores dropped in all four areas. This phenomenon is furthered explained as evidenced by the fact that 31% of 2013 ACT test takers failed to meet a single benchmark. Through this discrepancy it can be inferred that students who are college ready are seeing an increase in their achievement levels, but less students overall are college ready as measured by the ACT.

As a result of these trends, ACT (2013) made several recommendations for how to increase college readiness levels. These recommendations are focused on district practices, school practices, and classroom practices. Classroom rigor was central to these

recommendations as schools were directed to expose students to a rigorous curriculum in high school that includes four years of rigorous English courses and three years each of rigorous mathematics, science, and social studies. ACT also recommended that schools implement policies and practices for data driven instructional decision making that will support the monitoring of students so that appropriate early interventions can be put into place.

College Remediation

As the United States moves into a twenty first century influenced by globalization and the knowledge economy it is faced with the harsh reality that every year thousands of students graduate from high school unprepared for the academic demands of college (Bettinger & Long, 2009). About one third of all students entering college require some level of remedial course work and the cost to provide these programs totals upwards of one billion dollars at public colleges across the nation (Bettinger & Long, 2009). Increasing the number of college graduates going forward is key to the success of the United States (Hunt, Carruthers, Callan, & Ewell, 2006), but the research is mixed as to whether or not college remediation has any impact on student outcomes in college.

Martorell and McFarlin (2011) conducted a longitudinal study using a regressional discontinuity strategy that examined the effects of remedial college courses on students in Texas. For this study, the researchers examined student performance on college placement test scores. The researchers focused on students who barely failed, within ten scale points of the passing cutoff, their college placement exams. The researchers then used available college administrative records to gather additional data on those students such as academic credit hours taken, years of college completed, and degree attainment. They found little indication that remedial courses helped students succeed in college. A similar study was conducted by

Calcagno and Long (2008) in Florida. Using a regressional discontinuity strategy they too concluded that remedial coursework has a limited impact on student graduation rates. The results of these two studies differ from the findings of a Bettinger and Long (2007) study on the effects of remediation on college success conducted with students in Ohio.

Bettinger and Long (2007) followed, for a five year period, 18-20 year old first year public college students who entered college in the fall of 1998. The researchers collected the following pieces of data for their study: college transcripts, applications, standardized test results, and student surveys. Bettinger and Long concluded that students who took remedial classes had better educational outcomes and were less likely to drop out of college and more likely to graduate from college than students of similar backgrounds who did not take any remedial classes. The difference in the findings between these studies demonstrates a limitation of all three studies, using a sample population of students in one state may not be generalizable to students nationwide and the impact of remedial courses may be different from state to state. The mixed results of college remedial programs emphasize the need for K-12 education systems to develop college ready students who do not require any remediation to meet the academic expectations of higher education.

College Readiness and Middle School

The College Board (2011) and ACT (2012) identified a rigorous high school curriculum as consisting of four years of English, and three years of math, social studies, and science. Additionally, both the College Board and ACT identified the need to increase classroom rigor and to expose students to a rigorous high school curriculum as key in developing college readiness. These findings support the work of Adelman (1999, 2006) who found that a rigorous high school curriculum was the most important factor in developing college ready students.

Adelman (1999) conducted a longitudinal study from 1980-1993 that examined the factors that enabled students to successfully graduate from college. Adelman followed a cohort of students who began the study as high school sophomores and followed them through the next eleven years; a time period Adelman felt was sufficient for them to graduate from college. Adelman used high school and college transcripts, test scores, and surveys and interviews of cohort members to gather data. Adelman explained that his study was motivated by four developments in higher education: an increasing level of blame placed on colleges for students not graduating, an expanding proportion of students attending college, an increase in students attending multiple undergraduate colleges, and affirmative action policies impacting the college admissions process. Adelman found that the most important factor that can influence a student's success in college is the quality and intensity of their high school coursework. Students who studied math content up to and beyond Algebra 2 doubled the odds that they graduated from college, and students who took Advanced Placement courses were more likely to graduate from college than those who did not. Adelman acknowledged that while socioeconomic and demographic factors can influence a student's access and success in college, a strong high school curriculum supported by academic resources negates any differences in student's backgrounds and exposing all students to a rigorous curriculum was imperative for collegiate success.

Adelman would replicate his work in a 2006 study. In his replicated study, Adelman included students who graduated from high school in 1992 and followed them through 2000. In this study Adelman began collecting data on his participants in 1988 when the students were in 8th grade as opposed to sophomores as done in his previous study. This population was selected because they were in K-12 educational systems after the publication of *A Nation at Risk* and could provide evidence as to the effectiveness of educational reforms that stemmed from the

report's publication. The findings of Adelman's second study confirmed and advanced the findings of his first study. The ability of students to successfully complete a college degree is linked to what content they study, how much of the content they study, and how deeply and intensely they study the content (Adelman, 2006). Adelman suggested that secondary schools provide students with maximum opportunities for rich learning experiences by designing courses with academic rigor and substance.

While the work of Adelman (1999, 2006) supports students engaging in rigorous high school work, students must first be ready for the demands of high school in order meet the demands of increasingly rigorous coursework (ACT, 2008; Camblin, 2003; Wimberley & Noeth,2005). A 2008 ACT study entitled *The Forgotten Middle* concluded that developing college readiness is not a task relegated to high schools, but is rather a K-12 system responsibility. The ACT (2008) study concluded "that under current conditions the level of academic achievement that students attain by 8th grade has a larger impact on their college and career readiness by the time they graduate from high school than anything that happens academically in high school". (p.2)

The purpose of ACT's (2008) study was to determine what influences college and career readiness and what can be done to ensure that more middle school students get off to a strong start in high school. Data for this study was gathered by examining over 216,000 members of the 2005 and 2006 graduating high school classes. Students in this sample had taken all three programs of ACT's longitudinal assessment component of ACT's College Readiness System. The College Readiness System was built around six central philosophies:

- States should adopt fewer- but essential- college and career readiness standards that focus on essential skills and knowledge needed for postsecondary education as their new graduation standards,

- States should adopt a rigorous core curriculum for all high school graduates whether they are bound for college or work,
- States must define performance targets for college readiness standards,
- States must strengthen the rigor of their courses, states must monitor the college readiness levels of all students beginning at the latest in 8th grade,
- States must establish longitudinal P-16 data systems to better prepare students for college and to monitor the success of students through college.

The three assessments in the College Readiness Systems are EXPLORE, PLAN, and the ACT TEST. EXPLORE is a test used in 8th grade to provide baseline information about a student's academic preparation in order to help plan future academic coursework. PLAN is designed for 10th graders as a way to monitor student ability levels and recommend interventions if needed. The ACT test is designed for students in 11th and 12th grade to measure academic readiness prior to entering college and the workforce. By using this available data, ACT was able to conduct a longitudinal study with a large sample size.

Predictive models were constructed around six classes of predictor variables, or factors, which could influence student scores on the ACT exam. The six factors used were background characteristics, eight grade achievement as reported by student scores on EXPLORE, standard high school coursework, advanced high school coursework, high school grade point average, and student testing behaviors on the ACT that reflect whether, when and how often students took the ACT. This research found that compared to 8th grade achievement, the predictive power of each of the other factors on ACT scores examined was small and in some cases negligible (ACT, 2008).

Further analysis by ACT (2008) into developing college ready students looked at what steps students could take to improve their college readiness during high school against having met the EXPLORE benchmark scores. These steps included students maintaining a B average, working to improve their existing grades, taking required math and science courses, electing to

take more advanced math and science courses, taking advanced or honors courses in all curricular areas, meeting all EXPLORE benchmarks in 8th grade, and increasing EXPLORE scores by two points in each subject area in 8th grade. Analysis of these factors found that being on target for college readiness in 8th grade and demonstrating improvement of college readiness levels in 8th grade had a much larger impact on determining the ultimate level of college readiness attained by students by the time they graduated high school than any high school level enhancement. ACT (2008) added that this finding should not be taken to mean that high schools cannot improve student college readiness levels, but rather that actions taken to improve student achievement in middle school have a greater impact on increasing student levels of college readiness than anything that can happen in high school.

Results of this study found that the interventions put in place to help high school students develop college readiness levels come far too late to make any meaningful difference for students. Interventions must take place at the upper elementary and middle school levels to make any significant difference for students. This study not only informs K-12 systems of ways in which they can develop college ready students, but also helps to further explain why remedial college courses are also ineffective, if students cannot be made college ready in high school how can they be made college ready at the college level? Educators must develop and monitor college ready academic behaviors at a young age because as the more these behaviors become habitual, the more likely students are to be college ready (ACT, 2008). While *The Forgotten Middle* (2008) emphasized the need for schools to develop college readiness in middle school it also relied on its own EXPLORE testing to arrive at its conclusions. In Pennsylvania, a majority of students take the SAT which does not have a longitudinal test designed to assess middle

school student college readiness levels. All middle school students in Pennsylvania do, however, take the PSSA and have teacher assigned grades that provide student achievement data.

Wimberly and Noeth (2005) concluded that the steps to develop college readiness in students must begin in middle school. They conducted a study that included students in 8th, 9th, and 10th grade from 15 schools in 6 districts around the United States: Chicago, Charleston, Denver, Los Angeles, New Orleans, and Oklahoma City. These districts were selected for their ability to provide a broad and diverse student sample (Wimberly & Noeth, 2005). Data were collected from 2,942 student surveys and a focus group consisting of 263 students who were preselected by school administrators and counselors. The purpose of the study was to examine the extent of early exploration in college readiness areas and to determine how parents, school staff, and school experiences help with early educational planning. The results of this study indicated that while 78% of the students surveyed planned to pursue higher education studies, only 36% perceived their classroom experiences as being very helpful in preparing them for both the academic and nonacademic demands of college. This finding led the authors to conclude that many of the students were failing to take courses that would help develop the skills necessary for college. Additionally, the authors found that while students relied on their family for academic and financial planning, many families were not well versed in how to properly guide their children on a path to college. The results of Wimberley and Noeth's study led to four policy recommendations directed towards schools. The first recommendation was for schools to begin putting all students in a position to be college ready in middle school. This process involves working with students to set goals, establishing rigorous high school course work and graduation requirements, and providing all students with relevant information about the college process. The second recommendation urged schools to communicate with parents about the importance of

taking rigorous courses that enable students to be prepared for college. The third recommendation tasked schools with sharing and explaining student assessment data with parents to inform them of student progress towards college readiness. The fourth and final recommendation was for schools to reach out to parents to discuss how to plan for college costs and make parents aware of available financial aid and scholarship options. This study, while it included a sizable sample and a focus group, focused only on suburban and urban areas. It did not include districts from rural areas. This omission may limit the generalizability of the study's findings for educators in rural areas.

Balfanz (2009) conducted a study of 23 middle schools in Philadelphia that focused on putting students on a path for high school graduation and ultimately college readiness. In these schools the student population was identified as being made up of at least 80% minority students and had at least 80% of the student body eligible for free and reduced lunch. Balfanz found that middle school is a particularly important time for students impacted by achievement gaps. During their middle school education, minority students either significantly close their achievement gap relative to their white peers or fall further behind to them. The grades students earned in middle school were found to have strong predictive power in determining whether or not they would graduate high school. Student grades were found to have a stronger predictive power than standardized test scores in determining whether students would graduate high school because, Balfanz concluded, grades take into account more factors that contribute to academic success such as resiliency, attendance, and effort. Balfanz identified success in middle school as being critical to developing college readiness because middle school serves as the time when students must take the steps to close educational gaps in order to be ready to take the rigorous high school course work that leads to college readiness. Two key recommendations of this study

were for educators to acknowledge that course grades are more predictive of eventual success than test scores and to create developmentally appropriate college readiness indicators for middle school students that parents can understand. A limitation of this study is that it included a student population from an urban school district and may not be generalizable to rural and suburban districts; further study into other populations is necessary to validate this study's findings across more groups. Despite these limitations, the findings of this study led Balfanz (2009) to conclude that middle school must be viewed as the critical time for developing the twenty-first century skills required of postsecondary students in order to ensure they can take full advantage of future career opportunities.

Von Secker (2005) examined the role that student participation in a rigorous math curriculum in middle school plays in producing college ready students. In a study of 33,788 8th grade students attending a county wide school district in Maryland from 2001-2004, Von Secker found that 88% of the students who took Algebra 1 in 8th grade and earned a grade of C or better were later identified as college ready and unlikely to require any remedial courses upon entering college. Only 26% of students who did not take Algebra 1 in 8th grade were later identified as being college ready. Students who took Algebra 1 in 8th grade scored significantly higher on the SAT's than those who did not and were far more likely to graduate from college than those who did not. In a telling statistic, 75% of the students who took Algebra 1 in 8th grade and earned a grade of C or better graduated from college compared to 34% of students who graduated and did not take Algebra 1 in 8th grade. Minority students are also far more likely to graduate from college if they take Algebra 1 in 8th grade. African American students were found to be 44% percent more likely to graduate from college if they took Algebra 1 in 8th grade and earned grade of C or higher and Hispanic students were 42% more likely to graduate from college if they took

Algebra 1 in 8th grade and earned grade of C or higher. The findings of the research into college readiness and middle school indicate that actions taken the middle level can have positive outcomes that impact student's postsecondary success.

Grading Practices

Research into the SAT (Burton & Ramist, 2001) and ACT (Radunzel & Noble, 2012; Sawyer, 2010) found that high school student grades calculated into an overall grade point average were a strong predictor of success in college. While over the years grades have received criticism as being poor measures of reporting student knowledge due to their subjective nature (Allen, 2005; Cizek, 2000; Shepard, 2006; Terwilliger, 1989) they remain a data source that colleges use to make admissions decisions (Geiser & Santelices, 2007). A factor that contributes to the perceived unreliability for grades is the inconsistency of what they measure and how individual teachers approach grading practices. Brookhart (1994) conducted an extensive review of the literature on grading practices through the late 1980's and early 1990's and found that several trends had emerged around grading practices towards the end of the twentieth century. Research discovered that over time, significant variation among teacher's grading practices emerged and that teachers perceived the meaning and purpose of grades differently (Brookhart, 1994). The individual teacher differences found in the literature became an area of particular focus for researchers exploring grading practices and the validity of student grades.

Cizek, Fitzgerald, and Rachor (1995) surveyed 143 elementary and secondary school teachers in the Midwest about their grading practices. Cizek et al., (1995) found that among this sample, grading practices were widely varied and were unpredictable as no obvious grading patterns could be discerned based on grade level or subject area. Factors like years of experience, gender, and grade level taught did not point to any relationships that could explain the type of

methods used by teachers to assign student grades. Teachers surveyed were reported to use a variety of grading practices and a majority of those surveyed were unaware of their school district's grading policies or the grading practices employed by their colleagues (Cizek et al., 1995). This study's findings indicate a need for instructional leadership. Researchers (Marks & Printy, 2003; Stiggins, 2001) have identified the need for school administrators to assume responsibility for instructional leadership as key to ensuring that consistent, appropriate grading practices guided by authentic assessments that measure what students know and are able to do are followed within schools.

