Students' Curricular Paths and GPAs: The Relationship with ACT Scores

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Abstract

The purpose of this study was to determine the differences in ACT scores on the subtests of math, English, reading, and science between students enrolled in different curricular paths, and whether the differences were affected by the student demographic variables gender, race, and socioeconomic status (SES). Another purpose of this study was to determine whether there was a relationship between students' ACT composite scores and GPAs and whether the relationship was affected by the student demographic variables of gender, race, and SES. A quantitative correlation design using archival data with five independent variables was employed in this study. The independent variables included curricular path, gender, race SES, and GPA average. The dependent variables for this study were the math, English, reading, and science ACT subtest scores and the composite ACT score. The population for this study was high school students attending the Sunflower Public School District. The sample was limited to high school students who took the ACT during the 2013-2014 or 2014-2015 school year.

The results of the data analysis indicated that students who enrolled in at least one math, English, or science AP course performed better on the ACT math, English, reading, or science subtests respectively than students who enrolled in regular courses. The demographics did not affect differences for math, English, and reading, but race had an effect on the difference for science. Minority students who enrolled in at least one AP science course performed better on the ACT science subtest than did minority students who enrolled in the regular science courses. The third finding of the data analysis indicated that students with higher GPAs tended to have higher ACT composite scores and students with lower GPAs tended to have lower ACT composite scores. The

relationship between GPAs and ACT composite scores was stronger for female students than for male students and for minority students than it was for non-minority students. Lastly, the relationship between GPAs and ACT composites scores for full pay lunch students was not different from the relationship between cumulative GPA and ACT composites scores for reduced lunch students. The results of the data analysis could be interpreted to indicate that students who enroll in AP courses in the three content areas may perform better on the ACT subtests than students who enrolled in regular courses.

Dedication

This dissertation is dedicated to my mom and two sons, Wilene Jones, Keith Jones Jr., and Leonjay Mack. My mother inspired me to be great and put forth my best effort in all that I do. Thank you, mom, for all the support throughout the three years of completing this process. You watched my sons while I attended class and study sessions. You listened to me when I just needed to vent about something I did not understand or when I did not feel like writing. You emailed me to make sure I was still on pace and even read sections of my dissertation to encourage me about how much I had written. This dissertation represents more than getting a piece of paper. It sets the standard because it has never been done in my family and now my two young sons understand that nothing is impossible if you put your heart, mind, and effort into something. This dissertation was completed to prove something to myself. I can interact with the best and brightest educators in the field of education. This dissertation represents that I can complete a process that challenges one's perseverance, time management skills, analytical skills, writing ability, and research skills. I hope that my two sons understand that to achieve greatness there must be a sacrifice, and the sacrifice is only temporary. I dedicate this dissertation to all those who said I could not finish it. I admit in the back of my head failure was never an option because I know that I am a role model for those younger than me who aspire to great things. I love you family and thank you for all your support.

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Chapter One

Introduction

Education is the cornerstone of success in America. America has prided itself on providing an equal education for everyone. In today's educational system, high schools across the country are charged with preparing students to be college and career ready (College and Career Readiness, 2016, para. 1). Some students take advantage of the advanced academic courses provided by their school district while other students are content with enrolling in regular courses. Educators are engaged in a constant conversation regarding what prepares students for life after high school. The Obama Administration has focused on improving education nationwide, and stated, "Every student should graduate from high school ready for college and a career, regardless of their income, race, ethnic or language background, or disability status" (U.S. Department of Education, 2010, p. 3). As a result, programming for college and career readiness increased dramatically as states responded to the administration's readiness agenda, by designing their policies for college and career readiness (Castro, 2013). In the state of Kansas, school districts have the flexibility to determine the assessment tool to evaluate student achievement. School districts have used achievement scores to measure if the College and Career Readiness Standards are effective. Currently, there are 293 school districts in the state of Kansas. According to the American College Test, Technical Manual Report (2014a), most urban school districts in the state have implemented the ACT as the primary assessment of academic achievement. The Common Core Standards Initiative has helped school districts across the nation a curriculum that prepares students for college, career, and life (Common Core Standards Initiative, 2016, para. 3).

In the state of Kansas, there is a large achievement gap between White students and students of color when it comes to obtaining an ACT composite score of 21 or better, which determines college readiness. According to ACT (2015), 78% of the students taking the exam are White, and there is a 2-3% difference in ACT composite scores, with White students leading the way in scoring above the state average of 21.8 (Sunflower, 2015). Most educators would argue that a student's socioeconomic status, access to high-level coursework, and grade point average (GPA) might indicate if a student is college and career ready. The perception is that White students enroll in more academic challenging courses than do minority students.

Background

The Sunflower Public School District is located in the heart of Kansas and serves approximately 12,000 students. The Sunflower Public School District has experienced a shift in demographics from 2005 to 2013, gaining a diverse population. In 2005, 73.7% of the student population was white, 11.6% Hispanic, 8.4% Black, and 6.4% other (Sunflower, 2015). In 2013, 68% of the student population was white, 9.5% Hispanic, 7% Black, and 16.5 other (Sunflower, 2014). In Table 1, the data reflects the district's increase in the number of students who enrolled and were approved for free or reduced lunch.

Table 1

District Students Approved For Free and Reduced-Price Lunch

School Year	Free and Reduced Lunch	Enrollment	Percentage
2011-2012	4,079	11,613	35.1
2012-2013	4,412	11,835	37.3
2013-2014	4,539	11,941	38.0
2014-2015	4,606	11,840	38.9
2015-2016	4,758	12,106	39.3

Note. Adapted from "KSDE Report Card" by KSDE retrieved on February 16, 2016, from http://uapps.ksde.org/k12/CountyStatics.aspx?org_no=D0[redacted]

Sunflower Public School District's students performed above the state and national average on the ACT with a district average of 23.7 in 2013-14 and 2014-15. The state average was 21.8 in 2013-14 and 21.9 in 2014-2015, which indicates that the Sunflower Public School District was performing well on the assessment (Sunflower, 2014). Overall, the district is growing and improving academically; however there continued to be a gap between White and minority students performances on the ACT.

Table 2

Sunflower Public School District ACT Scores 2010-2015

School Year	Building 1	Building 2	District	State
2010	23.7	23.3	23.5	21.9
2011	24.3	23.8	24.1	21.9
2012	23.6	22.6	23.1	21.8
2013	24.3	23.0	23.7	21.8
2014	24.0	23.4	23.7	22.0
2015	23.9	23.3	23.6	21.9

Note: Adapted from "KSDE Report Card" by KSDE retrieved on February 16, 2016 from http://uapps.ksde.org/k12/CountyStatics.aspx?org_no=D0[redacted]

The Sunflower Public School District is attempting to make the ACT one measurement of student achievement. The Sunflower Public School District is having a difficult time getting students of color to take the ACT. In 2013-14, 7% of the 60% of students who took the ACT in the district were students of color (Sunflower, 2014). In 2013-2014, the Sunflower Public School District reported that 21% of junior and senior students enrolled in an Advanced Placement (AP) class; however, most students were White. In 2014-15, 897 seniors were enrolled in the district, and only 60% of them took the ACT. Over 85% of the 60% that took the ACT were White students (Sunflower, 2014).

The Director of Teaching and Learning (personal communication, July 2014) stated there was no current intentional strategy to help increase students of color enrollment in AP classes at either high school. There were no set criteria established for

students to enroll in an AP courses; therefore, students who were not aware of the program or not recruited to enroll in the courses missed the opportunity.

The ACT organization developed the ACT Core Framework to help school districts model successful schools that were doing well preparing their students for the ACT. The framework is based on the yearly reports from 550 public schools in over 20 states (ACT, 2016d). The framework consisted of developing five areas: curriculum and academic goals, staff selection and building leadership capacity, instructional programs and strategies, monitoring programs, and developing interventions and making adjustments (ACT, 2016d). The framework has helped school districts develop healthy classrooms, schools, and core district practices. According to the ACT, it originally focused on college readiness, and the organization understands that learning is a lifelong journey. The ACT reports, "ACT now offers more than 20 programs and services, providing support for all of the life's transitions along the Kindergarten through Career continuum" (ACT, 2015, para. 3).

The Sunflower Public School District addressed educational equity in its mission, vision, and goals. Equity is one of the three key words that define what the Sunflower Public School District is all about and provides direction for educators in the school district. The goal of the district is to make sure students leave the school district prepared for college and career opportunities. One way the district is trying to ensure that students are prepared for college and career opportunities is to make AP courses available to students.

Statement of the Problem

Until 2015, the Sunflower Public School District measured student achievement by administering the Kansas State Reading and Mathematics Assessments. Beginning with the 2014-2015 school year, the school district considered the use of the ACT as one of the measurements of student achievement for high school students. Even though the district averages had been above the state average, there was a large disparity in ACT scores between minority and non-minority students (Sunflower, 2015). The district wanted to know whether the curricular path (AP or regular) made a difference in how well students scored on the ACT. The Sunflower Public School District wanted to understand the impact of student enrollment in AP courses on their ACT scores.

The Sunflower Public School District did not have a system in place to encourage students of color to enroll in AP courses. No criteria had been set to determine what specific skills or requirements were needed to enroll in AP courses (Director of Assessment and Data, personal communication, February 26, 2016). No strategy existed to ensure all junior or senior students would take the ACT in preparation for college or career opportunities. The perception was that if the student had a passing grade point average (GPA) of 2.0 or higher, the student's ACT score would meet the state average score. The Sunflower Public School District also needed to know whether there was a relationship between a student's GPA and ACT score. The problem was that before the district could determine if the ACT exam is the appropriate measure to determine academic success, the district needed to know whether there was any relationship between curricular path and ACT subscores or GPAs and ACT composite score.

Purpose of the Study

The purpose of this study was to determine the differences in ACT scores on the subtests of math, English, reading, and science between students enrolled in different curricular paths (AP or regular). The second purpose of this study was to determine whether the differences in ACT scores on the subtests of math, English, reading, and science between students enrolled in different curricular paths (AP or regular) were affected by the student demographic variables of gender, race, and SES. The third purpose of this study was to determine if there was a relationship between students' ACT composite scores and their GPAs. The final purpose of this study was to determine whether the relationship between students' ACT composite scores and their GPAs was affected by the student demographic variables of gender, race, and SES.

Significance of the Study

The significance of this study was to determine if a student's curricular path influences their ACT score. Currently, there are no criteria to enroll in an AP course in the Sunflower Public School District. Also, learning whether the student demographics of race, gender, and SES influences a student's ACT score might help the district create programs or interventions to address the areas of deficiency. The results of the study could help teachers and counselors communicate with parents about their students' needs to increase their ACT scores. The study could highlight the positive effects of enrolling in specific AP courses that could help to increase students' ACT scores. This study is valuable because it could help the Sunflower Public School District put strategies in place to close the gap between White students and students of color.

Delimitations

"Delimitations are self-imposed boundaries set by the researcher on the purpose and scope of the study" (Lunenburg & Irby, 2008, p. 134). The delimitations of this study are as follows:

1. The study was limited to high school students enrolled in the Sunflower Public School District who took the ACT during the 2013-14 and 2014-2015 school years.
2. The only demographic data used in this study were student gender, race, and SES.
3. The ACT assessment and student GPA were the only measurements used in this study.
4. The AP courses utilized in this study included AP English Composition and Language, AP English Literature and Composition, AP Biology, AP Chemistry, AP Environmental Science, AP Physics, AP Calculus AB, AP Calculus BC, and AP Statistics.

Assumptions

"Assumptions are postulates, premises, and propositions that are accepted as operational for purposes of the research. Assumptions include the nature, analysis, and interpretation of the data" (Lunenburg & Irby, 2008, p. 135). The following were assumed for this study:

1. All students were enrolled in the Sunflower Public School System.
2. The data collected on GPAs, ACT scores, and curricular path were accurate per the district's official records.