Cross and Frary (1999) also concluded that grading practices vary greatly from teacher to teacher and can consist of many factors. A unique feature of this study was that students were also surveyed about their teachers' grading policies. This study was conducted in a single school district in Virginia. In this study, 310 middle and high school teachers were surveyed about their grading practices, their opinions about grading practices and assessment, school level taught, experience level, and subject(s) taught. Results of the teacher survey indicated that teachers used a wide variety of factors including student effort, participation, and homework completion in addition to traditional assessments to determine their grades, supporting the research that various academic and nonacademic factors influence a student's grade. Cross and Frary argued that "if teachers embraced grading practices as recommended by measurement specialists, surely more valid indicators of achievement would result" (p.9). A population of 7,367 middle school and high school students were surveyed to discover the perceptions students had of the factors they believed most influenced the grades they received from teachers and their overall level of satisfaction with the grading processes used by their teachers. Student responses were in line with the teacher responses and indicated that teachers did use a variety factors to determine

student grades. Student opinions regarding the fairness of such grading practices were mixed and reflected differing notions of what students thought was fair to include in overall grades. This study is valuable because it surveyed both teachers and students to arrive at its overall finding that teacher grades take into account more than just student achievement. A limitation of this study is that it only included one school district and thus may reflect and inform the instructional practices of that district but may not be generalizable to other school districts with different grading policies.

Standards Based Grading

Cross and Frary (1999) discussed the need for educators to embrace the practices supported by measurement specialists. Research into grading practices dating back to the late 1800's revealed inconsistencies in teacher grading practices which led Guskey (1994) to make the following recommendations for grading methods: "provide accurate and understandable descriptions of learning" and "use grading and reporting methods to enhance not hinder teaching and learning" (p. 17). Guskey (1994) put forth the notion that rather than being a hodgepodge of teacher perceptions, grades should reflect what students know and are able to do in line with grade level expectations. Grades, Guskey argued, should not only quantify student performance, but should also communicate student ability to teachers and parents. Guskey also supported the elimination of punishing students for turning in work late or incomplete, thereby removing nonacademic behaviors like effort and homework completion that influence student grades.

The findings of Guskey (1994) occurred at a time when education was entering the era of educational standards and this development led other researchers (Marzano, 2000; O' Connor, 2002; Schmoker, 2001) to reexamine how student performance was measured and reported. Standards based grading is a method of grading in which student performance is measured in

relation to specific content standards that are explicitly shared with students and parents to better inform them of educational progress (O'Connor, 2002). This shift, O'Connor argued, created trusting educational environments where students knew what was expected of them and would feel supported in their efforts to grow as learners as they worked toward mastery of standards. Standards based grading systems put into practice the recommendations found in brain based research (Chapman, 1993; Jensen, 1998; Willis, 2007) by promoting school environments that support students being able to learn in different ways and feel comfortable taking risks throughout the learning process. Schmoker (2001) cited several examples of schools that were able to demonstrate school wide increases in student achievement by designing instruction tailored to specific standards and tied to measurable outcomes. Marzano (2000) took the concept of designing instruction linked to specific standards a step further and argued in support of transforming grading practices to reflect closer alignment to content standards. Through his work with standards based education, Marzano provided concrete ways to shift traditional grading practices to more standards based grading practices.

Marzano (2000) identified academic achievement, as represented by student competence in meeting the specific subject-matter content, thinking and reasoning skills, and general communication skills, as the primary factor to include in grades. Providing feedback to parents about student effort, behavior, and attendance was appropriate so long as it was not factored in when assessing student achievement. Through his research into grading, Marzano concluded that a single letter grade was an ineffective as a way to report student achievement because it could not provide enough detailed feedback to properly explain student performance. Marzano ultimately supported eliminating letter grades entirely from report cards and moving towards a reporting system that communicated student achievement in specific content standards on a 1-4

scale, with a 4 indicating the highest level of achievement. Marzano's work became heavily cited in the education field as researchers championed his philosophies and supported significant changes to classroom grading that focused on using grades to communicate specific attainment of standards and the removing nonacademic factors that influenced grades (Allen, 2005; O'Connor, 2002; Winger, 2005; Wormeli, 2006). The sweeping reforms to grading practices recommended by researchers were met with resistance, however, from individuals that felt they understood the traditional, albeit hodgepodge, grading practices commonly used by teachers for years (Guskey & Jung, 2006). The literature on the effectiveness of standards based reporting systems in producing gains in student achievement is thin, as supporters (Allen, 2005; O' Connor, 2001 Guskey, 2007; Marzano, 2000; Winger, 2005) of standards based grading tend to rely more on theory and practical recommendations over concrete, data driven research recommendations.

Burks, Baete, and Pollio (2012) did report that standards based grading systems could impact achievement in a study that found that teachers who employed standards based grading practices over traditional methods of grading improved student performance on state standardized assessments. Participants for this study included students from 11 high schools in the Jefferson County Public School system in Louisville, Kentucky. In their study, Burks et al., found that students who participated in a standards based grading system had stronger correlations between their grades and their performance on standardized tests than students who had participated in a traditional grading system. Students who performed well in courses using standards based grading systems performed better than students who performed well in courses using traditional grading systems on state standardized tests. A finding that the researchers found particularly important was that students who earned grade of A in a course that used

standards based grading practices scored substantially better on state standardized tests than students who failed the course, while students who earned a grade of A in classes that used traditional grading systems only scored marginally better on state standardized tests than students who failed the same course. These findings led the authors to conclude that standards based grading practices appear to yield more valid indicators of student performance than traditional grading practices. This study is particularly valuable in that it provides hard data on how standards based grading practices impact student achievement rather than relying predominantly on theoretical arguments like other proponents (Allen, 2005; Guskey, 2007; Marzano, 2000; O'Connor, 2002) of standards based grading. Burks et al., proved standards based grading systems can be effective at predicting student performance on standardized tests and urged the use of standards based grading systems to support the development of college ready students. They did not, however, address the role that the nonacademic factors that influence traditional grading systems can have in predicting student performance and college readiness.

Grades as Predictive Measures

While much of the twenty-first century literature on grading was attempting to distance nonacademic factors from influencing student grades, Bowers (2009) explored the use of grades as data sources and how the nonacademic factors that influence them can inform educators and parents about student performance. Bowers conducted a longitudinal study that examined two cohorts of students who graduated from high school in 2006 in order to determine the relationship between teacher assigned grades and standardized assessments. Student data in this study included teacher assigned grades in 9-12 grade, 10^{th} grade standardized test data, and ACT scores. The sample size for this study consisted of 195 students who began school in 2002 and were on track to graduate from high school in 2006. A multidimensional scaling (MDS) was

used to analyze the correlation relationships between teacher-assigned grades and standardized tests. This technique was used for its ability to visualize relationships between multiple variables in a dataset in order to make better comparisons between multiple data points. Bowers found that when controlling for academic knowledge assessed in both grades and standardized tests, grades assess other factors such as student ability to master the processes of school which were highlighted in areas such as behavior, participation in class, and daily attendance.

Bowers (2009) expressed that grades can be used as data to target specific interventions based on the needs reflected in them.

> Low grades may represent a student's challenges with the academic material of a subject, which might also be reflected in low standardized test scores, and so tutoring in that subject may be an appropriate intervention strategy. However, the results presented here suggest that low grades could also indicate a student's challenges with the social processes of school, and thus the student may need help instead with study habits, participation, homework completion, or attendance before they can excel in the academic dimension of a topic. This study shows that data that pertains to a student's ability to negotiate these social processes of school are already collected on every student in every subject at every grade level through teacher assigned grades and that this data are informative for data driven decision making for school leaders. (p. 622)

Use of these data can allow educators to allocate the time and resources necessary to help students and, because every teacher assigns grades to every student, grades can be used to design system wide interventions (Bowers, 2009). These findings are significant because they point to other nonacademic measures that allow students to be successful in an academic setting. Conley (2007) in his work on college readiness identified similar nonacademic behaviors like time

management, participation in class, and communicating with professors that are found in successful college ready students. A limitation to Bowers study, however, was the small sample size of 195 students indicating that further study is warranted to better support the findings of his study.

Willingham et al., (2002) found that teacher assigned grades are frequently used as data sources to make educational decisions in combination with standardized test scores. In their study of 8,454 high school students, they found discrepancies existed between student grades and standardized test scores. These differences were not necessarily negative and the differences between teacher assigned grades and test scores gave each of them complementary strengths as sources of data to use for making educational decisions. Students who tended to receive higher grades than standardized test scores were found to employ appropriate school skills and demonstrate initiative. Teachers that tailor grades towards these habits are likely to instill a commitment to academic work that will lead to lasting success. Positive attitudes towards school when reflected in grades can increase student achievement, student confidence, and student aspirations for their educational goals. The findings of Willingham et al. is contrary to research critical of grading practices (Allen, 2005; Cizek et al., 1995) and finds that teacher grades can be a useful source of information to explain what student characteristics are associated with student achievement. These characteristics are described as Scholastic Engagement and include behaviors like doing homework, demonstrating motivation, taking advanced electives, completing assignments, and regular school attendance. The predictive value of grades can be found in their ability to describe the ability of students to meet broader pedagogical ends like maintaining effort and initiative and learning skills critical to the management of complex tasks (Willingham et al., 2002)

Further support for grades as a valuable predictor of student success in college can be found in the research of Geiser and Santelices (2007). Using a sample of 79,785 students who entered the University of California system in 1996, they found that high school grades, over the SAT, are consistently the best predictor of college freshman grades and four year college outcomes. In their findings Geiser and Santelices share similar sentiments to Bowers (2009) and Willingham et al. (2000) when they state "though raw intellectual ability is important, other student qualities such as motivation, personal discipline, and perseverance are also critical for achieving and maintaining a strong GPA over the four years of high school" (p.25).

Stricker, Rock, and Burton (1991) conducted a study that reinforced the predictive value of grades for college success by highlighting the fact that many of the behavioral factors that influence K-12 grades also influence college grades. While men tended to do better on the SAT than women, women's high school and college grades were found to be higher. This was explained by examining the study habits of men and women at college. In a study of 4,351 college freshman at a northeastern university, women were found to possess and practice more conscientious student behaviors that allow them to persevere through difficult tasks. The student behaviors found to most influence differences in college GPA between men and women were class attendance, assignment completion, taking tests on a schedule, using appropriate study skills, and taking detailed notes in class. The findings of this study, while older, support the notion that teacher assigned grades, while known to be influenced by a variety of factors, have predictive ability for college success and the nonacademic behaviors previously criticized for influencing grading practices do contribute to future student success. This validates the findings of Bowers (2009) that grades should not be taken out of the student data collection and analysis process, but should be viewed as a valuable and valid measure of student performance for

educational leaders to design and implement programs and interventions to help students. While research demonstrates that student grades can be effective means for predicting college readiness, grades have seen their role in assessing student achievement diminished in favor of high stakes standardized test scores.

Standardized Testing and Accountability

High stakes standardized tests became prominent following the publication of *A Nation at Risk* in 1983 and are a critical piece of the No Child Left Behind act of 2001. Kubiszyn and Borich (2003) define high stakes testing as "the use of tests and assessments alone to make decisions that are of prominent educational, financial, or social impact" (p.6). The importance of these tests is evident in the decisions that are made as a result of student performance from deciding whether a student is promoted to the next grade or classifying schools as high or low performing to making employment decisions about teachers and administrators (Kubiszyn & Borich, 2003). Additionally, student performance on high stakes tests are affecting property values as real estate agents are rating the quality of neighborhoods based on student achievement meaning that millions of dollars could hinge on single test scores (Amerin & Berliner, 2002). The underlying logic behind these pressures is that schools will be placed in positions where they must take actions that will demonstrate improved student achievement (Forte, 2010; Hochberg & Desimone, 2010).

The significance of high stakes accountability based standardized test scores in the era of NCLB has led to a wealth of research and literature on the topic. Investigations into the effect high stakes testing has had on student achievement has led researchers to arrive at mixed results regarding the positive or negative impact standardized testing has had on student learning and achievement in relation to standards (Dee & Jacob, 2011; Linn, 2005;Springer, 2008).

Additional researchers have examined the effect accountability based standardized tests have had on addressing achievement gaps between white students and minority students, often yielding mixed results into how well standardized tests contribute to more equitable student achievement (Barton & Coley, 2009; Harris & Herrington, 2006;Hunter & Bartee, 2003; Lee, 2006). Another segment of NCLB research has focused on the significant impact of accountability based standardized testing has had on educational policy and practice within schools (Jennings & Rentner, 2006; Nichols & Berliner, 2007; Pederson, 2007; Peterson &West, 2003; Simpson, Lacava, & Sampson Graner, 2004). While high stakes testing in the NCLB era focuses on K-12 learning outcomes and places pressure on schools to meet accountability standards, the question of how effective these tests are for predicting whether students will be college ready upon high school graduation has also been addressed in the literature.

Predictive Ability of Standardized Tests in the United States

Lefly, Lovell, and O'Brien (2011) examined the postsecondary readiness of 17,499 students in Colorado by analyzing the congruence of student performance on the Colorado State Assessment Program (CSAP) in middle school and high school, student ACT results, and the need for graduates to take remedial college courses upon enrollment into postsecondary institutions. They found that students who were proficient on the CSAP in middle school were less likely to require remediation in their first year of college than those who were not proficient. Student proficiency on the CSAP reading assessment was highly predictive of future college readiness. In the area of reading, 83.4 % of students who required no remedial course work upon entering two year institutions scored proficient or above on the 6th and 8th grade CSAP. For students attending four year institutions, 93% of the students who did not require any college remediation scored at proficient or above on both the 6th and 8th grade reading CSAP. The

predictive ability of middle school math CSAP scores was also evident. For students attending two year institutions, 71 % of the students who scored proficient or above in mathematics on the 6th and 8th grade CSAP did not require remediation. For students attending four year institutions, 85.3% did not require remediation and were proficient on both the 6th and 8th grade CSAP. Students who did require remediation were far more likely to have scored below proficient on both the 6th and 8th grade CSAP tests in both reading and math. This is especially true in the area of reading, where only 6.3% of students who were not proficient on the CSAP in 8th grade entered college requiring no remediation.

Lefly et al., (2011) also found a strong correlation between CSAP scores and performance on the ACT, "The high correlations between CSAP Reading and ACT Reading (r = .73), between CSAP Reading and ACT English (r = .77), and between CSAP Math and ACT Math (r = .82) indicate that this positive relationship exists in all three content areas measured by these two assessments" (p.9). A second significant finding from this study was that 90% of students who met the ACT college readiness benchmark were accurately identified as being college ready as their performance on college placement assessments did not require them to take any remedial coursework. While the previous result is to be expected, 79.2 % of students who did not meet the ACT college readiness benchmark were not required to take remedial courses based on university placement assessment performance. This suggests that the ACT readiness benchmarks are more rigorous than university placement assessments. When controlling for subgroups, students of poverty, English Language Learners, and students with disabilities were more likely to require remediation, but the majority in each group did not require any remediation. This led the researchers to conclude that the need for remediation in college is more heterogeneous among subgroups.

Lefly et al. (2011) made several recommendations to educators based on their findings, including urging educators to closely examine middle school student data and provide necessary interventions when needed, placing an emphasis on postsecondary education training in the middle grades, providing high schools with middle school student data, and implementing better use of state assessment data. These recommendations urge educators to use the readily available data sources that they already have in order to better provide interventions that can support the development of college ready students. A limitation of this study was that the population consisted only of students who went on to attend postsecondary schools in Colorado. The performance of students who went on to attend postsecondary institutions in other states were not included in the study.

Martin (2010) examined the predictive validity of scores on the Oklahoma State Testing Program (OSTP) assessments to student performance on the ACT EXPLORE college readiness assessment. Data consisted of the 3rd through 7th grade OSTP scores in math and reading and the 8th grade EXPLORE data of approximately 1150 students from twelve public school districts in Oklahoma. The OSTP classifies students on the Oklahoma Performance Index (OPI) as scoring either advanced, satisfactory, limited knowledge, or unsatisfactory on the assessment. Regression analyses were conducted and significant correlations were found between student performance on the OSTP and EXPLORE. As students progressed through their educational experience, their OSTP performance became more closely correlated to their EXPLORE score in both math and reading. This correlation allowed the author to conclude that the OSTP has a relatively stable relationship with EXPLORE.

Martin (2010) found that students' OPI scores were significantly associated with performance on the EXPLORE exam. It was reported that of the 103 students who scored in the

unsatisfactory range on the OPI, 85 of them scored in the predicted EXPLORE range and 11 students scored just above their predicted range. A recommendation of Martin was to include teacher grades as a data source to track student performance because teacher assigned student grades are indicators of student performance in relation to the very same content standards of standardized tests and do not come with the additional costs associated with outside, third party assessment programs (Martin, 2010). A limitation of this study was the relatively small sample size of 586 students that, while considered by the author to be ample for this study, was not representative of the entire population of Oklahoma.

Ehlert and Podgursky (2005) studied the relationship of student performance on the 10th and 11th grade Missouri Assessment Program (MAP) assessments to ACT scores, college attendance, and college performance. Data were collected on the high school class of 2001. In Missouri students take standardized assessments in 4th, 8th, and 10th grade and take communications arts (CA) standardized assessments in 3rd , 7th , and 11th grade. The sample size of this study was approximately 32,000 students. Through their data analysis, the authors found strong correlations between student performance on the MAP and on the ACT leading to the conclusion that strong positive relationships exist between the MAP and ACT. Students who scored proficient on the 10th grade math MAP assessment had a median ACT score of 27 which put them in the 90th percentile of all ACT test takers. Students who scored proficient on the 11th grade CA assessment had a median ACT score of 25 which put them in the 82nd percentile of all students who took the ACT. Ehlert and Podgursky concluded that while the MAP assessments have strong predictive value towards ACT scores, the state standards seem to be set very high as students who were proficient on the MAP scored exceptionally high on the ACT. Additionally, while students who scored proficient on the MAP demonstrated success in college, students who

were only proficient on one assessment in high school were still accepted into universities identified as "very selective" and demonstrated a measure of postsecondary success as 70% of students earned a GPA of least 2.0 and stayed on through their first year. This finding also demonstrates one of the study's limitations, state standards and assessments will differ in their rigor and so this study may not be generalizable to all states depending on the level of their content standards.

PSSA Predictive Ability

In Pennsylvania, the PSSA was developed and implemented to meet the accountability requirements of NCLB. A standards based criterion referenced assessment, the PSSA is used by Pennsylvania schools to measure students statewide in their ability to meet state academic standards while at the same time, determining the degree to which schools enable students to meet those standards (Thacker, Dickinson, & Koger, 2004). Content on the PSSA is linked to state standards and students are classified as Advanced, Proficient, Basic, or Below Basic depending on their scores in relations to content standards. Thacker (2004) found that the PSSA is a valid and reliable assessment of student ability as items in math and reading accurately represented the content found within state standards. Internal consistency reliability coefficients were found to be greater than .90 for reading and mathematics. Test score distributions were found to be similar among cohorts of students through multiple administrations of the PSSA (Thacker, 2004). While PSSA scores differed among race, ethnicity, and socioeconomic status, these differences were consistent with other testing discrepancies among subgroups (Thacker, 2004). In addition to examining the reliability of the PSSA, researchers also examined the predictive ability of the PSSA.

Koger, Thacker, and Dickinson (2004) examined the relationship of PSSA scores, SAT scores, and self-reported high school grades for the classes of 2002 and 2003. The purpose of their study was to determine if PSSA scores were appropriately related to other measures of educational achievement, in this case, SAT scores and high school grades. Data consisted of 11th grade PSSA scores which were gathered from the Pennsylvania Department of Education, SAT scores which were provided by the College Board, and grades which were collected from student self-report responses on the SAT Student Descriptive Questionnaire for the 2002 and 2003 graduating high school classes.

The study of Koger et al., (2004) found that students who performed well on any one measure of content tended to do well on all measures and in all content areas. They found, however, a stronger correlation between PSSA scores and SAT scores than of student reported high school grades to both PSSA scores and SAT scores. While the PSSA and SAT use differently formatted items and were designed to serve different purposes, the predictive value of the PSSA to project performance on the SAT is high. Koger et al., (2004) found that PSSA and SAT scores for 2002, 2003, and the two year score averages show a strong correlation between the math and reading/ verbal component on each assessment ($r = 0.686$ for PSSA and $r = 0.737$ for SAT for the two year average) and between the math components on the two assessments and the reading/ verbal assessments on the two assessments ($r = 0.856$ for math and $r = 0.742$ for reading/ verbal for the two years averaged). More moderate correlations were also found between the PSSA and SAT to student-reported GPAs ($r = 0.501$ for PSSA reading and $r = 0.539$ for PSSA math, while $r = 0.491$ for SAT verbal and $r = 0.525$ for SAT math). These lower correlations involving student grades were described as being attributable to the differences in the actual courses taken by individual students and the differing grading practices between teachers and

schools. A particularly valuable finding of the researchers was that when schools demonstrated gains on PSSA scores from 2002 to 2003, their SAT scores also increased and when school performance on the PSSA decreased during that span so did their SAT scores. Students who scored in the top 80% of all SAT verbal test takers scored proficient or higher on the 11th grade reading PSSA, while 60% of the top SAT math test takers scored proficient or above on the 11th grade math PSSA. These findings and the strong correlation between PSSA performance and SAT performance demonstrates the value of schools preparing students for the PSSA in an effort to make them more college ready.

The PSSA has also been used to determine its relationship with university proficiency exam scores and college course grades in English and math. Sinclair and Thacker (2005) examined three unnamed Pennsylvania universities to test the predictive value of PSSA scores to performance on college proficiency exams and on their first year college grades in English and math courses. Proficiency exams were explained in this study as assessments that are used to determine student's appropriate starting levels for English and math course sequences which can range from remedial, standard, or advanced level courses. In the case of all three universities, Sinclair and Thacker (2005) found strong correlations between performance on the PSSA and performance on university proficiency exams. Additionally, in many cases the PSSA was found to predict freshman year GPA as well or better than the university proficiency exams in both freshman year English and math courses.

The work of Sinclair and Thacker (2005) proved to be valuable in demonstrating that the PSSA does correlate to University proficiency exams and can serve as a similar and in some cases better predictor of student performance in freshman year courses. As schools move towards developing college ready students, the ability for the PSSA to predict student grades in

college can assist schools in developing curriculum and in helping counselors examine the readiness levels of students who are in the process of college selection. The purpose of the current study is examine to what extent the 8th grade PSSA and 8th grade final teacher assigned grades can predict college readiness a measured by the SAT college readiness benchmark scores.

CHAPTER III

Methodology

This chapter provides a specific description of the methodology used in this study. It includes an overview of the research design, rationale for using logistic regression, the population, and data collection and analyses procedures. This quantitative study used logistic regression models to examine the predictive ability of 8th grade PSSA scores and 8th grade teacher assigned final grades in English and math courses to student college readiness as measured by SAT. The 11th grade PSSA has been found to be highly correlated with SAT scores (Koger et al., 2004), but an examination of the correlation between the middle school PSSA and SAT had not been studied. This study used 8th grade teacher assigned final grades in English and math courses because of their ability to provide student data that reflected other measures not readily assessed by standardized tests (Bowers, 2009). The large majority of students in this study's sample took the SAT instead of the ACT. A result of the small ACT test taking population is that the school district population included in this study does not take the EXPLORE and therefore has no other way to gauge college readiness benchmarks in middle school other than grades and standardized test data.

Research Questions

This study sought to determine to what extent 8th grade student data can predict college readiness as measured by the SAT. Students taking the SAT either met the benchmarks or did not meet the benchmarks, thereby making the dependent variable in this study a dichotomous variable. The predictor variables were the 8th grade PSSA and 8th grade final teacher assigned grades. The 8th grade PSSA consisted of three areas, math reading, and writing that aligned with the three sections on the SAT. Only math and English grades were included in this study

because they had similar tested content areas on the SAT. This study was guided by the following research questions:

Question 1a: To what extent does the 8th grade math PSSA predict college readiness as measured by the SAT?

Question 1b: To what extent does the 8th grade reading PSSA predict college readiness as measured by the SAT?

Question 1c: To what extent does the 8th grade writing PSSA predict college readiness as measured by the SAT?

Question 2a: To what extent do 8th grade teacher assigned final grades in math courses predict college readiness as measured by the SAT?

Question 2b: To what extent do 8th grade teacher assigned final grades in English courses predict college readiness as measured by the SAT?

Population and Sample

The population of this study consisted of students from the graduating classes of 2013, 2014, and 2015 who attended a suburban Pennsylvania school district and had 8th grade final teacher assigned grades in English and math, 8th grade PSSA scores, and SAT scores on file. This school district serves approximately 9,100 students in grades K-12. Table 1 provides information relating to the demographics of the school district in this study as well as the demographics of students in the state of Pennsylvania.

Table 1

District and State Demographics

Demographic	District %	State %
White	72	71
Black	4	15
Hispanic	11	9
Asian/Pacific Islander	10	3

District schools at every level consistently meet and exceed AYP targets. This district places considerable emphasis on the middle school experience of students to ensure a successful transition to the rigorous expectations of its high school program. Over 90% of this district's high school graduates attend postsecondary education institutions. This population was chosen due to the ability to gather comprehensive student data and its high college bound student population, which helped to make the findings more generalizable to other suburban school districts in Pennsylvania that have similar patterns of postsecondary attendance. Only students in the cohorts who had all three pieces of data: 8th grade PSSA scores, 8th grade final grades in English and math courses, and SAT scores available were included in the study. Due to the geographic location of the participant school district, the majority of students took the SAT over the ACT. The SAT scores collected for this study were the students' first attempt, as this attempt represents the closet proximity to the students' time in middle school. The sample size of students included in this study was 1446. This number comprises approximately 77% of all students in the three graduating classes that were examined. Including students from three graduating classes was possible due to the relative stability in student performance during that time span.

Additionally, demographic groups were examined as part of this study. Information relating to gender was collected to determine whether there exists a greater likelihood that males or females within the population would meet the SAT college readiness benchmarks. Students who had IEP's as well as students who were free and reduced lunch eligible were also identified to determine if any differences existed in those students' ability to meet college readiness benchmarks when compared to their peers. Students were also grouped for analysis purposes by the math class they took in 8th grade, as there were multiple math course offerings that students could have taken in this school district during their 8th grade year: 8th grade general mathematics, Pre-Algebra, Algebra, Geometry, and Algebra II. By analyzing the 8th grade math levels of students, conclusions can be drawn regarding whether taking rigorous math courses in 8th grade, Algebra 1 or higher, has an effect on the likelihood that a student will be college ready on the SAT. Finally, the student SAT scores that were analyzed were their first attempt at the exam and students were grouped by when in their high school career they first took the SAT. This was done because the goal of this study was to determine the extent to which middle school data sources can predict college readiness as measured by the SAT. While students are allowed multiple attempts to take the SAT, performance on subsequent tests may be more explained by increased familiarity with the test and interventions taken after their first attempt and less explained by the impact of a student's middle school education. Scores on students' second and third attempts at the SAT are further away from their time in middle school and may be influenced by taking higher level high school courses or receiving targeted tutoring and less by their middle school education. Table 2 provides information regarding how these demographic variables were coded for analysis purposes.

Table 2

Coding of Demographic Variables

Demographic Variable	Coding
Gender	
Male	0
Female	1
Free or Reduced Lunch Status	
Ineligible	0
Eligible	1
IEP Status	
No IEP	0
IEP	1
8th Grade Math Level	
Below Algebra 1	0
Algebra 1 or Above	1
When Student First Attempted SAT	
10th Grade or Earlier	1
First Semester 11th Grade	2
Second Semester 11th Grade	3
12th Grade	4

Data Collection

The researcher was granted permission to access student data by the district superintendent with the stipulation that the data would be collected by an approved internal district employee in order to guarantee that the researcher or no one else outside of district employment would have access to any information that could identify any student (Appendix A). Data was collected by the approved district employee and entered into an Excel spreadsheet (Appendix B). A random number replaced all student names to ensure confidentiality. Following the data collection and entry, the district provided the researcher with the secure data that in no way revealed any student's identity.

Logistic Regression

A logistic regression was used to determine the extent to which students' 8th grade PSSA scores and 8th grade final teacher assigned grades predict college readiness as measured by the SAT. This method was appropriate because the dependent variables in this study, meeting the SAT college readiness benchmarks, were dichotomous variables. Students either met the benchmark or did not. These binary variables were coded as having either a value of 1 indicating a student met the benchmark or 0 indicating that a student did not meet the benchmark. For this study, the logistic regression predicted the probability of group membership of students being college ready or not, as measured by the SAT, by analyzing students' middle school data as predictor variables. Specifically, does an increase in middle school student performance contribute to an increased likelihood that a student will be college ready on the SAT?

The predictors as identified in each model are the independent variables that were entered into the logistic regression. *B* represents the values, represented by log-odds units that explain the relationship that exists between the independent variable and dependent variable. This

estimate provides the log odds that result in either an increase or decrease of one unit on the part of the predictor variable. Standard Error is represented by S.E and it is related to the coefficients used in the equation as it is an assessment of the parameters in the equation and indicates if, and by how much, the parameter differs from 0. The significance of the model is indicated by *p*, coefficients that have *p* values less than .05 are considered statistically significant in this study's models. The *Exp(B)* values are the odds ratios for the predictor variables. An odds ratio of 1 indicates that meeting the college readiness benchmarks is equally likely to occur among groups, an odds ratio of greater than1 signifies that the likelihood of meeting the benchmarks is greater in one group or groups than another and an odds ratio of less than 1 signifies that the likelihood of meeting the benchmarks decreases when compared to another group or groups. Inverse Odds Ratio (IOR) was used in instances when there were negatively related coefficients which produced negative beta values. The IOR totals were calculated by dividing 1 by the *Exp(B)*. A 95% Confidence Interval (95 % CI) was calculated in this study and it represented the range of values that are 95% certain to contain the mean of the population. SPSS software analyzed the data collected for this study.

Dependent Variables

The results from the graduating classes of 2013, 2014, and 2015 on the SAT were the dichotomous dependent variable. Students who met the college readiness benchmark were coded 1 and students who did not meet the benchmark were coded 0. Raw performance data received from the school district was coded by the researcher into an Excel spreadsheet for analysis purposes (Appendix C). The SAT college readiness benchmarks are included in Table 3.

Table 3

SAT College Readiness Benchmark Scores

Content Area	SAT Benchmark Score
Math	500
Reading	500
Writing	500
Total Composite Score	1550

Note. While the three content areas of the SAT each have a college readiness benchmark score of 500, the total composite college readiness score is 1550.

Independent Variables

One independent variable included in this study was students' 8th grade teacher assigned final grades in math and English. Teacher assigned final grades were analyzed as categorical data and were coded appropriately in SPSS. This coding turned student grades into dichotomous variables to allow for logistic regression analysis. Appendix C provides the Excel spreadsheet that was used to code the data. Students' 8th grade final assigned grades in English were used to compare performance in both the reading and writing sections of the SAT. In order to ensure appropriate cell sizes student grades were arranged into three levels A, B, and C or below. A grade of A was coded as 3, a grade of B coded as 2, and grades of C or below coded as 1. These three categories were selected due to the fact that students taking college entrance exams aspire to attend a higher education institution and tend to be higher achieving students (Bromberg & Theokas, 2013; Baum, Ma, & Payea, 2013). Table 4 provides the school district grading scale and the coding used for teacher assigned 8th grade final grades.