3. Students who took the ACT did their best on the assessment.

Research Questions

This study focused on four research questions to guide the dissertation. "Research questions are vital components to the dissertation and serve as the "directional beam" for the study (Lunenburg & Irby, 2008, p. 126). To achieve the purpose of this study, the following research questions were posed:

RQ1. To what extent are there differences in ACT scores on the subtests of math, English, reading, and science between students enrolled in different curricular paths (AP or regular)?

RQ2. To what extent are the differences in ACT scores on the subtests of math, English, reading, and science between students enrolled in different curricular paths (AP or regular) affected by the student demographic variables of gender, race, and SES?

RQ3. To what extent is there a relationship between students' ACT composite scores and their GPAs?

RQ4. To what extent is the relationship between students' ACT composite scores and their GPAs affected by the student demographic variables of gender, race, and SES?

Definition of Terms

According to Lunenburg and Irby (2008), "Key terms need to be clarified if they are paramount to the study and referenced or used continuously throughout the dissertation" (p. 8). The following terms are defined for this study:

Advanced Placement (AP) path. For the purposes of this study, students were considered in the AP path if they were enrolled in one or more of the following courses offered in Sunflower Public School District: AP English Composition and Language , AP

English Literature and Composition, AP Biology, AP Chemistry, AP Environmental Science, and AP Physics, AP Calculus AB, AP Calculus BC, and AP Statistics (Sunflower High School Course & Description Planning Guide, 2015)

American College Test (ACT). The ACT is a standardized college admissions test developed by ACT, Inc. measuring English, mathematics, reading, and science (ACT, 2016b).

Grade point average (GPA). The GPA is a numeric average of all grades achieved in classes at a given school (Sunflower, 2015). A student GPA is calculated as the total number of grade points received over a given period divided by the total number of credits awarded (Sunflower High School Course & Description Planning Guide, 2015).

Regular path. For the purposes of this study, any course that is not designated as Advanced Placement is considered a regular path course.

Overview of the Methodology

A quantitative correlational design using archival data with five independent variables was employed in this study. The independent variables included student's GPA, curricular path, gender, race, and socioeconomic status. The dependent variables for this study were the math, English, reading, and science ACT subtest scores and the composite ACT score. High school students enrolled in the Sunflower Public School District were the population of interest. Hypothesis tests were conducted to address each of the four research questions. Two-sample *t* tests, two-factor analyses of variance (ANOVAs), Fisher *z* tests, and correlations were calculated.

Organization of the Study

This study contains five chapters. Chapter one included the background of the study, statement of the problem, purpose statement, the significance of the study, delimitations, assumptions, research questions, the definition of terms, and the overview of the methodology of the study. Chapter two contains an in-depth literature review, which includes the history of the Advanced Placement (AP) Program, minorities missing in AP courses, Impact of AP Curriculum, AP Coursework and ACT scores, GPA and ACT scores, and a chapter summary. Included in chapter three is a description of the methodology used in this study, which includes the research design, population and sample, sampling procedures, instrumentation, data collection procedures, data analysis procedures, hypothesis testing, and limitations. A presentation of the study's findings including descriptive statistics and results of the hypothesis testing for the four research questions are found in chapter four. Chapter five includes a summary of the entire study including an overview of the problem, purpose statement and research questions, review of the methodology, findings related to the literature, and major findings, implications for action, recommendation for future research, and concluding remarks.

Chapter Two

Review of the Literature

The purpose of this study was to explore whether there is a difference in ACT subtest scores between students enrolled in different curricular paths (AP or regular) and whether the differences in ACT subtest scores were affected by the student demographic variables of gender, race, and SES. An additional purpose of this study was to determine the relationship between students' ACT composite scores and their GPAs and whether this relationship was affected by the student demographic variables gender, race, and SES. Chapter two contains an in-depth literary review, which includes the history of the Advanced Placement (AP) Program, minorities missing in AP courses, impact of AP curriculum, AP coursework and ACT scores, GPA and ACT scores, and a chapter summary.

History of the Advanced Placement (AP) Program

Over the last decade, school districts have intentionally improved curriculum to enable students to be college and career ready. Part of the plight to make sure students were ready for college and performed well on admission exams was to increase the rigor in the high school curriculum. School districts accomplished this by offering college-level courses through many programs but specifically utilizing or implementing the AP program. In 2010, there were 39 AP courses in various subject areas, and nearly 60% of high schools in the U.S. had an AP program (Mo et al., 2011). The perception 10 years ago was that lack of access to AP courses was the main problem. School districts across the nation have made incredible strides implementing the AP program. Mo et al. (2011) believe that the AP program is the right vehicle to promote excellence in the classroom.

Research shows that students who enroll in honors or AP classes have a better understanding of the content and are more prepared for post-secondary education (Mattern, Marini, & Shaw, 2013). The AP program allows students to go deeper into the material and have hands-on experience with the content to help prepare students for post-secondary education (Mattern et al., 2013).

The AP program is a service provided by College Board. According to the College Board (2015), the AP program is "a mission-driven not-for-profit organization that connects students to college success and opportunity" (para. 1). Founded in 1900, the College Board has provided services such as the AP program to help students prepare for college. The College Board experts and college-level educators in the field of study design the AP courses.

Following World War II, pilot programs were developed to help close the gap between secondary and higher education. Bland and Neve (2012) indicated the Ford Foundation helped fund two studies that "recommended that secondary schools and colleges work together to avoid repetition in coursework at the high school and college advance quickly as possible" (p. 21). The decline in enrollment at Ivy League schools caused private schools in the early 1950s to offer Advance Placement courses (Bland & Neve, 2012). The idea of providing ambitious students a head start was the goal of the College Board organization (Bland & Neve, 2012).

Originally, 11 initial advanced courses were offered as a pilot program in 1952. By the 1955-1956 school year, the program was underway, and the College Board took the initiative and "named the program College Board Advanced Placement Program" (Bland & Neve, 2012, p. 21). Over the past 65 years, AP has expanded by adding new

initiatives and curriculum. Currently, there are over 3 million students nationwide enrolled in AP courses (Theokas & Saaris, 2013). AP continues to be the lead program to prepare students for college entrance exams such as the ACT and SAT.

Minorities Missing in AP Classes

In the 1980s and 1990s, College Board made a strategic effort to expand the AP program by offering AP courses to low-income and minority school districts (Bland & Neve, 2002). Although there has been an attempt to provide an equitable education for all high school students, an achievement gap still exists. The Department of Education's Office for Civil Rights works with the necessary parties to "evaluate the success rates and data of AP programs that receive assistance from the Federal government" (Bland & Neve, 2002, p. 24). Bland and Neve found that students who enroll in challenging and in-depth coursework excelled at a higher academic level. According to the Theokas and Saaris (2013),

> School districts have intentionally implemented strategies to help increase the number of AP courses offered and taken by students. A good number of states have invested in AP distance learning programs that do not have AP courses. There are barriers for students of color to enroll in AP courses, and school districts are working to remove them and help students from low-income families have the same educational opportunity. (p. 23)

Theokas and Saaris (2013) went on to state, "It turns out that more than half a million low-income students and students of color are "missing" from AP participation" (p. 3). Students of color would benefit from these advanced courses if they enrolled in them at the rate of White students. According to Wyatt, Patterson, & Di Giacomo (2015), AP

programs have doubled, and minority students continue to be underrepresented in AP courses. Often, educators feel that minority students are not prepared for college-level courses.

The trend of minorities not seeing the benefit of enrolling in AP classes is nation-wide. Theokas and Saaris (2013) went on to state that over time if school districts intentionally include students of color the number of minority students in AP courses would increase. This effort involves teachers building relationships with students and their parents to increase the awareness of AP programs. Enrollment in AP courses increased and the numbers of students taking AP exams have increased 95% in the past 10 years (Theokas & Saaris, 2013). Even though AP participation has increased the gaps between subgroups or SES has not changed (Theokas & Saaris, 2013).

> The problem still lies that minority subgroups have not increased. Districts that have low-income families lack AP courses, but the government is finding federal dollars to fund AP programs and ways to recruit and develop highly qualified teachers. (Theokas & Saaris, 2013, p. 4)

The AP program has expanded to urban, suburban, and rural areas; however, research supports that while a large portion of school districts have access to the AP programs only particular subgroups take advantage of the courses. Theokas and Saaris (2013) conducted a study during the 2010 school year and found that 71% of all high schools had an AP program, and these schools were attended by 91% of America's public school students. Additionally, Theokas and Saaris (2013) found that

> Asian students (97%) were slightly more likely to have access to AP courses in their high school, while American-Indian students had the least access (76%);

> students eligible for free or reduced-price lunch (91%) and middle and high-income students (93%) were roughly as likely to attend schools with AP programs as were Hispanic (91%), Black (89%), and White (91%) students. (p. 5)

Theokas and Saaris (2013) suggested that students who do not have access to AP courses usually live in poverty areas or attend schools in rural school districts.

> Schools without an AP program tend to be small, higher poverty, and more often rural. For example, 74% of urban schools and 86% of suburban schools have an AP program, compared with only 59% of rural schools. Similarly, 99% of large schools and 87% of medium-sized schools have a program, while only 44% of small schools do. (Theokas & Saaris, 2013, pp. 3)

According to Education Trust (2013), "One in every 10 students participates in the AP program" (p. 4). Asian and middle and high-income students usually participate at a higher rate than do African-American and Hispanic students. As shown in Table 3, Asian and White students participate in AP classes more than the Hispanic, Black, and Multicultural races. The data included in the table show that American-Indian, Black, and low-income students have a small participation rate in AP courses.

Table 3

National AP Participation Rates

Group	Percent Participation
Overall	11.7
Race	
Asian	25.1
White	11.9
Hispanic	9.0
American Indian	6.3
Black	6.0
Socioeconomic Status	
Low Income	5.5
Non-Low Income	15.6

Note. Adapted from Finding America's Missing AP and IB students, Theokis and Saaris, 2013, Education Trust, Volume 1. Retrieved from https://edtrust.org/wp-content/uploads/2013/10/Missing_Students.pdf

According to the data presented in Table 3, 11.7% of students are enrolled in an AP courses nationwide. There is a gap between White students and students of color, except Asian students. The Asian students participate in AP courses at a rate of 25.1%, which is more than double White student enrollment and outnumbers Hispanic, Black, and American-Indian enrollment by more than 14%. Additionally, there is a 10.1% gap in students between low-income households that are enrolled in AP courses and students in non-low-income households.

Klopfenstein (2004) conducted a study to determine whether school climate and parent to teacher and student relationship were important "in closing the gap between

minority and non-minority students" (p. 14). Klopfenstein (2004) argued that it is the responsibility of the school district and building leaders to develop strategies intentionally to address the gap. Klopfenstein (2004) stated, first, schools need to foster a more "intimate environment" while providing a diverse advanced curriculum. Second, academic tracking should remain flexible enough that students are able and encouraged to pursue challenging academic tracks (p. 14). Klopfenstein (2004) argued that family characteristics play a major role in indicating AP participation. He found that individual mentoring, the diversity of AP offerings, magnet programs, intentional recruitment, and AP incentive programs were helpful in engaging minority students. According to Klopfenstein (2004), Black and Latino students did not have academic role models in their community or homes; therefore, the guidance and parenting were not present to encourage them to take more rigorous courses to prepare them for college. Additionally, he found that there was the perception that exists that Black and Latino students do not care about academic achievement. However, student achievement was more about the lack of access and the opportunity to be in AP coursework (Klopfenstein, 2004).

Lack of access was not the only factor that Klopfenstein found for low participation in AP courses by minority students. He felt that teachers who had positive relationships with students were more likely to see academic gains with all students, especially students of color (Klopfenstein, 2004). Klopfenstein found in Texas that the high schools were large, which made it difficult for minority students to learn in such environments. "Large high schools can be subdivided into smaller "schools-within-a-school" to foster a more intimate educational environment while providing a diverse advanced curriculum" (Klopfenstein, 2004, p. 26). He encouraged administrators to

provide incentives for minority students to enroll in more challenging courses. He encouraged teachers and principals to discuss the big picture of college, goal setting and to students navigate the college process, which all led back to encouraging them to take AP courses (Klopfenstein, 2004).