Table 4

District Grading Scale

Teacher Grade	Percent Scale	Coding
A	100- 90	3
B	89-80	2
C or Below	79 and Below	1

The second independent variable used was student performance on the 8th grade PSSA in math, reading, and writing. Table 5 provides the score ranges for the PSSA math, reading, and writing sections.

Table 5

PSSA Level Score Ranges

	Advanced	Proficient	Basic	Below Basic
	Score Range	Score Range	Score Range	Score Range
PSSA Math	1446 and up	1284-1445	1171-1283	700-1170
PSSA Reading	1473 and up	1280-1472	1146-1279	700-1145
PSSA Writing	1748 and up	1236-1747	914-1235	913-700

Continuous PSSA scaled scores were used as predictor variables. For data analysis purposes each student's scaled score was divided by ten due to the high number of available points on the PSSA. PSSA questions are worth more than one point and therefore there is little value in knowing what effect a one point increase, if any, has on predicting future college readiness. By dividing the scores by ten, it allowed for the results to determine how a ten point increase in performance on the PSSA would impact the likelihood of a student's ability to meet

the SAT college readiness benchmarks. Students' 8th grade PSSA scores in math were used to compare performance on the math SAT, reading PSSA scores were used to compare performance on the reading section of the SAT, and writing PSSA scores were used to compare performance on the writing section of the SAT.

CHAPTER IV

Results

Existing research that focuses on predicting college readiness on the SAT relies frequently on high school student data sources as its predictor variables. This limits those studies' generalizability across K-12 systems and places the emphasis of developing college ready students on high schools. The purpose of the current study was to determine the extent to which middle school student data sources can predict college readiness as on the SAT, as research (ACT, 2008) has identified the important role middle school education has on shaping college ready students.

Data collected from a suburban public school district in the state of Pennsylvania were used to investigate the following research questions:

Question 1a: To what extent does the 8th grade math PSSA predict college readiness as measured by the SAT?

Question 1b: To what extent does the 8th grade reading PSSA predict college readiness as measured by the SAT?

Question 1c: To what extent does the 8th grade writing PSSA predict college readiness as measured by the SAT?

Question 2a: To what extent do 8th grade teacher assigned final grades in math courses predict college readiness as measured by the SAT?

Question 2b: To what extent do 8th grade teacher assigned final grades in English courses predict college readiness as measured by the SAT?

Population

Data were collected for 1446 students. This number comprises approximately 77% of the total number of students from the 2013, 2014, and 2015 graduating classes from the school district examined in this study. Students from three graduating classes were grouped together in this study due to the relative stability of student performance during the three year period. Only students that had all pieces of specified data available were included in this study. Those data were students' first attempt SAT scores in math, reading, and writing, final 8th grade teacher assigned grades in math and English, and 8th grade Pennsylvania System of School Assessment (PSSA) scores in math, reading, and writing. Once this population was identified additional data collected consisted of gender, IEP status, free and reduced lunch status, 8th grade math course taken, and when each student first took the SAT. The findings and generalizability of this study are limited to the extent that this study only included students who had all pieces of researcher requested data available and did not include all district students as 23% of students were not included in the study.

The population included in this study initially had to have SAT data on file which means every student in this study had aspirations of attending college. Therefore, the findings in this study do not describe the total college readiness levels of all students in the district, but rather students who intended to go to college. Once students were identified as having SAT data on file, their 8th grade PSSA scores and 8th grade final teacher assigned grades were collected. Students who transferred into the district from other states after 8th grade would not have had PSSA scores on file, nor would students who attended private schools who did not administer the PSSA. Additionally, students who entered the school district after 8th grade and did not have 8th grade PSSA scores and/or 8th grade final teacher assigned grades sent to the school district would

have been excluded from this study. As a result, this study's population primarily consists of students who aspired to go to college and who attended district schools in 8th grade.

Frequency statistics pertaining to the demographics of this population along with the total school district population are presented in Table 6. Female students made up 48.9% of the sample population (n = 707) and male students made up 51.1% of the sample population (n = 739). This gender breakdown was closely aligned to the overall district population. Students with an IEP consisted of 4.8% of the total population in the study (n = 69), while the overall district IEP population was 16%. This influenced the findings as students with IEP's in this study consisted of just over one quarter of the total district population with IEP's and the IEP students in this sample aspired to attend college. Students who were free or reduced lunch eligible made up 8.4% (n = 121) of the sample population, while the overall district population of free or reduced lunch eligible students made up 20% of the district population.

Table 6

Frequency Statistics: Student Demographic Data

Variable	n	% Sample	% of District
Gender			
Female	707	48.9	48.59
Male	739	51.1	51.41
IEP Status			
IEP	69	4.8	16
No IEP	1,377	95.2	84
Free or Reduced Lunch Eligible			
Eligible	121	8.4	20
Not Eligible	1,325	91.6	80

Students in this sample demonstrated high levels of student performance, as indicated by their performance on the PSSA and, as evidenced by their final teacher assigned grades, in the classroom. Students were especially successful on the math and reading PSSA as evidenced by 84.4% (*n* = 1221) scoring advanced on the math PSSA and 84.3% (*n* =1219) scoring advanced on the reading PSSA. Similarly, 98.1% (*n* = 1419) of students scored proficient and above on the writing PSSA. Table 7 provides more detailed statistics regarding the PSSA.

Table 7

Frequency Statistics: PSSA Student Performance Data

	Advanced		Proficient		Basic		Below Basic	
	n	%	n	%	n	%	n	%
PSSA Math	1,221	84.4	204	14.1	17	1.2	4	.3
PSSA Reading	1,219	84.3	196	13.6	28	1.8	5	.3
PSSA Writing	427	29.5	992	68.6	26	1.8	1	.1

Final teacher assigned grades provided additional context for the performance of students in this sample as 66.9% (*n* = 968) earned a grade of an A in English and 54.6% (*n* = 789) earned a grade of an A in math. In addition to two-thirds of the students earning an A in math, their math courses demonstrated a level of considerable rigor. Von Secker (2005) identified participation in Algebra in 8th grade as a key factor in future college readiness. In this population, 47.6% (*n* = 688) of students took Algebra I and 39.8% (*n* = 575) of students took Algebra II in 8th grade. Additional students (*n* = 21) were enrolled in advanced geometry courses in 8th grade. Only 11.3% (*n* = 162) of the students in this population took a course lower than Algebra I. Table 8 provides statistics related to student grades in math, as well their 8th grade math level, and their English grade.

Table 8

Frequency Statistics: 8th Grade Course Data

Variable	n	%
Math Grade		
A	789	54.6
B	472	32.6
C	153	10.6
D	30	2.1
F	2	.1
8th Grade Math Course Taken		
Algebra I	688	47.6
Algebra II	575	39.8
Basic Geometry	1	.1
Geometry Honors	20	1.4
Math Prep	4	.3
Mathematics 8	8	.6
Pre-Algebra	150	10.4
English Grade		
A	968	66.9
B	358	24.8
C	97	6.7
D	21	1.5
F	2	.1

Students in this study overwhelmingly, at 92.3%, took the SAT for the first time during their junior year of high school. Student performance on the SAT in this study is being examined through the ability of students to meet the SAT college readiness benchmarks. Table 9 provides more information pertaining to when students in this sample first took the SAT and the percentage of students in the sample who met each of the SAT college readiness benchmarks.

Table 9
Frequency Statistics: Student SAT Data

Variable	n	%
When SAT was first taken		
7th Grade	1	.1
8th Grade	13	.9
9th Grade	4	.3
10th Grade	26	1.8
11th Grade	1,334	92.3
12th Grade	68	4.7
Met SAT Math Benchmark		
Yes	938	64.9
No	508	35.1
Met SAT Reading Benchmark		
Yes	921	63.7
No	525	36.3
Met SAT Writing Benchmark		
Yes	835	57.7
No	611	42.3

Analysis of Math Data

Logistic regression models were run to determine the extent to which middle school data sources predict college readiness as measured by the math SAT. The first regression run, found in Table 10, examined the predictability of the three demographic predictor variables included in this study, gender, IEP status, and free and reduced lunch status with no academic predictors included.

Table 10

Output for Demographic Data to SAT Math Benchmark

Predictors	*B*	S.E	*p*	*Exp(B)*	IOR	[95% CI]
Gender (1)	-.464	.114	.000	.629	1.589	[.503~.787]
IEP (1)	-1.717	.281	.000	.180	5.555	[.104~.312]
Free and Reduced Lunch (1)	-1.098	.199	.000	.334	2.994	[.226~.493]
Constant	1.032	.086	.000	2.808		
Test	χ^2	*Df*	*p*			
Overall model evaluation						
Likelihood-ratio test	90.881	3	.000			
Goodness-of-fit test						
Hosmer & Lemeshow	.843	2	.656			

Notes: Pseudo R^2 =.061 (Cox & Snell), .084 (Nagelkerke).

The results found in Table 10 indicate that demographic factors have a significant effect on students' ability to meet the SAT college readiness benchmark in math. Gender was found to be statically significant in predicting a student's ability to meet the SAT college readiness benchmark in math, as males were 1.589 times more likely to meet the benchmark than females. Having an IEP was also significant, as students who did not have an IEP were 5.555 times more likely to meet the college readiness benchmark in math than students who did have an IEP. Additionally, being free and reduced lunch eligible also was significant. Students who were not eligible for free and reduced lunch were 2.994 times more likely to meet the college readiness benchmark in math than students who were eligible. It is important to note that these results are

only generalizable to students who aspire to go to college, as only students who had SAT scores on file are represented in these demographic groups.

The next model presents the findings of a logistic regression using the math PSSA as a predictor of meeting the SAT math benchmarks without any demographic controls. The independent predictor variable, math PSSA scores, was entered as a continuous variable. Each scaled score was divided by 10 so that in the analysis, a determination of the predictive ability of the PSSA could be made based on score increments of 10 rather than 1. The structure of the PSSA does not allow for 1 point increases in score. The results of this regression are found in Table 11.

Table 11

Output for Math PSSA

Predictors	*B*	S.E	*p*	*Exp(B)*	[95% CI]
PSSA Math Score	.120	.007	.000	1.127	[1.113~1.42]
Constant	-18.369	1.039	.000	.000	
Test	χ^2	*df*	*p*		
Overall model evaluation					
Likelihood-ratio test	687.631	1	.000		
Goodness-of-fit test					
Hosmer & Lemeshow	3.030	8	.932		

Notes: Pseudo R^2 =.378 (Cox & Snell), .521 (Nagelkerke).

Performance on the 8th grade math PSSA was found to be a significant predictor of meeting the college readiness benchmark on the math SAT, as a 10 point increase on the 8th grade math PSSA resulted in a 1.127 times increase in the likelihood that a student would meet the college readiness benchmark in math on their first attempt.

The logistic regression model was run again with PSSA math scores as the academic predictor while controlling for the demographic variables of the study. The results of this regression are found in Table 12.

Table 12

Output for Math PSSA with Demographic Controls

Predictors	*B*	S.E	*p*	*Exp(B)*	IOR	[95% CI]
Gender (1)	-.531	.147	.000	.588	1.700	[.440~.784]
IEP (1)	-.761	.351	.030	.467	2.141	[.235~.931]
Free and Reduced Lunch (1)	-.725	.256	.005	.484	2.066	[.293~.800]
PSSA Math Score	.117	.007	.000	1.124		[1.110~1.139]
Constant	-17.605	1.046	.000	.000		
Test	χ^2	*df*	*p*			
Overall model evaluation						
Likelihood-ratio test	713.100	4	.000			
Goodness-of-fit test						
Hosmer & Lemeshow	4.215	8	.837			

Notes: Pseudo R^2 =.389 (Cox & Snell), .536 (Nagelkerke).

When controlling for demographic variables, areas of significance were discovered in the ability for PSSA math scores to predict college readiness on the SAT. Males were 1.700 times more likely to meet the SAT math readiness benchmark than females. Students who did not have an IEP were 2.141 times more likely to meet the math SAT benchmark than students who did have an IEP. Free and reduced lunch was also found to be a significant predictor, as students who were not free and reduced lunch eligible were 2.066 times more likely to meet the benchmark than student who were eligible. The inclusion of the demographic variables with the math PSSA served to slightly decrease the likelihood that students who did not have an IEP or were free and reduced lunch eligible would meet the college readiness benchmark in math when compared to their peers who had an IEP or were eligible for free and reduced lunch. Males, however, slightly increased the likelihood they would meet the SAT math benchmark when compared to their female peers. The predictive ability of the PSSA remained stable.

The population in this current study had a variety of math course offerings in 8th grade. Von Secker (2005) identified students taking Algebra 1 in 8th grade as a key component to fostering future college readiness. Table 13 provides the results when the control of math level

taken by students in 8th grade was added as a variable. Math levels were dichotomized with students taking a math class at the Algebra 1 level or above identified as the indicator variable and students enrolling in a course below Algebra 1 as the constant.

Table 13

Output for Math PSSA Controlling for 8th Grade Math Level

Predictors	*B*	S.E	*p*	*Exp(B)*	[95% CI]
PSSA Math Score	.115	.007	.000	1.122	[1.108~1.137]
Math Level (1)	1.098	.249	.000	2.998	[1.839~.4.887]
Constant	-18.689	1.063	.000	.000	
Test	χ^2	*df*	*p*		
Overall model evaluation					
Likelihood-ratio test	708.391	2	.000		
Goodness-of-fit test					
Hosmer & Lemeshow	5.955	8	.652		

Notes: Pseudo R^2 =.387 (Cox & Snell), .533 (Nagelkerke).

As the model in Table 13 indicates, taking a math course at a level of Algebra 1 or above significantly improves, by 2.998 times, the likelihood that a student will meet the SAT college readiness benchmark in math. Again in this model, the predictive ability of the PSSA remained stable. An additional regression was run to determine what, if any, affect when students take the SAT has on their ability to meet the SAT college readiness benchmark in math.

Table 14 displays the results when controlling for at what point in a student's career the SAT was first taken. When controlling for when in a high school student's career they take the SAT there no significance found on a student's ability to meet the benchmark. Again, in this additional model, the predictive ability of the PSSA remained stable.

Table 14

Regression Output for Math PSSA Controlling for Time of First SAT

Predictors	*B*	S.E	*p*	*Exp(B)*	[95% CI]
PSSA Math Score	.120	.007	.000	1.128	[1.113~1.143]
10th Grade and Earlier			.245		
First Semester 11th (1)	.799	.457	.081	2.224	[.907~5.451]
Second Semester 11th (2)	.684	.440	.121	1.982	[.836~4.698]
12th Grade (3)	-.317	1.059	.765	.729	[.091~5.805]
Constant	-19.160	1.184	.000	.000	

Test	χ^2	*df*	*p*
Overall model evaluation			
Likelihood-ratio test	691.751	4	.000
Goodness-of-fit test			
Hosmer & Lemeshow	3.869	8	.869

Notes: Pseudo R^2 =.380 (Cox & Snell), .523 (Nagelkerke).

The research question posed of "to what extent students' 8th grade math PSSA score predicts college readiness on the SAT math section" was answered. The findings indicate that for every 10 point increase on the 8th grade PSSA, the likelihood of meeting the SAT benchmark increased 1.127 times and remained stable when controlling for demographic variables. When controlling for demographic variables, being female, having an IEP, and being eligible for free and reduced lunch decreased the likelihood that a student would be college ready. The odds of being college ready increased when a student took a course at the Algebra1 level or higher in 8th grade. When in a student's career they took the SAT did not add any significance to the predictor of PSSA score.

A logistic regression was conducted to determine the extent to which 8th grade final teacher assigned grades in math predict college readiness as measured by the math SAT. The independent predictor variable, 8th grade math grades were entered as categorical variables. Student grades were categorized as A, B, and C or below. Dummy coding was used and C was

entered as the first indicator variable. This regression does not include any demographic controls. The results of this regression are found in Table 15.

Table 15

Output for Math Grade

Predictors	*B*	S.E	*p*	*Exp(B)*	[95% CI]
C or Below	.042	.003	.000		
B (1)	.423	.177	.017	1.526	[1.079~2.159]
A (2)	1.906	.176	.000	6.729	[4.765~9.502]
Constant	-.474	.151	.002	.000	
Test	χ^2	*df*	*p*		
Overall model evaluation					
Likelihood-ratio test	201.068	2	.000		
Goodness-of-fit test					
Hosmer & Lemeshow	.000	1	1.000		

Notes: Pseudo R^2 =.130 (Cox & Snell), .179 (Nagelkerke).

This logistic regression model was run to predict meeting the SAT college readiness benchmark in math using the 8th grade final teacher assigned grades as a predictor. Students who earned a grade of A in their 8th grade math course were 6.729 times more likely to meet the college readiness benchmark on the math SAT than students who earned a C or below. Students who earned a B in their 8th grade math class were 1.526 times more likely to meet the college readiness benchmark than students who earned a C or below.

The model was run again using grades as the predictor variable and controlling for gender, IEP status, and free and reduced lunch eligibility. Table 16 displays the results of this model. When controlling for demographic variables, areas of significance were discovered in the ability for 8th grade final teacher assigned math grades to predict college readiness on the SAT. Males were 1.522 times more likely to meet the SAT math readiness benchmark than females. Students who did not have an IEP were 7.633 times more likely to meet the math SAT benchmark than students who did have an IEP. This is an increase in the likelihood of students

without an IEP meeting the SAT math benchmark from both the model run without academic predictors and in the model that included PSSA math scores. Free and reduced lunch eligibility was also found to be a significant predictor, as students who were not free and reduced lunch eligible were 2.808 times more likely to meet the benchmark than student who were eligible. This represents an increase in ability to meet the benchmark for students who were not free and reduced lunch from the model including PSSA scores. The predictive ability of 8th grade final teacher assigned grades remained stable with the introduction of demographic variables.

Table 16

Output for Math Grade with Demographic Controls

Predictors	*B*	S.E	*p*	*Exp(B)*	IOR	[95% CI]
Gender (1)	-.421	.119	.000	.657	1.522	[.520~.829]
IEP (1)	-2.033	.379	.000	.131	7.633	[.062~.275]
Free and Reduced Lunch (1)	-1.033	.227	.000	.356	2.808	[.228~.555]
C or below			.000			
B (1)	.374	.196	.056	1.453		[.990~2.133]
A (2)	1.840	.190	.000	6.294		[4.341~9.126]
Constant	-.629	.173	.000	.533		
Test	χ^2	*df*	*p*			
Overall model evaluation						
Likelihood-ratio test	275.288	5	.000			
Goodness-of-fit test						
Hosmer & Lemeshow	2.864	5	.721			

Notes: Pseudo R^2 =.173 (Cox & Snell), .231 (Nagelkerke).

Table 17 added the control of math level taken by students in 8th grade as a predictor variable. Math levels were dichotomized with students taking a math class at the Algebra 1 level or above identified as the indicator variable and students enrolling in a course below Algebra 1 as the constant.

Table 17

Output for Math Grade Controlling for Math Level

Predictors	*B*	S.E	*p*	*Exp(B)*	[95% CI]
C or below			.000		
B (2)	.283	.185	.127	1.326	[.922~1.908]
A (1)	2.098	.184	.000	5.341	[3.725~7.657]
Math Course (1)	-.765	.204	.000	5.483	[3.673~8.185]
Constant	-1.815	.235	.486	.163	
Test	χ^2	*df*	*p*		
Overall model evaluation					
Likelihood-ratio test	280.392	3	.000		
Goodness-of-fit test					
Hosmer & Lemeshow	.811	2	.667		

Notes: Pseudo R^2 =.176 (Cox & Snell), .243 (Nagelkerke).

As the model in Table 17 indicates, a student taking a math course at a level of Algebra 1 or above in 8th grade is 5.483 times more likely to meet the SAT college readiness benchmark in math than a student who did not take a math class at the level of Algebra 1 or higher in 8th grade. A further regression was run to more closely examine the predictive effect taking an 8th grade math class of Algebra I or higher has on being college ready at the time the SAT is first taken. The predictive ability of 8th grade final teacher assigned grades decreased slightly with the introduction of math level as a control variable, as the likelihood of a student who earned an A meeting the benchmark decreased. The model in Table 18 shows the results of a regression when only students who took 8th grade math offerings higher than Algebra 1 were compared with one another. The results in Table 18 demonstrate the significant impact taking advanced math courses in 8th grade has on a student's ability to meet the SAT college readiness benchmark in math. Students who took Algebra II were 18.757 times more likely than students who took Algebra I to meet the SAT math college readiness benchmark and students who took Geometry were 19.202 times more likely than students who took Algebra I to meet the SAT math college

readiness benchmark. This finding led the researcher to examine the impact high performance in any of the math course offering had on predicting college readiness on the math SAT.

Table 18

Output for Advanced Math Levels

Predictors	*B*	S.E	*p*	*Exp(B)*	[95% CI]
Algebra I			.000		
Algebra II	2.932	.208	.000	18.757	[12.471~28.210]
Geometry	2.955	1.028	.004	19.202	[2.563~143.876]
Constant	.041	.076	.594	1.042	
Test	χ^2	*df*	*p*		
Overall model evaluation					
Likelihood-ratio test	349.401	2	.000		
Goodness-of-fit test					
Hosmer & Lemeshow	.000	0	.000		

Notes: Pseudo R^2 =.238 (Cox & Snell), .342 (Nagelkerke).

Table 19 displays the results of the logistic regression model when comparing students who scored a grade of A or B in their math class regardless of level, with a grade of A being the indicator variable.

Table 19

Output for Math Grade of A and B

Predictors	*B*	S.E	*p*	*Exp(B)*	[95% CI]
A in Math	-.163	.123	.183	.849	[.668~1.080]
Constant	.706	.098	.000	2.026	
Test	χ^2	*df*	*p*		
Overall model evaluation					
Likelihood-ratio test	1.781	1	.182		
Goodness-of-fit test					
Hosmer & Lemeshow	.000	0	.000		

Notes: Pseudo R^2 =.001 (Cox & Snell), .002 (Nagelkerke).

The results in Table 19 indicate no significance was found between students who received a grade of A or B in their 8th grade math class. This indicates that the level of math a

student takes in 8th grade is more important than their performance, as indicated by a grade, in 8th grade math. A student that takes a higher math level in 8th grade and earns a B may in fact be more college ready than a student who takes PreAlgebra and earns an A. In this case, taking a higher level of math is a more significant factor in predicting college readiness than success in a math class. Table 20 displays the results of student grade predictability when controlling for at what point in a student's career the SAT was first taken.

Table 20

Output for Math Grade Controlling for Time of First SAT

Predictors	*B*	S.E	*p*	*Exp(B)*	[95% CI]
C or below			.000		
B (2)	.411	.178	.021	1.508	[1.064~2.139]
A (1)	1.865	.177	.000	6.458	[4.562~9.144]
10th Grade and Earlier			.031		
First Semester 11th (1)	.093	.387	.810	1.098	[.514~2.344]
Second Semester 11th (2)	-.288	.374	.441	.750	[.360~1.561]
12th Grade (3)	-1.044	.842	.215	.352	[.068~1.834]
Constant	-.260	.400	.516	.771	

Test	χ^2	*df*	*p*
Overall model evaluation			
Likelihood-ratio test	210.168	5	.000
Goodness-of-fit test			
Hosmer & Lemeshow	6.703	5	.244

Notes: Pseudo R^2 =.135 (Cox & Snell), .186 (Nagelkerke).

Table 20 illustrates that when using math grades as a predictor and controlling for when the SAT was first taken no statistical significance was found.

The research question posed of to what extent students' 8th grade math grades predict college readiness on the SAT math section was answered. The findings indicate students who earn a grade of A are far more likely to be college ready than those that do not. Students earning a grade of B are also more likely to be college ready than students that earn a C or less. Gender

was found to have a significant effect, as being female reduced the likelihood of meeting the college readiness benchmark in math. Having an IEP and being free and reduced lunch eligible also reduced the likelihood that a student would be college ready. Students who participated in a math course at a level of Algebra I or above were found to be significantly more likely to meet the SAT math college readiness benchmark than students who took courses at a lower level than Algebra I. When a student first took the SAT was found to have no significance on the odds that a student would meet the college readiness benchmark in math. Table 21 examines the effect all of the significant predictor variables have on predicting college readiness on the math SAT when entered together in one model.

Table 21

Output for Math Controlling PSSA, Grades, and Demographics

Predictors	*B*	S.E	*p*	*Exp(B)*	IOR	[95% CI]
Gender (1)	-.694	.155	.000	.500	2.000	[.368~.677]
IEP (1)	-.464	.377	.219	.629		[.300~1.317]
Free and Reduced Lunch (1)	-.680	.267	.011	.507	1.972	[.301~.855]
C or below			.000			
B (1)	.202	.229	.379	1.224		[.780~1.919]
A (2)	.830	.236	.000	2.293		[1.444~3.643]
PSSA Math Score	.101	.007	.000	1.106		[1.091~1.122]
Math Course (1)	1.455	.290	.000	4.286		[2.430~7.560]
Constant	-16.795	1.093	.000	.000		
Test	χ^2	*df*	*p*			
Overall model evaluation						
Likelihood-ratio test	761.371	7	.000			
Goodness-of-fit test						
Hosmer & Lemeshow	8.834	8	.356			

Notes: Pseudo R^2 =.409 (Cox & Snell), .563 (Nagelkerke).

Table 21 demonstrates that with all predictors present, being male doubled the likelihood of meeting the SAT college readiness benchmarks in math. This result indicates that when gender interacts with these multiple variables, students who are female become less likely to

meet the college readiness benchmark within a population of students who had aspirations of attending college. This finding raises questions regarding the equity in opportunity females have in math compared to their male peers and demonstrates either the math PSSA or teacher grading practices in math are leading females to, ultimately, become less college ready in math as measured by the SAT. Initially, with no academic predictors, males were 1.589 times more likely than females to meet the SAT benchmark. With the inclusion of all the variables, males became 2.0 times more likely to meet the benchmark than females. Having an IEP was found to have no statistical significance in the current model. Students who were not free and reduced lunch eligible were 1.972 times more likely to meet the college readiness benchmarks in math. The predictive ability of grades decreased in the full model while the predictive ability of the PSSA remained stable. This indicates, while still predictive, grades are less of a stable predictor of being college ready on the SAT than the PSSA is. Taking a math course at a level of Algebra 1 or above as a predictive variable decreased slightly in this full model, but still indicated a 4.286 increase in the likelihood of meeting the SAT math benchmark.

Analysis of Reading Data

Logistic regression models were run to determine the extent to which middle school data sources predict college readiness as measured by the reading SAT. The first regression that was run, found in Table 22, examined the predictability of the three demographic variables included in this study, gender, IEP status, and free and reduced lunch status with no academic predictors included. The results found in Table 22 indicate that some demographic factors have a significant effect on a student's ability to meet the SAT college readiness benchmark in reading. Gender was not found to have any significance on a student's ability to meet the SAT college readiness benchmark in reading. Having an IEP was significant, as students who do not have an

IEP are 4.237 times more likely to meet the college readiness benchmark in reading than students who do have an IEP. Additionally, being free and reduced lunch eligible also was significant. Students who were not eligible for free and reduced lunch were 2.105 times more likely to meet the college readiness benchmark in reading than students who were eligible. These findings are similar to the math findings as students without IEPs and who are not free or reduced lunch eligible are more likely to meet the college readiness benchmarks in reading. Unlike math, however, there was no significance with regards to gender impacting college readiness. It is important to again note that these results are only generalizable to students who aspire to go to college, as only students who had SAT scores on file are represented in these demographic groups.

Table 22

Output for Demographic Data to SAT Reading Benchmark

Predictors	*B*	S.E	*p*	*Exp(B)*	IOR	[95% CI]
Gender (1)	-.084	.112	.452	.920		[.739~1.144]
IEP (1)	-1.444	.270	.000	.236	4.237	[.139~.400]
Free and Reduced Lunch (1)	-.743	.194	.000	.475	2.105	[.325~.696]
Constant	.741	.081	.000	2.098		
Test	χ^2	*Df*	*p*			
Overall model evaluation						
Likelihood-ratio test	48.461	3	.000			
Goodness-of-fit test						
Hosmer & Lemeshow	1.026	2	.599			

Notes: Pseudo R^2 =.033 (Cox & Snell), .045 (Nagelkerke).

A logistic regression was then run to determine the extent to which the 8th grade reading PSSA predicted college readiness as measured on the reading PSSA without the inclusion of any demographic variables. The independent predictor variable, reading PSSA scores, was entered as a continuous variable. Each scaled score was divided by 10 so that in the analysis a determination of the predictive ability of the PSSA could be made based on score increments of

10 rather than 1. This model, found in Table 23, indicates that reading PSSA score was found to be a significant predictor of meeting the college readiness benchmark on the SAT as a 10 point increase on the 8th grade reading PSSA resulted in a 1.097 times increase in the likelihood that a student would meet the college readiness benchmark in reading on their first attempt.

Table 23

Output for Reading PSSA

Predictors	*B*	S.E	*p*	*Exp(B)*	[95% CI]
PSSA Reading Score	.092	.005	.000	1.097	[1.085~1.108]
Constant	-14.439	.864	.000	.000	
Test	χ^2	*df*	*p*		
Overall model evaluation					
Likelihood-ratio test	521.261	1	.000		
Goodness-of-fit test					
Hosmer & Lemeshow	1.678	8	.989		

Notes: Pseudo R^2 =.303 (Cox & Snell), .414 (Nagelkerke).

The model was run again using the reading PSSA and controlling for gender, IEP status, and free and reduced lunch eligibility. The results of this regression are found in Table 24.

Table 24

Output for Reading PSSA with Demographic Controls

Predictors	*B*	S.E	*p*	*Exp(B)*	IOR	[95% CI]
Gender (1)	-.499	.137	.000	.607	1.647	[.464~.794]
IEP (1)	-.499	.324	.123	.607		[.322~1.145]
Free and Reduced Lunch (1)	-.341	.232	.142	.711		[.451~1.121]
PSSA Reading Score	.093	.006	.000	1.098		[1.086~1.110]
Constant	-14.306	.883	.000	.000		
Test	χ^2	*df*	*p*			
Overall model evaluation						
Likelihood-ratio test	539.857	4	.000			
Goodness-of-fit test						
Hosmer & Lemeshow	4.207	8	.838			

Notes: Pseudo R^2 =.312 (Cox & Snell), .427 (Nagelkerke).

When controlling for demographic variables, areas of significance were discovered in the ability for PSSA reading scores to predict college readiness on the SAT. Males were 1.647 times more likely to meet the SAT reading readiness benchmark than females. The addition of the PSSA decreased the likelihood that females would meet the SAT reading benchmarks whereas without the PSSA as a predictor no significance was found with regards to gender. No statistical significance was found related to having an IEP or being free and reduced lunch eligible despite finding significance without the PSSA included as a predictor variable. These findings indicate the introduction of the PSSA as a predictor variable has an effect on the likelihood of students in certain demographic groups meeting the SAT reading benchmark that did not exist otherwise.