According to Education Trust (2006), a relationship exists between being a minority and living in poverty that influences student test scores; however, there are education systems in America who believe all kids can learn. Education Trust (2006) reported that a former deputy superintendent of Kansas City, Missouri Public Schools, stated, "All of my experiences have convinced me that a system of standards and accountability is one of the most powerful tools available to educators who are working to improve achievement for students of color"(para. 3). A former Superintendent of Elmont Union Free School District stated, "Because a child is poor doesn't mean he can't learn. Because a child lives in the projects does not mean he cannot learn. If there are gaps, we as a society must fill those gaps" (as cited in Education Trust, 2006, para. 7).

Often it comes down to access, money, and location. The AP curriculum has spread nationwide throughout various types of school districts, but students of color still choose not to participate at the same level as White or Asian students. Access to an AP program is limited in urban and rural areas but are expanding their curriculum, the excuse that only suburban White students have access to AP curriculum is slowly dwindling. In addition, if the demographics of suburban school districts are slowly changing, there is no excuse for students of color not to participate in courses that are more rigorous. Some educators and parents would still argue that just because students of color have access does not mean they will choose to participate. Often, students who live in poverty come

to school with “at risk” behaviors and issues that hinder their progress in class and especially on a standardized test (Petrilli & Wright, 2016). These “at risk” students often come from a single parent household or families that lack secondary education experience, struggle with substance abuse, and, are 2-3 grade levels behind in core content material (Petrilli & Wright, 2016). The perception that AP classes are too rigorous or time-consuming still lingers in the minds of many minority students (Education Trust, 2013). According to Education Trust (2006), “Poor and minority students are far less likely than their White and middle-class peers to be taught by highly qualified teachers. They are far less likely to be exposed to a rich and challenging curriculum” (para. 6). According to the deputy superintendent of KCK, (personal communication, November 10, 2015), family goals and student aspirations can shape the attitudes of students taking the ACT exam. According to Superville (2014), there was a lack of AP participation in the San Diego School District, particularly at Serra High School. The school’s population consisted of mainly Black and Hispanic students. When high-achieving Hispanic and Black students were asked by an Education Week reporter why they did not enroll in AP class, “The students replied, we did not know that we could enroll in AP courses” (Superville, 2014, para. 3). Due to the leadership’s strategic approach, the San Diego School District has recruited over 2,000 minority students to participate in AP courses.

Haycock (as cited in Education Trust, 2006) stated, “The size of the achievement gap is a direct result of the lack of resources that too many children of color are forced to endure in the schools they attend” (para. 10). According to Education Trust (2006), the differences leaders see in education today are often left up to the policy makers to decide

how money is spent and what is important within a school system. "The issue lies in the fact that not everyone understands education and districts across the nation are suffering from budget cuts" (Education Trust, 2006, para. 11). "With budget cuts, fewer teachers can be hired, and the hope of expanding challenging courses was stopped. Districts across the nation are reducing the teaching force and increasing class sizes, which can affect learning in the classroom" (Education Trust, 2006, para. 13).

Ringo (2008) conducted a study of two large high schools in a suburban school district to seek understandings of the various procedures and strategies used by schools to address the AP gap within a particular school district policy context. The focus of the qualitative study was on increasing Black students participation in AP courses and supporting Black student academic achievement in AP courses. At each school, various staff members, students, and parents were interviewed regarding the Black-White AP achievement gap. Ringo's (2008) findings indicated that "school district accountability pressures influence school-level reform efforts" (p. 241), and "identified race and relationships between White AP teachers and Black AP students and their parents as a key factor in closing the gap"(p. 3).

In one school, the heightened awareness around the gap increased the accountability and fostered a consciousness with administrators and teachers (Ringo, 2008). In school two, Ringo found that having a culture that focused on achievement made the demands to close the achievement gap less intense. Ringo (2008) indicated that there is value in district and building leadership. A leader, who is trying to close the achievement gap between subgroups, can influence school climate to impact student and teacher relationships. "Being intentional in strategically placing students in rigorous

courses made the difference in both suburban schools, which race and relationships with White teachers towards their student so of color made a difference in enrolling more minority students in AP courses" (Ringo, 2008, p. 220).

Hatch and Roegman (2016) conducted a study in four New Jersey school districts that "substantially increased the number of students taking AP exams without significantly decreasing the average student scores" (p. 1). According to Hatch and Roegman (2016), in 2013, "only 40% of New Jersey's students who took the ACT met three or more of the College readiness benchmarks" (p. 21). The New Jersey School District found that students were graduating from their high schools enrolled in remedial classes 60% of the time (Hatch & Roegman, 2016).

New Jersey attacked the issue of equity by providing college-level coursework to more students. First, the main concern was from teachers who did not want the curriculum to be watered down due to students being unprepared when entering AP courses. Hatch and Roegman (2016) stated that College Board showed that "increasing access is not correlated with decreasing scores on the ACT" (p. 21). Freehold Regional School District in New Jersey adopted three strategies to help increase AP access. "The Freehold Regional School District changed the following procedures: the way structurally AP classes were offered, policy changes in requirements and reporting, and providing educational or professional development strategies to increase the quality of teaching or advising" (Hatch & Roegman, 2016, p. 22).

The results from the New Jersey School Districts' initiative to create more AP access to all students, especially minority students, happened in a short period of time and were met with some resistance from teachers and parents of privileged students. All four

school districts realized that students from low-income families could be successful in AP classes if they had access to the courses. There could be a shift in the perception of AP courses if building leaders were intentional in providing support for all students in the classroom (Hatch & Roegman, 2016).

The Impact of the AP Curriculum

The AP curriculum, created by College Board Organization, offers rigorous college-level coursework to students in high school. Mattern et al. (2013) explained, "More schools are beginning to understand a minimum curriculum does not prepare students for success in college. AP gives students credits and shortens time in college, but its greatest value is the rigor, which helps in college" (p. 4). The reputation of the AP curriculum is highly regarded by Ivy League schools, such as Princeton, that look at students who have challenged themselves by enrolling in AP courses (Edwards, 2015). According to Mattern et al., (2013), the AP curriculum is the pipeline for success after high school. Pannoni (2014) stated that AP courses are the go-to option for students who want rigorous work. The power of AP courses is looking at multiple perspectives of an issue and going deep in the material that is being covered. According to Education Reporter (2014), "In AP classrooms, students examine texts, data, and evidence with great care, learning to analyze source material, develop and test hypotheses, and craft effective arguments. They engage in discussions, solve problems collaboratively, and learn to write and speak clearly" (para. 2).

School districts have specifically added AP courses to their curriculum to provide college level courses to help students be prepared for post-secondary education. Education Reporter (2014) states, "This expansion is built on the deep conviction that all

students who are academically prepared no matter their location, background, or socioeconomic status—deserve the opportunity to access the rigor and benefits of AP" (para. 3). The perception of AP courses is a constant debate. Most students believe it is only for high achieving students, but school districts have put supports in place to help any student who wants to enroll in an AP course. An AP English teacher (personal communication, October 27, 2015) stated the perception of taking AP courses indicates that the curriculum in vastly different from regular courses. The difference between regular courses is not necessarily the material provided in the courses, but the pace of the class and depth of the material covered in the course. Some AP courses implement portfolio presentations, extra assignments, and more rigorous grading practices (personal communication, AP English teacher, October 27, 2015).

According to Bromberg (2014), changing the process of how students are selected for AP courses helped change the perception of AP courses. In Washington, one school district automatically enrolled students who scored proficient on their district assessment test in an AP course. The students had the opportunity to opt out of the class; however, the district found more students remained in the course than leaving the course once they were exposed to the teacher and curriculum (Bromberg, 2014). This strategy boosted participation in AP classes, and there was a specific spike in participation by minority students. One administrator from the Washington School District stated, "It was about supporting students in the AP classes and challenging them to believe they were capable and prepared to complete the work" (Bromberg, 2014, para. 3). The idea that all students need access to rigorous classes starts with the district leadership, but has to be enforced by building leadership. According to Bromberg (2014), the Washington School District

provided more support for the student through AVID and AmeriCorps for additional services (para. 5). The Washington School District monitored its progress from 2003 through 2013 and saw an increase in AP enrollment at their school. "In 2003, 19% of students were enrolling and taking AP exams. In 2013, 33% of students were enrolling and taking AP exams" (Bromberg, 2014, para. 5).

Some state departments of education have an impact on the type of courses offered in state's high schools. In 2013, the federal government awarded more than $28 million dollars to states to support building AP programs in low-income areas. The state of Kansas received $99,000 to help support AP programs (U.S. Department of Education, 2013). The money was used to help school districts add programs to prepare students for college. The grants emphasized adding or enhancing AP courses in schools. Like Kansas, many other states received grants to support the implementation of AP programs. According to the U.S. Department of Education (2013), the Michigan State Department of Education received a $500,000 grant to help support districts implement more AP courses. Several Michigan school districts believe because of this grant over 13,500 students have access to AP courses that will prepare them for standardized tests such as ACT or SAT (U.S. Department of Education, 2013). Michigan ranks 29th out of 49 states that have access to the AP curriculum. According to U.S. Department of Education, 2015, "Advanced Placement classes and the corresponding exams come with very high expectations for our students, as well as important early exposure to the demands and rigor of college-level courses, all while still in high school,"(para. 2). The value of having AP courses available for all students is to set high expectations that all students

can learn. The regular high school curriculum included the same material with some exceptions, but with different expectations (U.S. Department of Education, 2015).

According to Education Week (2016), the 62,500- student "Elk Grove system was one of the districts nationwide that were censured by the U.S. Department of Education's Office for Civil Rights for not providing equal access to gifted education at the elementary level and AP courses in high school" (para. 5). A study conducted in Elk Grove, California indicated that a student's mindset could make the difference in whether they enroll in an AP or regular class. Most middle-class White students enroll in AP classes with the anticipation of earning a high score on the ACT (Education Week, 2016, para. 5). The mindset of students who have post-secondary goals and aspirations are driving the rationale to enroll in more rigorous coursework. Mattern et al. (2013) suggest that students enroll in AP classes with the idea that a student should be prepared for life, not just college. The students in the Elk Grove school district have been drawn to enroll in AP classes because they are not forced to take the exam but to understand the skills and concepts from the classes to prepare one for life after high school. Elk Grove has seen their numbers of participants in AP and honors courses increase because they have changed their approach (Education Week, 2016).

Educators across the United States continue to discuss what might positively affect ACT scores. In Memphis City, Mo, Yang, Hu, Calaway, and Nickey (2011) investigated whether "specific types of (AP) courses and the number of courses taken predicts the likelihood of passing subject benchmarks and earning a composite ACT score of 19" (p. 356). There are AP classes, such as math, that have proven to help other content benchmarks because of the skills and concepts learned in the course.

Mo et al. (2011) highlighted that although AP was originally designed for highly motivated and intellectually talented students, it is possible that students with higher academic performance are more motivated to take AP courses than are those students with lower academic performance. "The results of the study indicated that students who take AP mathematics score higher on the ACT math section than students who do not enroll in the class" (Mo et al., 2011, p. 356). The results indicated students who took AP courses versus students who did not take AP courses performed better on the ACT math section. Out of the four testing areas math was most significantly impacted by students who were enrolled in AP math. According to Mo et al. (2011), "Taking AP mathematics, taking AP social studies, gender, and taking, at least, one AP course significantly impacted student performance on the ACT mathematics test" (Mo et al., 2011, p. 358). The students were six times more likely to pass the math benchmarks in comparison to students who did not take the AP mathematics course. Lastly, the results indicated the more AP courses a student took; the more likely it was for them to score a 19 or higher on the ACT (Mo et al., 2011).