An additional regression was run to determine what, if any, effect controlling for when a student first takes the SAT has on their ability to meet the SAT college readiness benchmark in reading. Table 25 displays the results when controlling for at what point in a student's career the SAT was first taken.

Table 25

Output for Reading PSSA Controlling for Time of First SAT

Predictors	*B*	S.E	*p*	*Exp(B)*	[95% CI]
PSSA Reading Score	.092	.005	.000	1.097	[1.085~1.108]
10th Grade and Earlier			.002		
First Semester 11th (1)	1.055	.402	.009	2.873	[1.306~6.318]
Second Semester 11th (2)	.564	.385	.143	1.758	[.827~3.739]
12th Grade (3)	-.997	1.121	.374	.369	[.041~3.318]
Constant	-15.116	.982	.000	.000	

Test	χ^2	*df*	*p*
Overall model evaluation			
Likelihood-ratio test	536.900	4	.000
Goodness-of-fit test			
Hosmer & Lemeshow	4.942	8	.764

Notes: Pseudo R^2 =.310 (Cox & Snell), .425 (Nagelkerke).

The findings in Table 25 demonstrate that in the area of reading, when the SAT was taken was a significant predictor of meeting the college readiness benchmark in reading. Students who took the SAT during the first semester of their junior year, were 2.873 times more likely to meet the college readiness benchmark in reading, while no significant results were found for students that took it in the second semester of their junior year or their senior year.

The research question posed of "to what extent students' 8th grade reading PSSA score predicts college readiness on the SAT reading section" was answered. The findings indicate that for every 10 point increase on the 8th grade reading PSSA, the likelihood of meeting the SAT benchmarks improves by 1.097 times, meaning as students' scores on the reading PSSA increased so did the likelihood they would meet the SAT college readiness benchmark. When controlling for the variable of gender, being female decreased the likelihood of meeting the SAT reading benchmark despite no significance being found when gender was examined in isolation. Having an IEP and being eligible for free and reduced lunch were not found to have any statistical significance despite being significant in isolation. Students who took the SAT in the first semester of their junior year were significantly more likely to meet the college readiness benchmark in reading.

The logistic regression model found in Table 26 was conducted to predict the ability of a student to meet the SAT college readiness benchmark in reading using their 8th grade final teacher assigned grades in English as a predictor without the inclusion of demographic variables. English courses in this district encompass concepts relating to both reading and writing. Student grades were categorized as A, B, and C or below. Dummy coding was used and C was entered as the first indicator variable. Students who earned a grade of an A in 8th grade English were 9.1 times more likely to meet the college readiness benchmark on the reading SAT than students

who earned a C or below. Students who earned a B in their 8th grade English class were 2.508 times more likely to meet the college readiness benchmark than students who earned a C or below.

Table 26

Output for English Grade to SAT Reading

Predictors	*B*	S.E	*p*	*Exp(B)*	[95% CI]
C or Below			.000		
B (1)	.919	.236	.000	2.508	[1.579~3.983]
A (2)	2.208	.224	.000	9.100	[5.871~14.104]
Constant	-1.099	.211	.002	.333	
Test	χ^2	*df*	*p*		
Overall model evaluation					
Likelihood-ratio test	182.082	2	.000		
Goodness-of-fit test					
Hosmer & Lemeshow	.000	1	1.000		

Notes: Pseudo R^2 =.118 (Cox & Snell), .162 (Nagelkerke).

A logistic regression model was run again with grades, this time controlling for gender, IEP status, and free and reduced lunch eligibility. The results of this further regression are presented in Table 27.

Table 27

Output for English Grade to SAT Reading with Demographic Controls

Predictors	*B*	S.E	*p*	*Exp(B)*	IOR	[95% CI]
Gender (1)	-.374	.122	.002	.688	1.453	[.541~.873]
IEP (1)	-1.191	.289	.000	.304	3.289	[.173~.535]
Free and Reduced Lunch (1)	-.446	.208	.032	.640		[.425~.963]
C or below			.000			
B (1)	.920	.240	.000	2.509		[1.569~4.012]
A (2)	2.211	.230	.000	9.124		[5.816~14.314]
Constant	-.818	.218	.000	.441		
Test	χ^2	*df*	*p*			
Overall model evaluation						
Likelihood-ratio test	215.203	5	.000			
Goodness-of-fit test						
Hosmer & Lemeshow	1.878	4	.758			

Notes: Pseudo R^2 =.138 (Cox & Snell), .189 (Nagelkerke).

When controlling for demographic variables, areas of significance were discovered in the ability for 8th grade final teacher assigned English grades to predict college readiness on the Reading SAT. Males were 1.453 times more likely to meet the SAT reading readiness benchmark than females. This finding is consistent with the PSSA, that when measured without the addition of any additional academic predictor variables no statistical significance was found in the ability of females to meet the SAT reading benchmark, but when the predictor variable of grades was introduced, being female decreased the likelihood of females meeting the reading SAT benchmark. Students who did not have an IEP were 3.289 times more likely to meet the reading SAT benchmark than students who did have an IEP. Free and reduced lunch eligibility was not found to have any significance on students' ability to meet the SAT reading benchmark.

Table 28 reports the results of a regression model that compared only students who earned a grade of A or B. A grade of A was the indicator variable.

Table 28

Output for English Grade of A and B to SAT Reading Benchmark

Predictors	*B*	S.E	*p*	*Exp(B)*	[95% CI]
A in English	1.568	.132	.000	4.795	[3.704-6.208]
Constant	-.373	.108	.001	.689	
Test	χ^2	*df*	*p*		
Overall model evaluation					
Likelihood-ratio test	147.253	1	.000		
Goodness-of-fit test					
Hosmer & Lemeshow	.000	0	.000		

Notes: Pseudo R^2 =.105 (Cox & Snell), .146 (Nagelkerke).

The results in Table 28 found that a student who earns a grade of A is 4.795 times more likely to meet the SAT college readiness benchmark in Reading than a student who earned a B. When compared only to students who earned a B and not a C or below, the likelihood students

who earned an A of being college ready on the SAT decreased. Table 29 displays the results when controlling for at what point in a student's career the SAT was first taken.

Table 29

Output for English Grade Controlling for Time of First SAT (Reading)

Predictors	*B*	S.E	*p*	*Exp(B)*	[95% CI]
C or below			.000		
B (2)	.904	.238	.000	2.470	[1.550~3.935]
A (1)	2.176	.226	.000	8.812	[5.661~13.717]
10th Grade and Earlier	.885	.341	.000		
First Semester 11th (1)	.375	.327	.010	2.423	[1.241~4.730]
Second Semester 11th (2)	-.939	.914	.250	1.456	[.767~2.761]
12th Grade (3)	-1.556	.388	.304	.391	[.065~2.346]
Constant			.000	.211	

Test	χ^2	*df*	*p*
Overall model evaluation			
Likelihood-ratio test	210.188	5	.000
Goodness-of-fit test			
Hosmer & Lemeshow	.425	3	.935

Notes: Pseudo R^2 =.130 (Cox & Snell), .178 (Nagelkerke).

Table 29 illustrates that when using English grades as a predictor, controlling for when the SAT was taken, students who took the SAT in the first semester of their junior year were 2.423 times more likely to meet the college readiness benchmark in reading.

The research question posed of "to what extent students' 8th grade English grades predict college readiness on the SAT reading section" was answered. The findings indicate students who earn a grade of A are far more likely to be college ready than those who do not. Students earning a grade of B are also more likely to be college ready than students who earn a C or below. Being female reduced the likelihood of meeting the college readiness benchmark in reading despite gender have no significant effect when not interacting with grades. When interacting with grades having an IEP reduced the likelihood that a student would be college

ready, while being free and reduced lunch eligible was not found to be significant when interacting with grades, but was significant in isolation. Students who took the SAT during the first semester of their junior year were more likely to meet the college readiness benchmark in reading than at any other time. Table 30 reports the effect all of the significant predictor variables had on predicting college readiness on the reading SAT when entered together in one model.

Table 30

Output for SAT Reading Controlling for PSSA, Grades, and Demographics

Predictors	*B*	S.E	*p*	*Exp(B)*	IOR	[95% CI]
Gender (1)	-.582	.140	.000	.559	1.788	[.425~.735]
IEP (1)	-.431	.327	.187	.650		[.342~1.232]
Free and Reduced Lunch (1)	-.274	.233	.238	.760		[.482~1.199]
C or below			.000			
B (1)	.580	.275	.035	1.786		[1.042~3.060]
A (2)	.981	.269	.000	2.668		[1.574~4.521]
PSSA Reading Score	.086	.006	.000	1.090		[1.078~1.102]
Constant	-13.918	.923	.000	.000		
Test	χ^2	*df*	*p*			
Overall model evaluation						
Likelihood-ratio test	556.295	6	.000			
Goodness-of-fit test						
Hosmer & Lemeshow	6.877	8	.550			

Notes: Pseudo R^2 =.319 (Cox & Snell), .437 (Nagelkerke).

As shown in Table 30, with all predictors present, being male increased the likelihood of meeting the SAT college readiness benchmarks in reading. This result indicates that when interacting with these multiple variables, students who are female become less likely to meet the SAT reading benchmark. This finding raises similar questions to the findings in math, regarding the equity in opportunity females have in reading compared to their male peers and demonstrates either the reading PSSA or teacher grading practices in reading are leading females to, ultimately, become less college ready in reading as measured by the SAT. Having an IEP was

found to have no statistical significance in the current model. The odds of meeting the benchmark associated with student grades decreased, especially in the case of students who earned an A, while the odds associated with performance the PSSA remained relatively stable.

Analysis of Writing Data

Logistic regression models were run to determine the extent to which middle school data sources predict college readiness as measured by the writing SAT. The first regression run, found in Table 1, examined the predictability of the three demographic predictor variables included in this study, gender, IEP status, and free and reduced lunch status with no academic predictors included.

Table 31

Output for Demographic Data to SAT Writing Benchmark

Predictors	*B*	S.E	*p*	*Exp(B)*	IOR	[95% CI]
Gender (1)	.082	.109	.452	1.085		[.877~1.343]
IEP (1)	-1.299	.278	.000	.273	3.663	[.158~.470]
Free and Reduced Lunch (1)	-.972	.200	.000	.379	2.638	[.256~.560]
Constant	.415	.078	.000	1.514		
Test	χ^2	*Df*	*p*			
Overall model evaluation						
Likelihood-ratio test	52.115	3	.000			
Goodness-of-fit test						
Hosmer & Lemeshow	.037	2	.982			

Notes: Pseudo R^2 =.035 (Cox & Snell), .048 (Nagelkerke).

Table 31 presents the results of a logistic regression examining only the effect the demographic variables included in this study have on meeting the SAT college readiness benchmarks in writing. The results found in Table 40 indicate that some demographic factors have a significant effect on students' ability to meet the SAT college readiness benchmark in writing. Gender was not found to be statistically significant in a student's ability to meet the SAT college readiness benchmark in writing. Having an IEP was significant, as students who do not

have an IEP are 3.663 times more likely to meet the college readiness benchmark in writing than students who do have an IEP. Additionally, being free and reduced lunch eligible also was significant. Students who were not eligible for free and reduced lunch were 2.638 times more likely to meet the college readiness benchmark in writing than students who were eligible. It is important to again note that these results are only generalizable to students who aspire to go to college, as only students who had SAT scores on file are represented in these demographic groups.

A logistic regression was conducted to determine the extent to which the 8th grade writing PSSA predicts college readiness as measured by the writing SAT without the inclusion of demographic variables. The independent predictor variable, 8th grade PSSA writing scores, was entered as a continuous variable. Each scaled score was divided by 10 so that in the analysis a determination of the predictive ability of the PSSA could be made based on score increments of 10 rather than 1. Table 32 displays the results of this regression.

Table 32

Output for Writing PSSA

Predictors	*B*	S.E	*p*	*Exp(B)*	[95% CI]
PSSA Writing Score	.042	.003	.000	1.043	[1.036~1.049]
Constant	-6.263	.491	.000	.002	
Test	χ^2	*df*	*p*		
Overall model evaluation					
Likelihood-ratio test	241.608	1	.000		
Goodness-of-fit test					
Hosmer & Lemeshow	19.174	8	.014		

Notes: Pseudo R^2 =.154 (Cox & Snell), .207 (Nagelkerke).

Student performance on the writing PSSA was a significant predictor of meeting the college readiness benchmark on the SAT as a 10 point increase on the 8th grade PSSA resulted

in a 1.043 times increase in the likelihood that a student would meet the college readiness benchmark in writing on their first attempt.

The model was run again controlling for gender, IEP Status, and free and reduced lunch eligibility. The results of this regression are found in Table 33.

Table 33

Output for Writing PSSA with Demographic Controls

Predictors	*B*	S.E	*p*	*Exp(B)*	IOR	[95% CI]
Gender (1)	-.178	.119	.133	.837		[.663~1.056]
IEP (1)	-.830	.290	.004	.436	2.293	[.247~.770]
Free and Reduced Lunch (1)	-.922	.215	.000	.398	2.512	[.261~.606]
PSSA Writing Score	.041	.003	.000	1.042		[1.036~1.049]
Constant	-5.998	.500	.000	.000		
Test	χ^2	*df*	*p*			
Overall model evaluation						
Likelihood-ratio test	273.207	4	.000			
Goodness-of-fit test						
Hosmer & Lemeshow	14.457	8	.071			

Notes: Pseudo R^2 =.172 (Cox & Snell), .231 (Nagelkerke).

When controlling for demographic variables, areas of significance were discovered in the ability for PSSA writing scores to predict college readiness on the SAT. Gender was found to have no significance on students' ability to meet the SAT writing benchmark. Students who did not have an IEP were 2.293 times more likely to meet the writing SAT benchmark than students who did have an IEP. Free and reduced lunch was also found to be a significant predictor, as students who were not free and reduced lunch eligible were 2.512 times more likely to meet the writing benchmark than student who were eligible. When compared to the model that did not include the PSSA as a predictor, the introduction of the PSSA served to decrease the odds that a student who did not have an IEP or was free or reduced lunch eligible would meet the SAT benchmark in writing.

Table 34 presents the results regarding when a student first took the SAT. The findings demonstrate that in the area of writing, when the SAT was taken was not a significant predictor of meeting the college readiness benchmark in writing when entered into a model with the writing PSSA.

Table 34

Output for Writing PSSA Controlling for Time of First SAT

Predictors	*B*	S.E	*p*	*Exp(B)*	[95% CI]
PSSA Writing Score	.042	.003	.000	1.043	[1.036~1.049]
10th Grade and Earlier			.323		
First Semester 11th (1)	.518	.339	.126	1.679	[.865~3.260]
Second Semester 11th (2)	.349	.326	.284	1.418	[.748~2.687]
12th Grade (3)	-.088	.806	.913	.915	[.189~4.446]
Constant	-6.620	.600	.000	.001	

Test	χ^2	*df*	*p*
Overall model evaluation			
Likelihood-ratio test	245.104	4	.000
Goodness-of-fit test			
Hosmer & Lemeshow	22.514	8	.004

Notes: Pseudo R^2 =.156 (Cox & Snell), .210 (Nagelkerke).

The research question posed of "to what extent students' 8th grade writing PSSA score predicts college readiness on the SAT writing section" was answered. The findings indicate that for every 10 point increase on the 8th grade PSSA, the likelihood of meeting the SAT benchmarks improves by 1.043 times and the introduction of control variables did not change these odds. Gender was found to have no significant effect on whether students met the SAT college readiness benchmark in Writing. It was found that students who had an IEP and students who were free and reduced lunch eligible were less likely to meet the SAT college readiness benchmark in writing. When a student first took the writing SAT had no significant impact on their being college ready or not.

A logistic regression was conducted to determine the extent to which 8th grade English grades predict college readiness as measured on the writing SAT. English courses in this district encompass concepts relating to both reading and writing. Student grades were categorized as A, B, and C or below. Dummy coding was used and C was entered as the first indicator variable. Results of the regression including 8th grade final teacher assigned grades in English without the inclusion of demographic variables are found in Table 35.

Table 35

Output for English Grade to SAT Writing

Predictors	*B*	S.E	*p*	*Exp(B)*	[95% CI]
C or Below			.000		
B (1)	.809	.261	.002	2.246	[1.346~3.747]
A (2)	2.418	.246	.000	11.255	[6.925~18.196]
Constant	-1.494	.236	.000	.224	
Test	χ^2	*df*	*p*		
Overall model evaluation					
Likelihood-ratio test	243.383	2	.000		
Goodness-of-fit test					
Hosmer & Lemeshow	.000	1	1.000		

Notes: Pseudo R^2 =.155 (Cox & Snell), .208 (Nagelkerke).

Students who earned a grade of A in 8th grade English were 11.255 times more likely to meet the college readiness benchmark on the writing SAT than students that earned a C or below. Students who earned a B in their 8th grade English class were 2.246 times more likely to meet the college readiness benchmark than students who earned a C or below. The model was run again controlling for gender, IEP status, and free and reduced lunch eligibility. The results are found in Table 36. When controlling for demographic variables, areas of significance were discovered in the ability for 8th grade final teacher assigned English grades to predict college readiness on the writing SAT. In the case of meeting the writing benchmark, gender was found to have no significance. Students who did not have an IEP were 2.739 times more likely to meet

the writing SAT benchmark than students who did have an IEP. Students who were not free and reduced lunch eligible were 1.964 times more likely to meet the SAT writing benchmark than students who were eligible. The inclusion of grades served to slightly decrease the odds a student who did not have an IEP or were free and reduced lunch eligible would meet the readiness benchmarks in writing.

Table 36

Output for English Grade to SAT Writing with Demographic Controls

Predictors	*B*	S.E	*p*	*Exp(B)*	IOR	[95% CI]
Gender (1)	-.221	.120	.066	.802		[.633~1.015]
IEP (1)	-1.007	.301	.001	.365	2.739	[.202~.659]
Free and Reduced Lunch (1)	-.676	.218	.002	.509	1.964	[.332~.779]
C or below			.000			
B (1)	.795	.264	.003	2.215		[1.321~3.714]
A (2)	2.377	.251	.000	10.778		[6.590~17.626]
Constant	-1.253	.242	.000	.286		
Test	χ^2	*df*	*p*			
Overall model evaluation						
Likelihood-ratio test	269.864	5	.000			
Goodness-of-fit test						
Hosmer & Lemeshow	.623	4	.960			

Notes: Pseudo R^2 =.170 (Cox & Snell), .229 (Nagelkerke).

Table 37 reports the results of a regression model that compared only students who demonstrated high performance in their English classes as indicated by their earning a grade of A or B. A grade of A was the indicator variable. The results found in Table 38 indicate that a student who earns a grade of A is 5.889 times more likely to meet the SAT college readiness benchmark in Writing than a student who earned a B. When compared only to students who earned a B and not a C or below, the odds of being college ready on the SAT decreased from 11.255 times to 5.889 times. This large decrease demonstrates that while there is a large gap between students who earn a B in English and those who earn a C, a student who earns an A in English has greatly

increased odds that they will meet the college readiness benchmark in writing when compared to their peers.

Table 37

Output for English Grade of A and B to SAT Writing Benchmark

Predictors	*B*	S.E	*p*	*Exp(B)*	[95% CI]
A in English	1.773	.135	.000	5.889	[4.518-7.676]
Constant	-.813	.115	.000	.444	
Test	χ^2	*df*	*p*		
Overall model evaluation					
Likelihood-ratio test	188.633	1	.000		
Goodness-of-fit test					
Hosmer & Lemeshow	.000	0	.000		

Notes: Pseudo R^2 =.133 (Cox & Snell), .180 (Nagelkerke).

A logistic regression, results found in Table 38 was run to determine the effect when a student first took the SAT had on the likelihood a student would meet the SAT writing benchmark.

Table 38

Output for English Grade Controlling Time of First SAT (Writing)

Predictors	*B*	S.E	*p*	*Exp(B)*	[95% CI]
C or below			.000		
B (1)	.805	.261	.002	2.236	[1.340~3.733]
A (2)	2.439	.248	.000	11.467	[7.055~18.640]
10th Grade and Earlier			.060		
First Semester 11th (1)	.874	.327	.008	2.396	[1.262~4.551]
Second Semester 11th (2)	.782	.316	.013	2.186	[1.176~4.061]
12th Grade (3)	.361	.852	.672	1.434	[.270~7.622]
Constant	-2.284	.393	.000	.102	
Test	χ^2	*df*	*p*		
Overall model evaluation					
Likelihood-ratio test	250.599	5	.000		
Goodness-of-fit test					
Hosmer & Lemeshow	1.922	3	.589		

Notes: Pseudo R^2 =.159 (Cox & Snell), .214 (Nagelkerke).

Table 38 illustrates that when using English grades as a predictor, controlling for when the SAT was taken, students who took the SAT during the first or second semester of their junior year were significantly more likely to meet the college readiness benchmark in writing. Students taking the SAT for the first time during the first semester of their junior year were 2.4 times more likely to meet the SAT benchmark and students taking the SAT during the second semester of their junior year were 2.2 times more likely to meet the benchmark.

The research question posed of "to what extent students' 8th grade English grades predict college readiness on the SAT writing section" was answered. The findings indicate students who earn a grade of A are far more likely to be college ready than those that do not. Students earning a grade of B are also more likely to be college ready than students who earn a C or less. Gender was not found to have a significant effect on meeting the college readiness benchmark in writing. Having an IEP as well as being free and reduced lunch eligible reduced the likelihood that a student would be college ready. Students who took the SAT during either semester of their junior year were more likely to be college ready in writing. Table 39 examines the effect all of the significant predictor variables had on predicting college readiness on the reading SAT when entered together in one model.

With all predictors present, being male increased the likelihood of meeting the SAT college readiness benchmarks in writing by 1.432 times. This result indicates that when interacting with these multiple variables, students who are female became less likely to meet the college readiness benchmark in writing. This finding comes despite the finding that when examined in isolation and with one of the academic factors, either PSSA scores or English grades but not both, there was no statistical significance found with regard to gender. This finding raises similar questions to the findings in math and reading regarding the equity in opportunity

females have in writing compared to their male peers and demonstrates either the writing PSSA or teacher grading practices in English are leading females to, ultimately, become less college ready in writing as measured by the SAT. Students who did not have an IEP were found to be 1.992 times more likely to meet the college readiness benchmark in writing than students who did have an IEP. Students who were not free and reduced lunch eligible were 2.012 times more likely to meet the college readiness benchmarks in math. In both of these case, the likelihood of students who did not have an IEP or were not eligible for free or reduced lunch decreased from a model that included no academic predictors. The predictive ability of grades decreased, especially in the case of students who earned an A, while the predictive ability of the PSSA remained stable. This indicates that when interacting with multiple variables the writing PSSA was a more stable predictor of college readiness on the writing SAT than the grades students earned in 8th grade English were.

Table 39

Output for SAT Writing Controlling for PSSA, Grades, and Demographics

Predictors	*B*	S.E	*p*	*Exp(B)*	IOR	[95% CI]
Gender (1)	-.359	.126	.004	.698	1.432	[.545~.894]
IEP (1)	-.689	.307	.025	.502	1.992	[.275~.917]
Free and Reduced Lunch (1)	-.700	.226	.002	.497	2.012	[.319~.773]
C or below			.000			
B (1)	.575	.272	.034	1.776		[1.043~3.025]
A (2)	1.824	.260	.000	6.199		[3.722~10.323]
PSSA Writing Score	.032	.003	.000	1.033		[1.026~1.040]
Constant	-5.892	.543	.000	.003		
Test	χ^2	*df*	*p*			
Overall model evaluation						
Likelihood-ratio test	385.167	6	.000			
Goodness-of-fit test						
Hosmer & Lemeshow	7.988	8	.435			

Notes: Pseudo R^2 =.234 (Cox & Snell), .314 (Nagelkerke).

Summary of Findings

The findings of this study indicate that middle school data sources can be predictive of college readiness as measured by the SAT. There are, however, pragmatic considerations to take into account when examining the results of this study. The findings must be understood within the context of the sample population. The sample in this population consisted of students from an upper middle class suburban school district who aspired to go to college. Students who did not take the SAT were not included in the study's population.

When analyzed without any academic predictors, gender was only statistically significant in the area of math, as males were found to be more likely to meet the SAT benchmark than females. When analyzing gender in a model that included all of the demographic variables along with the academic variables, females were found to be statistically less likely than males to meet the college readiness benchmarks in math, reading, and writing. The area of math, however, is of primary concern. Only in math were males found to be 2 times more likely to meet the SAT college readiness benchmark than females. This finding indicates there was something occurring either in the math program or within the sample of females in this study that led a decreased likelihood of success in math. More research needs to be done to determine whether these findings indicate a true gender issue, an anomaly linked to this particular group of females, or a problem existing with the implementation of the math program of studies in this district.

Students who had IEP's were found to be significantly less likely to meet the college readiness benchmarks than students without IEPs. However, the greatest disparity between students with IEPs and those without IEP's was found in the grades that students earned. When student grades were entered into a model including all demographic variables, I found that the odds of meeting the SAT college readiness benchmark for a student who earned an A and did not

have an IEP increased significantly. These increases were not found to be as high when PSSA scores were used as a predictor. This raises concerns about whether all teachers hold all students to the same academic standards and whether the level of rigor is appropriate for all students. In order to develop college ready students, the expectations teachers hold their students to must be consistent.

Students who were free or reduced lunch eligible were less likely than their non-eligible peers to be college ready in the areas of math and writing. The area of writing highlighted the finding that students who were free or reduced lunch eligible were less likely to be college ready as measured by the SAT than students who had IEPs. This indicates that there is a need to develop the writing skills of students of lower socioeconomic status, as their skill level is lower than their peers who receive special education services. This study's findings indicate that socioeconomic status does in fact impact the college readiness level of a student who aspires to go to college and that inequality exists among students based on socioeconomic status.

The PSSA was found to be a stable predictor of college readiness even as it interacted with multiple variables. This study analyzed each student's raw score divided by 10. As student scores increased by 10 on the PSSA, so did their likelihood of being college ready. In all content areas, a 10 point PSSA score resulted in an increase of odds which was slightly higher than 1. While these odds are not very high, they still indicate that an increase in PSSA score resulted in an increase in the odds of being college ready. Interventions that can help to raise PSSA scores by 20, 50, or 100 points for example, will serve to further increase the odds of students meeting the college readiness benchmarks on the SAT.

Student grades were found to be predictive of college readiness, but were not as stable as the PSSA. Students who earned an A were significantly more likely to meet the college

readiness benchmarks than those who earned less than A. A closer look into what made up an A is warranted based on these findings, because whether or not the individual grades students earned were influenced by academic or nonacademic factors, their predictive ability was evident. As previously reported, further investigation is warranted into the grading practices in special education to ensure that student ability is being accurately reported and all students are exposed to levels of rigor that promote college readiness. While not as stable as the PSSA when interacting with different variables, the findings indicate that grades are a valuable tool for predicting college readiness as measured by the SAT.

The math level students took in eighth grade was highly predictive of college readiness on the SAT. Students who took a math course at the level of Algebra I or higher were found to be significantly more likely to be college ready on the SAT. The odds of being college ready were greater still for students who took a course higher than Algebra I such as Algebra II or Geometry.

CHAPTER V

Discussion and Recommendations

Introduction

The current study was influenced by findings that the level of academic achievement that students have attained by 8th grade has a larger impact on their readiness for college than anything that happens academically in high school (ACT, 2008). This focus on middle school and college readiness was a departure from much of the existing research on predicting college readiness that frequently examined the factors that can influence and predict the college readiness of high school students (Adelman 1999, 2006; Conley, 2007; Geiser & Santelices 2007; Wyatt et al., 2012). These researchers identified factors that influenced and indicated the college readiness levels of high school students, but did not examine the role middle school had on preparing students for the demands expected of college ready high school students. The purpose of the current study was to contribute to the field of college readiness research by examining the role middle school education, through the analysis of available student achievement data, can have in shaping college ready students.

The two key areas of data that all middle school students have to measure achievement are standardized test scores and final teacher assigned grades. Researchers have found that standardized tests at the high school level correlate to the SAT (Sinclair & Thacker, 2005) and can predict future college readiness (Ehlert & Podgursky, 2005; Lefly et al., 2011; Martin, 2010). The purpose of this study was to determine to what, if any, extent middle school standardized tests predict college readiness as measure by the SAT. Middle school student grades were also examined for their predictive ability. Researchers (Bowers, 2009; Geiser & Santelices, 2007; Willingham et al., 2002) have identified grades as being key sources of data that can inform not

only the academic ability of students, but also their ability to master the nonacademic processes of school. This study sought to determine what, if any, ability middle school grades have on predicting college readiness as measured by the SAT. Building on the findings of other researchers, the purpose of this study was to inform researchers and practitioners about the value that middle school data sources can have in providing information relative to students' college readiness. In order to prepare students for the demands of the twenty-first century, educators at all levels must share the responsibility of providing the necessary strategies and interventions to support growth in the area of college readiness.

Discussion

The current study found that both 8th grade Pennsylvania System of School Assessment (PSSA) scores and 8th final teacher assigned grades were significant predictors of college readiness as measured by the SAT. When student performance levels, measured by PSSA scores and grades, increased in the areas of math, reading, and writing, the likelihood of students' ability to meet college readiness benchmarks also increased in each area. PSSA scores were found to be a more stable predictor than grades and were subject to less variance when other variables were introduced into the logistic regression models. As different demographic variables such as gender, IEP status, and free and reduced lunch status were introduced into the logistic regression models, varying findings of statistical significance were discovered. Additional factors like the level of math a student took in 8th grade and when a student took the SAT were also found to have significance on whether or not students met the college readiness benchmarks.

PSSA Scores

The current study found that as student scores on the PSSA increased (as measured by ten point increments), the likelihood that they would meet the college readiness benchmarks in all areas also increased. This is in line with the findings of other studies (Ehlert & Podgursky, 2005; Lefly et al., 2011; Martin, 2010) that found that high stakes accountability tests mandated by states as part of No Child Left Behind do predict college readiness. This study advances the findings of Thacker and Dickinson (2004) who found that the 11th grade PSSA was correlated to success on the SAT by finding that success on the middle school PSSA is predictive of meeting SAT college readiness benchmarks. The PSSA proved to be a more reliable predictor of college readiness as measured on the SAT than final teacher assigned student grades, as the introduction of control variables into models including the PSSA did not significantly alter the odds of a student meeting the SAT college readiness benchmarks.