The results of the study in Memphis indicated keeping parents and students aware of the benefits of enrolling in an AP course is key in enrolling students in one or more courses. The takeaway is that AP mathematics helps students develop higher order thinking skills and significantly improves the performance of all subjects of the ACT (Mo et al., 2011). The results of students taking AP English did not increase based on enrollment in the AP course. English is a complex content area; therefore, the process of making significant gains in a short period of time is unlikely. Over time, students'

English scores may increase but not in the one to two years students are preparing for the ACT exam (Mo et al., 2011).

McKillip and Rawls (2013) conducted a study to understand better the relationship between students taking AP courses and their scores on the Scholastic Aptitude Test (SAT) exam. McKillip and Phillips examined public school graduates' "propensity scores to match junior year AP examinees in three subjects to similar students who did not take any AP exams in high school" (p. 305). The results of the study indicated that students who score a 3 or higher on the AP exam do well on the SAT. According to McKillip and Rawls (2013), "Less positive findings are found for students who take AP courses but not AP exams, or who score a 1 or 2 on AP exams" (p. 305).

Previous research (Mo et al., 2011) "that supports students who have a good GPA in AP courses go well on the SAT exam" (McKillip & Rawls, 2013, p. 306). Student characteristics play a role in their success in AP courses. "Students who are motivated, self-select AP courses, and have prior challenging coursework excel on the ACT and SAT" (McKillip & Rawls, 2013, p. 306). The results of the study indicated that there is minimal impact on students who do or do not take AP courses. McKillip and Rawls (2013) found that looking at the characteristics of a student could help in determining their success on a standardized test. Students who are proactive about enrolling in "AP would perform well on later assessments and enroll and persist in college even if they did not take the AP courses and exams because they are: more motivated and prepared at the start of high school, with more family advantages" (McKillip & Rawls, 2013, p. 308).

ACT and High School Coursework

In the 1920s, the SAT was the competing exam that was used by students to measure academic achievement and preparation for college. Lindquist founded the ACT in 1959 with the purpose of focusing on information taught in schools rather than creating a cognitive reasoning assessment (ACT, 2015). Lindquist's goal was to create a test based on academic preparation, not intelligence. The ACT has evolved over the years, adding a writing portion, including a student profile, and developing an online test and resources to help students prepare for college. In 2012, for the first time, more students registered for the ACT than for the SAT. The ACT has focused on introducing programs, such as ACT Aspire, to help students at all grade levels prepare for the exam (ACT, 2015).

Since 2013, some adjustments have been made to the ACT. The ACT designers have improved the content of the assessment to predict academic achievement in post-secondary education. The ACT Aspire and other programs were to be used as an indicator of students' strengths and weaknesses. According to ACT (2016c):

> The changes consist of additional questions on the reading test that address whether students can integrate knowledge and ideas across multiple texts. Also, the inclusion of additional statistics and probability items in the mathematics test allows for reporting of student achievement in this area. (para. 5)

The ACT is still the leading college admission standardized test; therefore, school districts are placing an emphasis on taking the test in high school as the assessment to measure academic achievement (ACT, 2015).

According to the Lawrence, Limestone, and Morgan Alabama public schools, the ACT has influenced how they approach teaching and learning. These urban school districts in Alabama have made the ACT the standard assessment to measure academic achievement for their school district. The school districts found that their students were not prepared or ready for college-level work. The average composite ACT score in Alabama is 18.8, which did not reach the benchmark score needed to indicate students were college ready (McDaniel, 2015).

The Alabama Commission on Higher Education stated that approximately 35% of students who were entering college enrolled in remedial classes, indicating that students were leaving their system unprepared for post-secondary work (McDaniel, 2015). As the ACT has changed over the years, school districts across the nation have adapted as well. School districts have embedded the ACT curriculum into the state standards to help students be prepared for the test.

Researchers (Dougherty & Mellor, 2010; Ginstead, 2013; Jones, 2008; Klopfenstein, 2004; Klopfenstein & Thomas, 2009; Noble, Davenport & Sawyer, 2001; Noble & Schnelker, 2005; Roberts & Noble, 2004; Roth, Crans, Carter, Ariet, & Resnick, 2000; Schiel, Pommerich, & Noble, 1996; Warne, Larsen, Anderson, & Odasso, 2015; Woodruff & Ziomek, 2004) conducted several studies about coursework completed by students and the relationship it had with ACT results. The variables in these studies included gender, grades, SES, types of school environments (urban, rural or suburban), and race to determine the impact on the ACT assessment.

Schiel et al. (1996) statistically controlled for prior achievement using PLAN scores and found great differences in the average ACT science and math scores

associated with taking advanced courses in science and math. The PLAN test is an exam that helps measures students performance on the ACT. The test consisted of math and reading content areas. The data was averaged among all the schools in the study finding the median and maximum values. The results showed that junior and senior students who took advanced courses in science and math had higher ACT scores than those that did not take the higher-level courses. The student's socioeconomic status, gender, previous academic success on the PLAN test, or race had no bearing on the students' scores (Schiel et al., 1996).

Roberts and Noble (2004) conducted a study in Iowa that reviewed variables from both tenth-grade core classes and non-cognitive areas as they related to the PLAN test. The study included a large sample size of students from a rural high school who completed college-level course work, which prepared the students for the ACT exam. The PLAN test was administered during the sophomore year to over 175,000 rural high school students to help prepare them for the ACT. Positive relationships with teachers were identified between students who enrolled in more advanced courses versus students who did not (p. 16). According to Roberts and Noble (2004),

> Results from the study showed that students who complete, or plan to complete, rigorous mathematics and science courses (e.g. algebra II, chemistry, geometry, trigonometry), on average, achieve higher PLAN mathematics, science, and composite scores than students who do not take these courses, regardless of the student's past history of academic success, educational background, gender, social economic status or personal characteristics of the students. (pp. 16-17)

The results of Roberts and Noble's (2004) research demonstrated that taking higher-level courses prepared students to perform well on the PLAN test. The results of the study also indicated there were no differences between genders and races.

Noble and Schnelker (2005) conducted research that examined students' ACT performance in math, English, and science in comparison to the types of high school courses they completed. In addition, "hierarchical logistic regression was used to examine the benefits of taking specific courses on students' likelihood of meeting or exceeding the ACT College Readiness Benchmarks in these three subject areas" (Noble & Schnelker, 2005, p. 2). "The data for the study consisted of 403,381 students from 10,792 high schools who took PLAN as sophomores and the ACT as juniors and seniors" (Noble & Schnelker, 2005, p. 2). The schools used sections within the ACT to develop the curriculum for the coursework (Noble & Schnelker, 2005). The results of the Noble and Schnelker research are in agreement with prior research that supports students enrolling in courses that are more challenging in preparation for the ACT.

According to Noble and Schnelker (2005), the demographic location of the high school played a role in the results of student performance. Characteristics in schools such as access to the PLAN test, courses, and having qualified teachers influenced the data. The difference in the Noble and Schnelker (2005) study in comparison to prior research is that "statistical significance tests could be used directly on high school effects to evaluate the implications of specific high school characteristics" (p. 22).

Jones (2008) conducted a study analyzing high school factors that influenced ACT scores. The study was conducted using data from New London High School in Madison, Wisconsin during the 2005-06 school year. Jones (2008) determined the

relationship between student "coursework completed, grades earned in those classes and the impact gender may have on ACT scores" (p. 3). Gender, high school courses completed in the four content areas, the grades earned in the classes, and student GPA were the independent variables for the study. According to Jones (2008), students who were enrolled in challenging advanced courses performed better on the ACT than students who were not enrolled in the advanced courses.

Jones (2008) found that out of the four tested content areas, AP math was the most beneficial in increasing the ACT composite score. Student grades had some impact on how the students performed on the ACT. "The results related to science indicated that students who performed well on the ACT had a minimum GPA of 3.03. The results of the study indicated that gender did not have a significant relationship with the ACT scores" (Jones, 2008, p. 4). In conclusion, Jones' (2008) found that rigor in the classroom is key to helping students perform well on standardized tests. The results of the Jones (2008) study indicated that having a high GPA is not necessarily the best predictor of performance on the ACT exam.

Ginstead (2013) conducted a study in Iowa of high school seniors who took the ACT in 2012. The results of the study support previous research regarding the value of enrolling in higher-level math courses and the impact on the ACT math score. According to Ginstead (2013), the relationship between enrollment in advanced mathematics courses and ACT scores were influenced by race/ethnicity for algebra II, calculus, and AP calculus and by gender for algebra II and calculus. The findings indicated that minority and female students lack exposure to the higher-level courses. "Female students saw less of an increase in ACT mathematics score when taking algebra II than males and less of

an increase in ACT mathematics and composite scores when taking algebra II and calculus than male students did"(Ginstead, 2013, p. 60). These findings demonstrate that the mathematic classrooms may have some cultural sensitivity concerns.

Recent research studies have found that taking AP courses was not enough to assure higher ACT scores, but taking the AP exam was a determining factor in increasing results. In a study led by Warne et al. (2015), data was obtained from a statewide database of two high school graduating cohorts (N = 90,044) in Utah. The researchers examined students' academic achievement by reviewing their ACT scores and seeing if taking AP courses had an impact on their ACT score. "Results indicate that merely enrolling in an AP course produces a very little benefit for students" (Warne et al., 2015, p. 400). Students who took and passed "the AP exam, however, obtain higher ACT scores, even after controlling for a wide variety of academic, socioeconomic, and demographic variables" (p. 400). The results of the study also indicated that gender, race, and socioeconomic background did not make a difference in students ACT scores if students were exposed to the AP curriculum and passed the AP exam. Warne et al., (2015) brought to the forefront that AP programs have expanded, and students are taking advantage of the opportunity by enrolling in AP courses. "Unfortunately, a larger number of students are not prepared for rigorous coursework" (Warne et al., 2015, p. 401). The results of the study indicated that it was good that more students had access to courses that were more rigorous, but the lack of support in the challenging course was a reason students did not perform well in the course (Warne et al., 2015).

School leaders want to provide access to AP courses for all students, but find it challenging to get all students interested in the AP courses. Research supports having

access to the classes helps a student versus not being in enrolled in AP courses at all (Warne et al., 2015). According to Dougherty and Mellor (2010), the research brings about a different perspective that students are being placed in rigorous courses but did not retain the content. The authors explained that it is counterproductive to place students in rigorous classes without the right supports in place to determine if the students are ready for the course work. Daugherty and Mellor (2010) reported that it is important for students to gain rigorous course work at the elementary and middle school level to be prepared for high school.

Dougherty and Mellor (2010) reported that it is beneficial for students to enroll in AP courses, but the bigger impact is when students take and pass the AP exams. Students that score well on the AP exam demonstrate that access to rigorous classes can prepare students for college. According to Dougherty and Mellor (2010) having unprepared students in rigorous courses makes more of a problem for teachers and the student. It is important for students to enroll in college-level courses, but the results indicated that students who passed the AP exams outperform students who do not take the test. "There have been relatively few constraints against giving a course an "advanced" or "college preparatory" label even if the normal content one might expect from such a course is not taught or if students receive credit without learning that content" (Daugherty & Mellor, 2010, p. 3).

Student GPA and ACT Scores

Few studies have shown that GPA has an impact on a student's overall ACT composite score. Characteristics of a school are important when measuring school climate, test scores, rigor in the classroom, and student GPA. The type of school district

(urban, suburban, or rural), the teacher the student is learning from, the school curriculum, and many other factors are different from district to district, school to school and class to class. According to Roth et al. (2000), in a study completed by the University of Florida, high school students who focused on taking challenging classes perform better on standardized tests than students who earned high GPAs but failed to take rigorous classes. According to Roth et al. (2000), "the findings were important to counselors and parents advising students planning to pursue postsecondary education" (p. 80). The results of the study indicated students who passed rigorous coursework did well at the collegiate level. The results were inconsistent with the fact that there were students who did not pass rigorous coursework but did well on the ACT exam.

The focus of the Roth et al. (2000) study was to support school districts that required students to enroll in rigorous courses. The study examined students who performed below average in algebra II but scored high on the Math Placement Test. "Exposure to the coursework helped prepare students to pass the Math Placement Test, which nullifies that students with high grades in the course will automatically pass the exam" (Roth et al., 2000, p. 73). Additionally, Roth et al. (2000) examined the Florida College Practice Test (CPT) (Florida state exam) completed by students who graduated from a Florida public high school in 1994. The focus of the study was on why students were not prepared for post-secondary education and what could be the rationale behind student unpreparedness. Roth et al. (2000) found that "students with average grades who take challenging courses would be better prepared to do college-level work than students who achieve high grades through taking undemanding courses" (p. 75).

Woodruff and Ziomek (2004) conducted a study from 1993 to 2001 in an effort to demonstrate grade inflation existing in education. Woodruff and Ziomek (2004) conjectured that coursework made a difference in the student's grades. However, it was difficult to measure because the characteristics of a school played a vital role in the performance of the students. Woodruff and Ziomek (2004) found that students who enrolled and completed more than the core classes in high school were more likely to have higher ACT composite scores than students who did not complete the core classes or enrolled in regular classes. The core set of classes included four years of English and three years of science, math, and social studies. "The results of the study indicated that students who took the extra year of math, science, and social studies did better on the ACT than students who completed the minimum or less than the core class requirements" (Woodruff & Ziomek, 2004, p. 19).

The discrepancies between high school student grades and standardized test scores were the focus of Bolek's (2011) study. He stated, "In Colorado, data was collected of core class high school grades and averaged for a high school score. As a data point, ACT scores were also compared to classroom grades in the subject above areas" (p. 3). The results of the data analysis did not show that there was a relationship between grades in core classes and scores on the ACT. Some students who had high GPAs did very well on the ACT; however, there were students who had a C average GPA that did well on the ACT. Bolek (2011) indicated the results of the study showed it was more about the rigor of the coursework than the grade in the class. According to Bolek (2011), "Relationship results for the comparison of classroom grades to the Colorado Student Assessment Program (CSAP) demonstrated strong positive correlation in English, math,

and science subject areas" (p. 3). The relationship results from the comparison of classroom grades to the ACT produced insufficient data to determine any form of relationship.

Mahlum (2015) conducted a study that "examined the relationship between Wyoming high school students' GPA and ACT composite scores and subsequent enrollment, persistence, completion, and college GPA, for twelve cohort years from 2000-2001 to 2011-2012 at one public Wyoming College" (p. 2). The state of Wyoming implemented the Hathaway Scholarship Program to help encourage Wyoming high school students to pursue college. The scholarship required Wyoming students to meet one of the four requirements: grade point average, ACT or SAT scores, and completion of the specific high school curriculum. The students qualified for the Hathaway Scholarship Program by submitting their ACT score and GPA. Students were eligible for four levels of the scholarship, which consisted of honors, opportunity, performance, and provisional opportunity. The students could earn between $800 and $1,600 a semester and as low as $800 a semester (Mahlum, 2015). The results of the study showed that the Hathaway Scholarship Program improved the perception of the college but did not improve the graduation rate or increase the GPA of the student body (Mahlum, 2015). The student with the minimum scholarship requirements for the scholarship made consistent gains in enrollment and persistence after the scholarship program was implemented (Mahlum, 2015).

The constant theme that is prevalent in most of the research reviewed is that having a positive teacher-student relationship influences students in the classroom, especially students of color. According to Vedantam (2015), Gehlback surveyed students

and teachers at a local high school in Boston to determine what teachers and students had in common. The students were able to see the results of the survey and found that they had things in common with their teachers, which improved their GPA (Vedantam, 2015). In an National Public Radio (NPR) program, Vedantam (2015) reported that Gehlbach and his colleagues at Harvard Graduate School completed a study on the power of student to teacher relationships and the impact it can have on student achievement. Gehlbach (as cited in Vedantam, 2015) stated, "When we look at the academic achievement of these Black and Latino students, what we find is that when they are in classrooms where they connect with the teacher, their grades go up by .4 of a letter grade" (para. 5).

Performing well in the classroom is the first step to performing well on standardized test. Finding students areas of weakness is another step in understanding what they need to be successful. Schools around the nation have identified that building relationships with parents and students are key to increasing academic performance in minority students and educating them about successful tips on the ACT.

Summary

This review of literature in chapter two contained the history of AP, which included the lack of minority enrollment in missing in AP courses. The next section consisted of the impact of AP curriculum. The third section contained the history of the ACT and high school coursework. The last section includes the student GPA in comparison to ACT composite scores. In chapter three, the methodology for this study is explained. The research design, population and sample, and sampling procedures are presented. Additionally, the chapter includes the instrumentation, measurement, validity

and reliability, data collection procedures, and data analysis and hypothesis testing, and limitations of the study.

Chapter Three

Methods

The purpose of this study was to determine the differences in ACT scores on the subtests of math, English, reading, and science between students enrolled in different curricular paths (AP or regular). The second purpose of this study was to determine whether the differences in ACT scores on the subtests of math, English, reading, and science between students enrolled in different curricular paths (AP or regular) were affected by the student demographic variables of gender, race, and SES. The third purpose of this study was to determine the relationship between students' ACT composite scores and their GPAs. The final purpose of this study was to determine if the relationship between students' ACT composite scores and their GPAs was affected by the student demographic variables of gender, race, and SES. This chapter focuses on information related to the research design, the population and sample, sampling procedures, instrumentation, measurement, validity and reliability, data collection procedures, data analysis and hypothesis testing, and limitations of the study.

Research Design

This study utilized a quantitative methods research design with archival data. According to Lunenburg & Irby (2008), "Causal-comparative research, or ex post facto (after the fact) research, is the most basic design for determining cause and effect relationships between variables" (p. 45). In causal-comparative research, the independent variable cannot be manipulated because it has already occurred (Lunenburg & Irby, 2008). The independent variables in this study were student curricular path, GPA,

gender, race, and SES. The dependent variables in this study were the math, English, reading, science ACT subtest scores, and the composite ACT score.

Selection of Participants

The population for this study was high school students attending the Sunflower Public School District. Purposive sampling was used for this study. Lunenburg & Irby (2008) defined purposive sampling as selecting a sample based on the researcher's experience or knowledge of the group to be sampled. The sample was limited to high school students who took the ACT during the 2013-2014 or 2014-2015 school year. The sample for this study included high school students who were enrolled in the Sunflower School District and took the ACT during the 2013-2014 or 2014-2015 school year.

Instrumentation

The instrument utilized in this study was the ACT. The test focuses on practical knowledge rather than cognitive reasoning and has helped individuals make choices toward career opportunities (ACT, 2014b). The ACT college readiness assessment is a curriculum- and standards-based educational and career planning tool that assesses students' academic readiness for college (ACT, 2014b). The ACT is offered six times during the school year. ACT scores are used for college admission and applications for scholarships. The test is timed and contains four sections: math, English, reading, and science (ACT, 2014c). Each ACT subset score ranges from 1 to 36, and the composite score is an average of all four subtest scores. Each subtest is scored separately. An average is then calculated to produce a composite score across all four content areas. The ACT is administered both in a paper pencil format and online. ACT calculates the scores by counting all the questions that were answered correctly first. There is no penalty for

guessing or incorrect answers on the test. The raw (correct answers) scores are then converted to scale scores (ACT, 2014b).

The test is designed to allow accommodations for students with disabilities, including extra time or a special testing site. ACT policies indicate that students with special needs who need accommodations, such as extended time or a special testing site, must submit the proper documents before enrolling for the test (ACT Get Ready, 2016a). High schools use the ACT results for multiple purposes, including academic advising and counseling, as well as evaluating the effectiveness of instruction, student academic strengths and weaknesses, and curriculum (ACT, 2014b).

Table 4 includes a summary of the four areas that are tested on the ACT. Included in the table are the amount of time each student is allocated to finish the test and the content on which students are tested. The instrument was chosen because it provides insight on how a student might do academically in college or post-secondary education.

Table 4

Description of the ACT Breakdown

Test	Time	Content
English	45 minutes	usage/mechanics and rhetorical skills
Mathematics	60 minutes	pre-algebra/elementary algebra, intermediate algebra/coordinate geometry, and plane geometry/ trigonometry
Reading	35 minutes	social studies, natural sciences, literary narrative or prose fiction, and humanities
Science	35 minutes	data representation, research summaries, and conflicting viewpoints

Note. Adapted from "Description of the ACT," by ACT, Inc., 2015. Retrieved from http://www.actstudent.org/testprep/descriptions/?_ga=1.47949287.1725905422.1455991115

Measurement. The first variables of interest are the ACT subtest scores and composite scores. The scale scores are the same no matter which format of the ACT a student is administered. The composite score and each subtest score range from 1 (low) to 36 (high). The students were divided into two categories based on the variable curricular path: students who enrolled in one or more AP courses in the areas of math, English, reading and science and those who did not enroll in any AP courses. For the purposes of this study, students were considered as being enrolled in the AP path if they were enrolled in one or more of the following courses offered in Sunflower School District: AP Calculus AB, AP Calculus BC, AP Statistics, AP English Composition and Language, AP English Literature and Composition, AP Biology, AP Chemistry, AP Environmental Science, and AP Physics.

A demographic variable was student gender (male or female). This information was indicated on a student's school records. The third demographic variable was student race. The following races were considered for this study: American-Indian, Black, White, Hispanic, Asian, and Multiracial. For the purpose of the study, students were categorized as minority or non-minority students. The minority students included American-Indian, Black, Hispanic, Asian, and Multiracial students. The non-minority students were White students.

Another demographic variable was student socioeconomic status (SES). A student's socioeconomic status (SES) was determined by parents or guardians' income. For this study, students who were eligible for free or reduced lunch were compared to students who were full lunch pay. The final measurement in the study included the student GPA. The GPA is a numeric average of all grades achieved in classes at a given school (Sunflower, 2015). A student GPA is calculated as the total number of grade points received over a given period divided by the total number of credits awarded (Sunflower, 2015).

Validity and reliability. "Validity is the degree to which an instrument measures what it supposed to measure" (Lunenburg & Irby, 2008, p. 181). Reliability is the degree to which an instrument is a consistent measure (Lunenburg & Irby, 2008). No instrument can claim 100% accuracy and for that reason analyzing the validity and reliability is critical for an instrument that is effective at providing quality measurement (ACT Technical Manual, 2014a).

The ACT is designed to evaluate college readiness. The ACT has been tested for validity and reliability. The ACT scores, subscores, and skill statements based on the

ACT College and Career Readiness Standards are directly related to student educational progress and can be readily understood and interpreted by instructional staff, parents, and students (ACT Technical Manual, 2014a).

The most common interpretations for validity related to this study involved evaluating students' success the first year of college and the effectiveness of high school college prep programs (ACT Technical Manual, 2014a). ACT (2014c) conducted validity (convergent and discriminant validity) and reliability (internal consistency and test-retest stability) studies on the use of ACT scores to evaluate programs and concluded that the ACT tests, high school coursework, and grades are conceptually and psychometrically linked to one another making them appropriate for measuring student academic achievement over time. This psychometric linkage also provides evidence for the validity of the ACT tests. ACT (2014a) explained that the reliability of the ACT composite score (theoretical correlation in the entire applicant population) is approximately 0.96. "Internal consistency reliability coefficients for the six 12-item scales range from 0.84 to 0.91 (*Mdn* = 0.87)" (ACT, 2014a, p. 139). These reliability coefficients provide strong evidence for the reliability of the ACT. Evidence exists for both validity and reliability when the ACT is used for analyzing student success the first year of college and evaluating the effectiveness of high school college preparatory programs (ACT, 2014a)

Data Collection Procedures

Before collecting the data, permission to conduct the study in the Sunflower Public School District was obtained by completing a research proposal form (Appendix A). The completed research proposal form was scanned and electronically sent to the

Director of Assessment, Research, & Instructional Resources. The research proposal was examined and approved by the Sunflower School District Committee on February 17, 2016 (Appendix B). Additionally, permission to conduct the study was requested from the Baker University Institutional Review Board (IRB) (Appendix C). The IRB Form was examined and approved by the IRB committee on February 22, 2016 (Appendix D).