Initially, the current study intended to examine student performance on the SAT based on their PSSA performance levels which include Advanced, Proficient, Basic and Below Basic. The logistic regression models using the categorical PSSA levels yielded poor results due in large part to the high levels of student achievement in the study's population. While other studies (Ehlert & Podgursky, 2005; Lefly et al., 2011; Martin, 2010) used the performance level of standardized test scores as predictor variables, the population of this study had an overwhelming amount of students, 84.4% in math and 84.3% in reading that scored in the advanced range. Writing was the only area in which the majority of students scored proficient at 68.6%. Using the continuous variables of PSSA scaled scores helped to provide relevant data for all students, instead of placing a very large portion of students into one category. For researchers and school systems that seek to replicate this study it is recommended that they examine their

population's performance on standardized assessments to determine whether to examine the performance level or continuous scaled score when determining the appropriate predictor variable for study.

Student Grades

The findings of this study demonstrated that grades can be used as important sources of data. While a majority of the students earned a final grade of an A or a B, with 54.6% earning an A in math and 66.9% earning an A in English and 32.6 % earning a B in math and 24.8% earning a B in English, the students who earned a C or below were consistently and significantly less likely to be college ready. This should be an area of concern for educators and stresses the importance of Bowers (2009) findings. Students in middle school who are not earning at least a grade of a B will require interventions that seek to target the reason for their low grades if they are to be put on a college ready track. As Bowers identified, poor performance reflected in student grades can either be related to a lack of understanding of content or an inability to master the nonacademic aspects of school. Educators should treat student grades as a valuable data source to gain information regarding student achievement.

This study also provided insight into how meaningful a grade of A is. In the area of English, students who earned an A were 4.795 times more likely to meet the SAT college readiness benchmark in reading than a student who earned a B. Additionally, a student who earned an A in English was 5.889 times more likely to meet the SAT writing benchmark in writing than a student who earned a B. These findings indicate that a student who earns a grade of an A in 8th grade English is significantly more likely to be college ready in the area of reading and writing as measured by the SAT.

In math, the grade of A was not significant when compared to only a grade of a B. This demonstrates a key difference between English and math performance. When compared to students who earn a B in eighth grade math class, earning an A in math does not predict college readiness in math as measured on the SAT. This indicates that in the area of math, all A's are not equal, as earning an A in a lower level math class is not the same as earning an A, or B, in a higher, more rigorous, math class. Higher level math classes were homogenously grouped whereas English and reading classes were heterogeneously grouped. This meant the rigor, pace, and expectations of advanced math classes were of a higher level and a student who earned a B in a high level math class would likely have earned an A in a math class that was less rigorous, slower paced, and less demanding.

Despite criticisms from researchers (Allen, 2005; Cizek, 2000; Shepard, 2006; Terwilliger, 1989) for being subjective, student grades were found to be predictive of college readiness as measured by the SAT. Grades were, however, less stable of a predictor than PSSA scores. The introduction of different control variables changed the odds associated with a student earning a particular grade and going on to meet the SAT college readiness benchmarks. This finding supports the idea that grades differ from teacher to teacher and may measure different skills in different ways. The PSSA is a carefully designed assessment developed and refined by assessment experts to ensure that it is a reliable method of assessment, and was found to be a more stable predictor than teacher assigned grades. This study used grades as categorical predictors due to the nature of how grades were reported in the district. Researchers that have access to continuous grade percentages can provide valuable insight into the difference between students who score in the low range of a particular grade versus the high range.

Demographic Variables

One of the findings of this study was that when controlling for gender, females were slightly less likely to meet the college readiness benchmarks in math and reading than males. This is in line with the findings of Stricker et al., (1991), who found that males perform better on the SAT than females. It should be noted, however, that in the Stricker et al. study, females ultimately caught up to their male counterparts in college. Females were found to succeed in college due their ability to navigate the nonacademic processes such as class attendance and participation that can influence performance in college better than males. While there was statistical significance found in this study with regard to gender, these findings should be examined pragmatically. The difference in odds between females and males meeting the benchmarks did not increase greatly and only in one model, math with all predictor and demographic variables included into one model, did the odds for a male being more college ready than a female double. It also must be noted that this study looked only at each student's first attempt at the SAT. It is possible that more females from this population were ultimately more likely to meet the SAT benchmarks based on subsequent attempts at the SAT.

Of particular note were the findings that students in subgroups, students with IEP's and who were free or reduced lunch eligible, were significantly less likely to be college ready when examined in isolation with their peers and when academic predictors where entered to examine college readiness in math and writing. In the case of reading, the PSSA removed statistical significance for students who had IEPs and were eligible for free and reduced lunch, while student grades removed significance for students with IEPs. Overall, however, these findings support what Wimberley and Noeth (2005) reported about students belonging to subgroups being less equipped to be college ready than their grade level peers. Balfanz (2009) identified middle

school as the critical time to get students that may typically fall behind their peers, like students of lower socioeconomic status, on a college ready track. This study provides further evidence that students who typically are impacted by the achievement gap are less likely to be college ready and middle school data can be used to demonstrate this fact.

Future research can advance the work of the current study by addressing one of the key limitations of this study; the population was fairly homogenous in terms of racial and ethnic makeup as well as unusually high achieving. Furthermore, the number of students taking the SAT who had an IEP or were free and reduced lunch eligible who were included in this study made up a very low percentage of the total district population of students belonging to either category. Schools should make every effort to support these students and promote college readiness for all students and part of that promotion should be to have all students take the SAT. IEP goals that promote the development of college readiness should be considered for all students. Implementing strategies to develop college readiness in students of lower socioeconomic status should also be an area of focus of schools in order to provide equitable opportunities for every student.

This study used SAT data identifying the first time students took the SAT. A large portion of the population, 92.3% of students, first took the SAT during their junior year. In an effort to make the results more meaningful, junior year was split into two predictor categories based on semester. It is hard to gauge just how meaningful the data relating to when students took the SAT really was, because in many cases students are directed as to when to take the SAT by their guidance counselor and school system. A larger, purposefully selected sample of students who take the SAT at different times in their high school career would allow for more comparison and better results. Despite this, students in this study's sample were more likely to

meet the readiness benchmarks at a significant level when they took the test during their junior year than at any other time in their career.

A valuable finding of this study was the importance of a student's 8th grade math level on predicting college readiness. Students who were enrolled in a math course at a level of Algebra I or higher were more likely to meet the SAT math benchmark than students who took a math course of a lower level. This supports the findings of Von Secker (2005) who identified exposing students to Algebra in 8th grade as a key step in developing college ready students. Further evidence of this fact was found when running the regression including only students taking higher level math classes. Students taking Algebra II were 18.575 times more likely to meet the college readiness benchmark in math than students who took Algebra I and students who took Geometry were 19.202 times more likely to meet the college readiness benchmark in math than students who took Algebra I. Clearly, students who enrolled in rigorous math course work in 8th grade were on a path of college readiness. Getting students on a rigorous track early echoes the findings of Adelman (1999, 2006) who found that exposing all students to a challenging curriculum supports the development of college readiness.

Limitations

The current study has limitations that impact its generalizability. The school district that the sample was derived from consisted of students who came from upper middle class backgrounds. These findings may not apply to schools in urban or rural areas that may have more diverse populations with regard to demographics or socioeconomics. Additionally, all the students who were included in this study had aspirations of going to college. The first piece of data that was collected were students' first attempt SAT scores in math. This method of data collection was appropriate because this study was measuring student college readiness as

measured by the SAT benchmarks. For students in the district without SAT scores on file, there was no analysis of their college readiness.

Once students were identified as having SAT data on file, their 8th grade PSSA scores and 8th grade final teacher assigned grades were collected. Students who transferred into the district from other states after 8th grade would not have had PSSA scores on file, nor would students who attended private schools who did not administer the PSSA. Additionally, students who entered the school district after 8th grade and did not have 8th grade PSSA scores and/or 8th grade final teacher assigned grades sent to the school district would have been excluded from this study. As a result, this study's population primarily consisted of students who aspired to go to college and who attended district schools in 8th grade.

The predictor variables used in this study also faced limitations. The demographic variables used in this study were gender, IEP status, and free or reduced lunch status. Not all students from these groups were examined, only students who had SAT scores on file. The generalizability of findings pertaining to students belonging to the demographic groups in this study are limited to students who aspired to go to college. The use of PSSA scores provided information regarding the predictive ability of students' 8th grade performance on a standardized assessment to their ability to meet the SAT college readiness benchmarks. School leaders in different states that administer different state standardized tests will need to examine how closely aligned the PSSA is to their own state's test when considering the findings of this study. The use of grades as a predictor variable also has limitations. Teacher grades have been found to vary from teacher to teacher and methods of grading and grading scales will differ from district to district. It is important for school leaders to put the findings in this study related to student grades within the context of their own system's grading practices and policies.

Conclusion

The current study found that both 8th grade PSSA scores and final teacher assigned grades were significant predictors of meeting the college readiness benchmarks on the SAT. These findings demonstrate the importance of using both data sources when examining student performance. Educational leaders should be encouraged that two readily available middle school data sources can provide valuable information regarding the likelihood that their students will be college ready. It should also be encouraging to know that as teachers work to improve student test scores and grades at the middle school level, they are also serving the larger purpose of creating college ready students.

Recommendations for Practice

The current study's findings have several implications for the field of instructional leadership. The following recommendations are offered to school and district administrators as well as educational policy makers as steps that can be taken at the middle school level to improve the college readiness levels of students.

1. School leaders should examine both standardized test scores and student grades when making decisions that impact student achievement. Both data sources are significant predictors of college readiness as measured by the SAT and both provide valuable information regarding student performance. Standardized test data provides insight into students' ability to master standards, while grades reflect both the academic and nonacademic skills mastered by students. The research of Conley (2007) into college readiness places equal value on academic and nonacademic traits required in college ready students.

2. School leaders should promote rigorous course offerings in all content areas at the middle level, but especially math. Designing K-12 systems with the goal of having all students taking Algebra I in 8th grade will help to promote the development of college ready students at all levels of the system.
3. Schools must make sure that students in special education with IEPs and students of low socioeconomic status are given every opportunity to develop their level of college readiness. Implementing specific interventions to help these students improve their reading, writing, and math ability should become a high priority for all school leaders. Additionally, emphasis must be placed on providing these students with access to a rigorous curriculum as well as knowledge of the college process. As indicated by the results of this study, many students in these subgroups are not even attempting to take the SAT.
4. Middle school leaders should communicate with high schools to provide information about students that are at risk of not being college ready. Data driven interventions that take place at the middle level need to continue into a student's high school career.

Recommendations for Further Research

This study was designed to determine the extent to which readily available middle school student data sources can predict college readiness. To accomplish this task, 8th grade state standardized test scores and final teacher assigned grades were collected. To measure college readiness, the SAT college readiness benchmarks established by the College Board were used. SAT scores were turned into dichotomous dependent variables and, as a result, a logistic regression model was used. The current study found that both PSSA scores and teacher grades were significant predictors of college readiness. The greater goal of this study was to contribute

to the field of educational research by emphasizing the important role all levels, especially the middle level, of K-12 systems share in developing college ready students that can find success in an ever changing twenty-first century world. The current study yielded encouraging, significant results, but additional research would be of great benefit to the field.

1. The current study gathered and analyzed data collected from a K-12 school district. Additional research can go further and collect college performance data. This longitudinal approach to the research can shed more light on which students were in fact college ready and which merely met the benchmarks.
2. The current study's population was from an affluent, high performing suburban district. This research could be replicated in more diverse school districts with regard to student performance level and racial and ethnic makeup.
3. The current study can be advanced by looking at the approximately 23% of students not included in the study to examine what data they were missing and how these students performed on the measures of student achievement on file with the district.
4. The current study used grades as categorical predictors. Future research should explore using grades as continuous predictors. Additionally, if the data is available to identify what made up a student's final grade, future research can replicate this study and go deeper into student grades by separating the portion of the grade that was influenced by academic factors and nonacademic factors. This separation will allow for a determination of how closely aligned the academic factors and nonacademic factors are and if they play a similar or different role in predicting college readiness.
5. The current study found that students with IEPs are far less likely to be college ready than those students who do not have an IEP. Additionally, a large portion of student

in the district who had an IEP did not attempt to take the SAT. Future research should focus on best practices for developing college ready special education students.

6. This study used the 8th grade PSSA as a predictor variable. This study should be replicated in other states to determine the ability of other standardized tests given in middle school to predict college readiness.
7. The population in this current district had a limited number of students taking the ACT. As more students begin to take the ACT in Pennsylvania, determining the extent to which the PSSA and grades predict college readiness on the ACT is warranted.
8. The current study examined the extent to which 8th grade student data sources, in the form of PSSA scores and final teacher assigned grades, predicted college readiness as measured on the SAT. It is recommended that this study be replicated using student data from earlier grades in an effort to discover whether elementary school data can provide insight into future college readiness.

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PARKLAND SCHOOL DISTRICT

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December 16, 2014

Dear Lehigh University Institutional Review Board:

Matthew Sterenczak has requested to conduct educational research for his doctoral dissertation in the Parkland School District. As superintendent, I have been informed of the design of his study and the data needed to complete his study. I am aware that Matthew is requesting data pertaining to demographics, student grades, standardized test scores, and SAT scores. I have spoken to Dr. George White and Dr. Louise Donohue of Matthew's Doctoral Committee regarding the nature of this research and the need to protect the confidentiality of the school district and its students. As a result of our communications, I am granting permission for research to be conducted in the Parkland School District by Lehigh University student Matthew Sterenczak for the purposes of completing his dissertation given the following agreed upon conditions:

The school district will not be identified by name in the study. All data will be accessed and collected by an internal employee that has been approved by the superintendent. The researcher will never see or possess any information that will reveal student names and will not be able to connect any of the data to individual students.

I support this effort and will provide the necessary assistance to ensure the successful completion of this study. If you have any questions I can be reached at (610) 351-5500.

Sincerely,

Richard T. Sniscak
Superintendent

APPENDIX B

Excel spreadsheet used in data collection

Student	**Gender**	**F+ R Lunch Eligible**	**IEP**	8th Grade Final Math Grade	Math Level	8th Grade Final English Grade	8th Grade Math PSSA Level	8th Grade Reading PSSA Level	8th Grade Writing PSSA Level	When SAT took	Total SAT Score	SAT Math Score	SAT Reading Score	SAT Writing Score

APPENDIX C

Excel spreadsheet used in data analysis

Student	**Gender**	**F+R Lunch Eligible**	**IEP**	8th Grade Final Math Grade	Math Level	8th Grade Final English Grade	8th Grade Math PSSA Level	8th Grade Reading PSSA Level	8th Grade Writing PSSA Level	Met SAT Readiness Benchmark in Math	Met SAT Readiness Benchmark in Reading	Met SAT Readiness Benchmark in Writing	When SAT taken

VITA

Dr. Matthew Sterenczak

Education

Doctorate in Educational Leadership, **Lehigh University**	2015
Master's in Educational Leadership, **Lehigh University**	2008
B.S. Secondary Education / Comprehensive Social Studies, **Bloomsburg University**	2004

Certifications

Principal K-12, Pennsylvania Administrative I	2010
Supervisor of Curriculum and Instruction, Pennsylvania Supervisory	2010
Social Studies 7-12, Pennsylvania Instructional II	2008

Honors and Awards

Collegeville Rotary Club Perkiomen Valley School District Teacher of the Year	2013

Professional Experience

Assistant Principal Tredyffrin/Easttown Middle School	2014-
Tredyffrin/Easttown School District Curriculum Supervisor	2014-
7th Grade Social Studies Teacher Perkiomen Valley Middle School East	2005-2014
7th Grade Social Studies Teacher Pennridge Central Middle School	2005