The Sunflower School District Assessment, Research, and Instructional Resource Department provided an Excel spreadsheet on March 1, 2016, with the following data: student ACT composite score; student ACT math, reading, English, science subtest scores; race, cumulative GPA; SES information; and AP classes completed. Student names were not included in the spreadsheet. The data was accessed from the District Viewpoint database system by the Sunflower Public School District. The spreadsheet was examined to ensure all the students met the requirements of the study.

Data Analysis and Hypothesis Testing

The data from the Excel spreadsheet obtained from the Sunflower School District were uploaded to IBM® SPSS® Statistics Faculty Pack 23 for Windows for analysis. Listed below are the research questions, the hypotheses, and the statistical test used to analyze the data for this study. Two-sample *t* tests, two-factor ANOVAs, Pearson product correlations coefficients, one sample *t* test for the correlation coefficient, and Fisher's *z* tests were used to analyze the data.

RQ1. To what extent are there differences in ACT scores on the subtests of math, English, reading, and science between students enrolled in different curricular paths (AP or regular)?

H1. There is a difference in ACT math subscores between students enrolled in AP calculus AB, AP calculus BC, or AP statistics and students enrolled in regular math.

A two-factor analysis of variance (ANOVA) was conducted to test H1 and H5. The two categorical variables used to group the dependent variable, ACT math subscores, were a curricular path (AP path, regular path) and gender (male, female). The two-factor ANOVA can be used to test three hypotheses including the main effect for the curricular path, the main effect for gender, and a two-way interaction effect (curricular path x gender). The main effect for curricular path was used to test H1. The level of significance was set at .05.

H2. There is a difference in ACT English subscores between students enrolled in AP English Composition and Language or AP English Literature and Composition and students enrolled in regular English.

A second two-factor ANOVA was conducted to test H2 and H8. The two categorical variables used to group the dependent variable, ACT English subscores, were curricular path (AP path, regular path) and gender (male, female). The two-factor ANOVA can be used to test three hypotheses including the main effect for the curricular path, the main effect for gender, and a two-way interaction effect (curricular path x gender). The main effect for curricular path was used to test H2. The level of significance was set at .05.

H3. There is a difference in ACT reading subscores between students enrolled in AP English Composition and Language or AP English Literature and Composition and students enrolled in regular English.

A third two-factor ANOVA was conducted to test H3 and H11. The two categorical variables used to group the dependent variable, ACT Reading scores, were curricular path (AP path, regular path) and gender (male, female). The two-factor ANOVA can be used to test three hypotheses including the main effect for the curricular path, the main effect for gender, and a two-way interaction effect (curricular path x gender). The main effect for curricular path was used to test H3. The level of significance was set at .05.

H4. There is a difference in ACT science subscores between students enrolled in AP Biology, AP Chemistry, AP Physics, or AP Environmental Science and students enrolled in regular science.

A fourth two-factor ANOVA was conducted to test H4 and H14. The two categorical variables used to group the dependent variable, ACT science subscores, were curricular path (AP path, regular path) and gender (male, female). The two-factor ANOVA can be used to test three hypotheses including the main effect for the curricular path, the main effect for gender, and a two-way interaction effect (curricular path x gender). The main effect for curricular path was used to test H4. The level of significance was set at .05.

RQ2. To what extent are the differences in ACT scores on the subtests of math, English, reading, and science between students enrolled in different curricular paths (AP or regular) affected by the student demographic variables of gender, race, and SES?

H5. The difference in ACT math subscores between students enrolled in different curricular paths (AP or regular) is affected by gender.

The two-way interaction effect (curricular path x gender) from the first ANOVA was used to test H5. The level of significance was set at .05.

H6. The difference in ACT math subscores between students enrolled in different curricular paths (AP or regular) is affected by race.

A fifth two-factor ANOVA was conducted to test H6. The two categorical variables used to group the dependent variable, ACT math subscores, were curricular path (AP path, regular path) and race (minority, non-minority). The two-factor ANOVA can be used to test three hypotheses including the main effect for the curricular path, the main effect for race, and a two-way interaction effect (curricular path x race). The two-way interaction effect (curricular path x race) was used to test H6. The level of significance was set at .05.

H7. The difference in ACT math subscores between students enrolled in different curricular paths (AP or regular) is affected by SES.

A sixth two-factor ANOVA was conducted to test H7. The two categorical variables used to group the dependent variable, ACT math subscores, were curricular path (AP path, regular path) and SES (free/reduced, full pay). The two-factor ANOVA can be used to test three hypotheses including the main effect for the curricular path, the main effect for SES, and a two-way interaction effect (curricular path x SES). The two-way interaction effect (curricular path x SES) was used to test H7. The level of significance was set at .05.

H8. The difference in ACT English subscores between students enrolled in different curricular paths (AP or regular) is affected by gender.

The two-way interaction effect (curricular path x gender) from the second ANOVA was used to test H8. The level of significance was set at .05.

H9. The difference in ACT English subscores between students enrolled in different curricular paths (AP or regular) is affected by race.

A seventh two-factor ANOVA was conducted to test H9. The two categorical variables used to group the dependent variable, ACT English subscores, were curricular path (AP path, regular path) and race (minority, non-minority). The two-factor ANOVA can be used to test three hypotheses including the main effect for the curricular path, the main effect for race, and a two-way interaction effect (curricular path x race). The two-way interaction effect (curricular path x race) was used to test H9. The level of significance was set at .05.

H10. The difference in ACT English subscores between students enrolled in different curricular paths (AP or regular) is affected by SES.

An eighth two-factor ANOVA was conducted to test H10. The two categorical variables used to group the dependent variable, ACT English subscores, were curricular path (AP path, regular path) and SES (free/reduced, full pay). The two-factor ANOVA can be used to test three hypotheses including the main effect for the curricular path, the main effect for SES, and a two-way interaction effect (curricular path x SES). The two-way interaction effect (curricular path x race) was used to test H10. The level of significance was set at .05.

H11. The difference in ACT reading subscores between students enrolled in different curricular paths (AP or regular) is affected by gender.

The two-way interaction effect (curricular path x gender) from the third ANOVA was used to test H11. The level of significance was set at .05.

H12. The difference in ACT reading subscores between students enrolled in different curricular paths (AP or regular) is affected by race.

A ninth two-factor ANOVA was conducted to test H12. The two categorical variables used to group the dependent variable, ACT reading subscores, were curricular path (AP path, regular path) and race (minority, non-minority). The two-factor ANOVA can be used to test three hypotheses including the main effect for the curricular path, the main effect for race, and a two-way interaction effect (curricular path x race). The two-way interaction effect (curricular path x race) was used to test H12. The level of significance was set at .05.

H13. The difference in ACT reading subscores between students enrolled in different curricular paths (AP or regular) is affected by SES.

A tenth two-factor ANOVA was conducted to test H13. The two categorical variables used to group the dependent variable, ACT reading subscale scores, were curricular path (AP path, regular path) and SES (free/reduced, full pay). The two-factor ANOVA can be used to test three hypotheses including the main effect for the curricular path, the main effect for SES, and a two-way interaction effect (curricular path x SES). The two-way interaction effect (curricular path x race) was used to test H16. The level of significance was set at .05.

H14. The difference in ACT science subscores between students enrolled in different curricular paths (AP or regular) is affected by gender.

The two-way interaction effect (curricular path x gender) from the fourth ANOVA was used to test H14. The level of significance was set at .05.

H15. The difference in ACT science subscores between students enrolled in different curricular paths (AP or regular) is affected by race.

An eleventh two-factor ANOVA was conducted to test H15. The two categorical variables used to group the dependent variable, ACT science subscale scores, were curricular path (AP path, regular path) and race (minority, non-minority). The two-factor ANOVA can be used to test three hypotheses including the main effect for the curricular path, the main effect for race, and a two-way interaction effect (curricular path x race). The two-way interaction effect (curricular path x race) was used to test H15. The level of significance was set at .05.

H16. The difference in ACT science subscores between students enrolled in different curricular paths (AP or regular) is affected by SES.

A twelfth two-factor ANOVA was conducted to test H16. The two categorical variables used to group the dependent variable, ACT science subscale scores, were curricular path (AP path, regular path) and SES (free/reduced, full pay). The two-factor ANOVA can be used to test three hypotheses including the main effect for the curricular path, the main effect for SES, and a two-way interaction effect (curricular path x SES). The two-way interaction effect (curricular path x race) was used to test H16. The level of significance was set at .05.

RQ3. To what extent is there a relationship between students' ACT composite scores and their GPAs?

H17. There is a relationship between students' ACT composite scores and their GPAs.

A Pearson product moment correlation coefficient was calculated to index the strength and direction of the relationship between ACT Composite scores and GPAs. A one-sample *t* test was conducted to test for the statistical significance of the correlation coefficient. The level of significance was set at .05.

RQ4. To what extent is the relationship between students' ACT composite scores and their GPAs affected by the student demographic variables of gender, race, and SES?

H18. The relationship between students' ACT composite scores and their GPAs is affected by gender.

Before testing H18, the sample data was disaggregated by gender (male, female). A Pearson product moment correlation coefficient was calculated to index the strength and direction of the relationship between ACT composite scores and GPAs for males, and a Pearson product-moment correlation coefficient was calculated to index the strength and direction of the relationship between ACT composite scores and GPAs for females. A Fisher's *z* test was conducted to test H18. The two sample correlations were compared. The level of significance was set at .05.

H19. The relationship between students' ACT composite scores and their GPA is affected by race.

Before testing H19, the sample data was disaggregated by race (minority, non-minority). A Pearson product moment correlation coefficient was calculated to index the strength and direction of the relationship between ACT composite scores and GPAs for minority students, and a Pearson product-moment correlation coefficient was calculated

to index the strength and direction of the relationship between ACT composite scores and GPAs for non-minority students. A Fisher's *z* test was conducted to test H23. The two sample correlations were compared. The level of significance was set at .05.

H20. The relationship between students' ACT composite scores and their GPA is affected by SES.

Before testing H20, the sample data was disaggregated by SES (free/reduced, full pay). A Pearson product moment correlation coefficient was calculated to index the strength and direction of the relationship between ACT Composite scores and GPAs for low-income students, and a Pearson product-moment correlation coefficient was calculated to index the strength and direction of the relationship between ACT composite scores and GPAs for regular students. A Fisher's *z* test was conducted to test H20. The two sample correlations were compared. The level of significance was set at .05.

Limitations

According to Lunenburg & Irby (2008), "Limitations are factors that may have an effect on the interpretation of the findings or the generalizability of the results. Limitations are not under the control of the researcher" (p. 131). The sample used in this study was limited to the students who chose to take the ACT. The researcher could not control when a student took the ACT. Students in the sample only needed to enroll in one or more AP math, English, reading or Science courses. In 2013-2014, 67% of the junior and senior students took the ACT. In 2014-2015, 60% of the junior and senior students took the ACT.

Summary

In chapter three, the methodology used in this study was described. The chapter included the research design, population and sample, sampling procedures, instrumentation, data collection procedures, data analysis and hypothesis testing, and limitations. Chapter four includes the hypothesis testing results and a summary.

Chapter Four

Results

The purpose of this study was to determine the differences in ACT scores on the subtests of math, English, reading, and science between students enrolled in different curricular paths (AP or regular). The second purpose of this study was to determine whether the differences in ACT scores on the subtests of math, English, reading, and science between students enrolled in different curricular paths (AP or regular) were affected by the student demographic variables of gender, race, and SES. The third purpose of this study was to determine the relationship between students' ACT composite score and their GPAs. The final purpose of this study was to determine if the relationship between students' ACT composite scores and their GPAs was affected by the student demographic variables of gender, race, and SES. This chapter includes the results of the hypothesis testing.

Hypotheses Testing

The first analyses presented below are the results of the hypothesis testing conducted to address research questions one and two arranged for the following content areas: math, English, reading, and science. Each content area of math, English, reading, and science results were addressed using three variables: gender, race, and SES. The final analyses were the results of the hypothesis testing conducted to address research questions three and four. Each content area of math, English, reading, and science were analyzed using three variables: gender, race, and SES.

RQ1. To what extent are there differences in ACT scores on the subtests of math, English, reading, and science between students enrolled in different curricular paths (AP or regular)?

H1. There is a difference in ACT math subscores between students enrolled in AP calculus AB, AP calculus BC, or AP statistics and students enrolled in regular math.

A two-factor analysis of variance (ANOVA) was conducted to test H1 and H5. The two categorical variables used to group the dependent variable, ACT Math scores, were curricular path (AP path, regular path) and gender (male, female). The two-factor ANOVA can be used to test three hypotheses including the main effect for the curricular path, a main effect for gender, and a two-way interaction effect (curricular path x gender). The main effect for the curricular path was used to test H1. The level of significance was set at .05. The results of the analysis indicated a statistically significant difference between the means, $F = 104.286$, $df = 1, 786$, $p = .000$. See Table 5 for the means and standard deviations for this analysis. The mean for students who enrolled in the AP path ($M = 26.32$) was higher than the mean for students who enrolled in the regular path ($M = 23.36$). Students who enrolled in at least one AP math class scored higher on the ACT math subtest than did students who did not enroll in at least one AP math class.

Table 5

Descriptive Statistics for the Results of the Test for H1

Curricular path	*M*	*SD*	*N*
AP	26.32	3.87	316
Regular	23.36	4.20	474

H2. There is a difference in ACT English subscores between students enrolled in AP English Composition and Language or AP English Literature and Composition and students enrolled in regular English.

A second two-factor ANOVA was conducted to test H2 and H8. The two categorical variables used to group the dependent variable, ACT English subscores, were a curricular path (AP path, regular path) and gender (male, female). The two-factor ANOVA can be used to test three hypotheses including the main effect for curricular path, the main effect for gender, and a two-way interaction effect (curricular path x gender). The main effect for curricular path was used to test H2. The level of significance was set at .05. The results of the analysis indicated a statistically significant difference between the means, $F = 19.699$, $df = 1, 786$, $p = .000$. See Table 6 for the means and standard deviations for this analysis. The mean for students who enrolled in the AP path ($M = 26.79$) was higher than the mean for students who enrolled in the regular path ($M = 24.94$). Students who enrolled in at least one AP English class scored higher on the ACT English subtest than did students who did not enroll in at least one AP English class.

Table 6

Descriptive Statistics for the Results of the Test for H2

Curricular path	*M*	*SD*	*N*
AP	26.79	4.97	235
Regular	24.94	5.13	555

H3. There is a difference in ACT reading subscores between students enrolled in AP English Composition and Language or AP English Literature and Composition and students enrolled in regular English.

A third two-factor ANOVA was conducted to test H3 and H11. The two categorical variables used to group the dependent variable, ACT Reading scores, were a curricular path (AP path, regular path) and gender (male, female). The two-factor ANOVA can be used to test three hypotheses including the main effect for the curricular path, the main effect for gender, and a two-way interaction effect (curricular path x gender). The main effect for curricular path was used to test H3. The level of significance was set at .05. The results of the analysis indicated a statistically significant difference between the means, $F = 12.546$, $df = 1, 786$, $p = .000$. See Table 7 for the means and standard deviations for this analysis. The mean for students who enrolled in the AP path ($M = 27.32$) was higher than the mean for students who enrolled in the regular path ($M = 25.85$). Students who enrolled in at least one AP English class scored higher on the ACT reading subtest than did students who did not enroll in at least one AP English class.

Table 7

Descriptive Statistics for the Results of the Test for H3

Curricular path	*M*	*SD*	*N*
AP	27.32	5.51	235
Regular	25.85	4.93	555

H4. There is a difference in ACT science subscores between students enrolled in AP Biology, AP Chemistry, AP Physics, or AP Environmental Science and students enrolled in regular science.

A fourth two-factor ANOVA was conducted to test H4 and H14. The two categorical variables used to group the dependent variable, ACT science subscores, were a curricular path (AP path, regular path) and gender (male, female). The two-factor ANOVA can be used to test three hypotheses including the main effect for the curricular path, the main effect for gender, and a two-way interaction effect (curricular path x gender). The main effect for curricular path was used to test H4. The level of significance was set at .05. The results of the analysis indicated a statistically significant difference between the means, $F = 15.443$, $df = 1, 786$, $p = .000$. See Table 8 for the means and standard deviations for this analysis. The mean for students who enrolled in the AP path ($M = 25.37$) was higher than the mean for students who enrolled in the regular path ($M = 24.11$). Students who enrolled in at least one AP science class scored higher on the ACT science subtest than did students who did not enroll in at least one AP science class.

Table 8

Descriptive Statistics for the Results of the Test for H4

Curricular path	*M*	*SD*	*N*
AP	25.37	3.97	356
Regular	24.11	4.47	434

RQ2. To what extent are the differences in ACT scores on the subtests of math, English, reading, and science between students enrolled in different curricular paths (AP or regular) affected by the student demographic variables of gender, race, and SES?

H5. The difference in ACT math subscores between students enrolled in different curricular paths (AP or regular) is affected by gender.

The two-way interaction effect (curricular path x gender) from the first ANOVA was used to test H5. The level of significance was set at .05. The results of the analysis indicated there was not a statistically significant difference between at least two means, $F = .119$, $df = 1, 786$, $p = .730$. See Table 9 for the means and standard deviations for this analysis. A follow-up post hoc was not warranted. The difference in ACT math subscores between students enrolled in different curricular paths (AP or regular) was not affected by gender

Table 9

Descriptive Statistics for the Results of the Test for H5

Curricular Path	Gender	*M*	*SD*	*N*
AP	Female	25.71	3.80	183
	Male	27.15	3.84	133
Regular	Female	22.79	4.11	259
	Male	24.03	4.22	215

H6. The difference in ACT math subscores between students enrolled in different curricular paths (AP or regular) is affected by race.

A fifth two-factor ANOVA was conducted to test H6. The two categorical variables used to group the dependent variable, ACT math subscores, were a curricular

path (AP path, regular path) and race (minority, non-minority). The two-factor ANOVA can be used to test three hypotheses including the main effect for the curricular path, the main effect for race, and a two-way interaction effect (curricular path x race). The two-way interaction effect (curricular path x race) was used to test H6. The level of significance was set at .05. The results of the analysis indicated there was not a statistically significant difference between of the means, $F = 1.346$, $df = 1, 786$, $p = .246$. See Table 10 for the means and standard deviations for this analysis. A follow-up post hoc was not warranted. The difference in ACT math subscores between students enrolled in different curricular paths (AP or regular) was not affected by race.

Table 10

Descriptive Statistics for the Results of the Test for H6

Curricular path	Race	*M*	*SD*	*N*
AP	Minority	26.08	4.13	58
	Non-Minority	26.37	3.82	258
Regular	Minority	22.55	4.43	134
	Non-Minority	23.67	4.08	340

H7. The difference in ACT math subscores between students enrolled in different curricular paths (AP or regular) is affected by SES.

A sixth two-factor ANOVA was conducted to test H7. The two categorical variables used to group the dependent variable, ACT math subscores, were a curricular path (AP path, regular path) and SES (free/reduced, full pay). The two-factor ANOVA can be used to test three hypotheses including the main effect for the curricular path, the main effect for SES, and a two-way interaction effect (curricular path x SES). The two-

way interaction effect (curricular path x SES) was used to test H7. The level of significance was set at .05. The results of the analysis indicated there was not a statistically significant difference between the means, $F = .640$, $df = 1, 786$, $p = .424$. See Table 11 for the means and standard deviations for this analysis. A follow-up post hoc was not warranted. The difference in ACT math subscores between students enrolled in different curricular paths (AP or regular) was not affected by SES.

Table 11

Descriptive Statistics for the Results of the Test for H7

Curricular path	SES	*M*	*SD*	*N*
AP	Full Pay	26.31	3.8	314
	Free/Reduced	27.50	2.12	2
Regular	Full Pay	23.45	4.1	436
	Free/Reduced	22.26	5.05	38

H8. The difference in ACT English subscores between students enrolled in different curricular paths (AP or regular) is affected by gender.

The two-way interaction effect (curricular path x gender) from the second ANOVA was used to test H8. The level of significance was set at .05. The results of the analysis indicated there was not a statistically significant difference between at least two means, $F = .467$, $df = 1, 786$, $p = .495$. See Table 12 for the means and standard deviations for this analysis. A follow-up post hoc was not warranted. The difference in ACT English subscores between students enrolled in different curricular paths (AP or regular) was not affected by gender

Table 12

Descriptive Statistics for the Results of the Test for H8

Curricular path	Gender	*M*	*SD*	*N*
AP	Female	26.78	4.94	162
	Male	26.82	5.06	73
Regular	Female	25.21	5.22	280
	Male	24.67	5.04	275

H9. The difference in ACT English subscores between students enrolled in different curricular paths (AP or regular) is affected by race.

A seventh two-factor ANOVA was conducted to test H9. The two categorical variables used to group the dependent variable, ACT English subscores, were a curricular path (AP path, regular path) and race (minority, non-minority). The two-factor ANOVA can be used to test three hypotheses including the main effect for the curricular path, the main effect for race, and a two-way interaction effect (curricular path x race). The two-way interaction effect (curricular path x race) was used to test H9. The level of significance was set at .05. The results of the analysis indicated there was not a statistically significant difference between the means, $F = .018$, $df = 1, 786$, $p = .894$. See Table 13 for the means and standard deviations for this analysis. A follow-up post hoc was not warranted. The difference in ACT English subscores between students enrolled in different curricular paths (AP or regular) was not affected by race.

Table 13

Descriptive Statistics for the Results of the Test for H9

Curricular path	Race	*M*	*SD*	*N*
AP	Minority	25.89	5.33	58
	Non-Minority	27.09	4.83	177
Regular	Minority	23.94	5.50	134
	Non-Minority	25.26	4.97	421

H10. The difference in ACT English subscores between students enrolled in different curricular paths (AP or regular) is affected by SES.

An eighth two-factor ANOVA was conducted to test H10. The two categorical variables used to group the dependent variable, ACT English subscores, were a curricular path (AP path, regular path) and SES (free/reduced, full pay). The two-factor ANOVA can be used to test three hypotheses including the main effect for the curricular path, the main effect for SES, and a two-way interaction effect (curricular path x SES). The two-way interaction effect (curricular path x race) was used to test H10. The level of significance was set at .05. The results of the analysis indicated there was not a statistically significant difference between the means, $F = .353$, $df = 1, 786$, $p = .552$. See Table 14 for the means and standard deviations for this analysis. A follow-up post hoc was not warranted. The difference in ACT English subscores between students enrolled in different curricular paths (AP or regular) was not affected by SES.

Table 14

Descriptive Statistics for the Results of the Test for H10

Curricular path	SES	*M*	*SD*	*N*
AP	Full Pay	26.87	4.92	229
	Free/Reduced	23.66	6.47	6
Regular	Full Pay	25.05	5.09	521
	Free/Reduced	23.20	5.61	34

H11. The difference in ACT reading subscores between students enrolled in different curricular paths (AP or regular) is affected by gender.

The two-way interaction effect (curricular path x gender) from the third ANOVA was used to test H11. The level of significance was set at .05. The results of the analysis indicated there was not a statistically significant difference between at least two means, $F = .052$, $df = 1, 786$, $p = .819$. See Table 15 for the means and standard deviations for this analysis. A follow-up post hoc was not warranted. The difference in ACT reading subscores between students enrolled in different curricular paths (AP or Regular) was not affected by gender

Table 15

Descriptive Statistics for the Results of the Test for H11

Curricular path	Gender	*M*	*SD*	*N*
AP	Female	27.27	5.51	162
	Male	27.42	5.54	73
Regular	Female	25.88	5.24	280
	Male	25.83	4.60	275

H12. The difference in ACT reading subscores between students enrolled in different curricular paths (AP or regular) is affected by race.

A ninth two-factor ANOVA was conducted to test H12. The two categorical variables used to group the dependent variable, ACT reading subscores, were a curricular path (AP path, regular path) and race (minority, non-minority). The two-factor ANOVA was used to test three hypotheses including the main effect for the curricular path, the main effect for race, and a two-way interaction effect (curricular path x race). The two-way interaction effect (curricular path x race) was used to test H12. The level of significance was set at .05. The level of significance was set at .05. The results of the analysis indicated there was not a statistically significant difference between the means, $F = .003$, $df = 1, 786$, $p = .956$. See Table 16 for the means and standard deviations for this analysis. A follow-up post hoc was not warranted. The difference in ACT reading subscores between students enrolled in different curricular paths (AP or regular) was not affected by race.

Table 16

Descriptive Statistics for the Results of the Test for H12

Curricular path	Race	*M*	*SD*	*N*
AP	Minority	26.17	6.17	58
	Non-Minority	27.70	5.23	177
Regular	Minority	24.73	5.52	134
	Non-Minority	26.21	4.68	421

H13. The difference in ACT reading subscores between students enrolled in different curricular paths (AP or regular) is affected by SES.

A tenth two-factor ANOVA was conducted to test H13. The two categorical variables used to group the dependent variable, ACT reading subscale scores, were a curricular path (AP path, regular path) and SES (free/reduced, full pay). The two-factor ANOVA was used to test three hypotheses including the main effect for the curricular path, the main effect for SES, and a two-way interaction effect (curricular path x SES). The two-way interaction effect (curricular path x race) was used to test H16. The level of significance was set at .05. The level of significance was set at .05. The results of the analysis indicated there was not a statistically significant difference between the means, $F = .399$, $df = 1, 786$, $p = .528$. See Table 17 for the means and standard deviations for this analysis. A follow-up post hoc was not warranted. The difference in ACT reading subscores between students enrolled in different curricular paths (AP or regular) was not affected by SES.

Table 17

Descriptive Statistics for the Results of the Test for H13

Curricular path	SES	*M*	*SD*	*N*
AP	Full Pay	27.38	5.47	229
	Free/Reduced	24.83	6.91	6
Regular	Full Pay	25.92	4.81	521
	Free/Reduced	24.82	6.51	34

H14. The difference in ACT science subscores between students enrolled in different curricular paths (AP or regular) is affected by gender.

The two-way interaction effect (curricular path x gender) from the fourth ANOVA was used to test H14. The level of significance was set at .05. The results of

the analysis indicated there was not a statistically significant difference between at least two means, $F = .023$, $df = 1, 786$, $p = .879$. See Table 18 for the means and standard deviations for this analysis. A follow-up post hoc was not warranted. The difference in ACT science subscores between students enrolled in different curricular paths (AP or regular) was not affected by gender

Table 18

Descriptive Statistics for the Results of the Test for H14

Curricular Path	Gender	*M*	*SD*	*N*
AP	Female	24.91	3.75	186
	Male	25.86	4.16	170
Regular	Female	23.76	4.21	256
	Male	24.61	4.78	178

H15. The difference in ACT science subscores between students enrolled in different curricular paths (AP or regular) is affected by race.

An eleventh two-factor ANOVA was conducted to test H15. The two categorical variables used to group the dependent variable, ACT science subscores, were curricular path (AP path, regular path) and race (minority, non-minority. The two-factor ANOVA can be used to test three hypotheses including the main effect for curricular path, the main effect for race, and a two-way interaction effect (curricular path x race). The two-way interaction effect (curricular path x race) was used to test H15. The level of significance was set at .05. The results of the analysis indicated there was a statistically significant difference between the means, $F = 4.21$, $df = 1, 786$, $p = .041$. See Table 19 for the means and standard deviations for this analysis. A follow-up post hoc was

conducted to determine which means were different. Three comparisons were statistically significant; however, only one can be meaningfully interpreted here. The results of the Tukey's Honestly Significant Difference (HSD) post hoc indicated that the mean for minority students enrolled in the AP path (M = 24.63) was higher than the mean for minority students enrolled in the regular path (M = 22.28). The difference in ACT science subscores between students enrolled in different curricular paths (AP or regular) was affected by race.

Table 19

Descriptive Statistics for the Results of the Test for H15

Curricular path	Race	*M*	*SD*	*N*
AP	Minority	24.64	4.11	89
	Non-Minority	25.61	3.90	267
Regular	Minority	22.27	4.64	103
	Non-Minority	24.68	4.26	331

H16. The difference in ACT science subscores between students enrolled in different curricular paths (AP or regular) is affected by SES.

A twelfth two-factor ANOVA was conducted to test H16. The two categorical variables used to group the dependent variable, ACT science subscale scores, were curricular path (AP path, regular path) and SES (free/reduced, full pay). The two-factor ANOVA can be used to test three hypotheses including the main effect for curricular path, the main effect for SES, and a two-way interaction effect (curricular path x SES). The two-way interaction effect (curricular path x race) was used to test H16. The level of significance was set at .05. The results of the analysis indicated there was not a

statistically significant difference between the means, $F = .286$, $df = 1, 786$, $p = .593$. See Table 20 for the means and standard deviations for this analysis. A follow-up post hoc was not warranted. The difference in ACT science subscores between students enrolled in different curricular paths (AP or regular) was not affected by SES.

Table 20

Descriptive Statistics for the Results of the Test for H16

Curricular path	SES	*M*	*SD*	*N*
AP	Full Pay	25.40	4.01	388
	Free/Reduced	24.77	3.26	18
Regular	Full Pay	24.18	4.45	412
	Free/Reduced	22.81	4.70	22

RQ3. To what extent is there a relationship between students' ACT composite scores and their GPAs?

H17. There is a relationship between students' ACT composite scores and their GPAs.

A Pearson product moment correlation coefficient was calculated to index the strength and direction of the relationship between ACT composite scores and GPAs. A one-sample *t* test was conducted to test for the statistical significance of the correlation coefficient. The level of significance was set at .05. The correlation coefficient ($r = .450$) provided evidence for a moderately strong positive relationship between GPAs and the ACT composite score. The results of the one-sample *t* test indicated a statistically significant relationship between the variables, $df = 771$, $p = .000$. Students with higher

GPAs tended to have higher ACT composite scores and students with low GPAs tended to have lower ACT composite scores.

RQ4. To what extent is the relationship between students' ACT composite scores and their GPAs affected by the student demographic variables of gender, race, and SES?

H18. The relationship between students' ACT composite scores and their GPAs is affected by gender.

Before testing H18, the sample data was disaggregated by gender (male, female). A Pearson product moment correlation coefficient was calculated to index the strength and direction of the relationship between ACT composite scores and GPAs for males, and a Pearson product-moment correlation coefficient was calculated to index the strength and direction of the relationship between ACT composite scores and GPAs for females. A Fisher's *z* test was conducted to test H18. The two sample correlations were compared. The level of significance was set at .05. The correlation for female students (r = .540) provided evidence for a moderately strong positive relationship between GPAs and ACT composite score. The correlation for male students (r = .397) provided evidence for a moderately strong positive relationship between GPAs and ACT composite score. The results of the Fisher's *z* test indicated that the two correlations are significantly different, z = 2.53, p = .011). The relationship between GPAs and ACT composite scores was stronger for female students than it was for male students.

H19. The relationship between students' ACT composite scores and their GPA is affected by race.

Before testing H19, the sample data was disaggregated by race (minority, non-minority). A Pearson product moment correlation coefficient was calculated to index the

strength and direction of the relationship between ACT composite scores and GPAs for minority students, and a Pearson product-moment correlation coefficient was calculated to index the strength and direction of the relationship between ACT composite scores and GPAs for non-minority students. A Fisher's *z* test was conducted to test H19. The two sample correlations were compared. The level of significance was set at .05. The correlation for minority students (r = .558) provided evidence for a moderately strong positive relationship between GPAs and ACT composite score. The correlation for non-minority students (r = .393) provided evidence for a moderately strong positive relationship between student GPA and ACT composite score. The results of the Fisher's *z* test indicated that the two correlations were significantly different, $z = 2.53$, $p = .011$. The relationship between GPAs and ACT composite scores was stronger for minority students than it was for non-minority students.

H20. The relationship between students' ACT composite scores and their GPA is affected by SES.

Before testing H20, the sample data was disaggregated by SES (full/reduced, free pay). A Pearson product moment correlation coefficient was calculated to index the strength and direction of the relationship between ACT composite scores and GPAs for full-pay students, and a Pearson product-moment correlation coefficient was calculated to index the strength and direction of the relationship between ACT composite scores and GPAs for free and reduced lunch students. A Fisher's *z* test was conducted to test H20. The two sample correlations were compared. The level of significance was set at .05. The correlation for free and reduced lunch students (r = .433) provided evidence for a moderately strong positive relationship between GPA and ACT composite score. The

correlation for full pay lunch students (r = .595) provided evidence for a moderately strong positive relationship between GPAs and ACT composite score. The results of the Fisher's z test indicated that the two correlations were not significantly different, z = -1.32, p = .187. The relationship between GPAs and ACT composite scores for free and reduced lunch students was not different from the relationship between GPAs and ACT composite scores for full pay lunch students.

Summary

The results from research question one and two indicate that students taking AP courses in math, English, reading, and science scored higher on the ACT subtests than students who do not enroll in AP courses. The variables of gender, race, and SES did not have an impact on the ACT subtest scores with the exception of science. The results from the science data indicate that a student's race made a significant difference between the students who enrolled in AP courses and students who did not enroll in an AP course.

The results from research question three indicated students with higher GPAs tended to score higher on the ACT and students with lower GPAs tended to score lower on the ACT. The results from research question four concluded that the relationship between GPA and ACT composite scores was stronger for female students than for male students. The relationship between cumulative GPA and ACT composite scores was stronger for minority students than for non-minority students. The conclusion to research question four was the relationship between GPA and ACT composite scores for full pay students was not different from the relationship between GPA and ACT composite scores for reduced lunch students.

Chapter four provided the hypothesis testing results. In chapter five, a study summary, which consisted of the overview of the problem, purpose statement and research questions, review of the methodology, and major findings is presented. In addition, chapter five includes the findings related to the literature, conclusions, which included implications for action, recommendation for future research, and concluding remarks.

Chapter Five

Interpretation and Recommendations

Student preparation for a standardized test is a common topic in education. Students who enroll in more rigorous high school courses have continuously performed better on the ACT than students who do not take rigorous course work (McKillip & Rawls, 2013). School districts have been challenged to close the achievement gap and to raise student scores on the ACT. This study was conducted to determine the differences between student curricular paths (AP or regular), and their ACT subtest scores. Next, this study was conducted to determine the relationship between students' ACT composite scores and their GPA. Also, the study was conducted to determine whether the relationships were affected by the student demographic variables of gender, race, and SES. Chapter five includes a summary of the study, findings related to the literature, and a conclusion that includes implications for action, recommendations for future research, and concluding remarks.

Study Summary

College and career readiness is a focus for school districts across the country. The objective is to prepare students for academic success no matter what they decide to pursue after high school. Often standardize test scores determine what path students take, which can be a barrier for many students, especially students of color. In the state of Kansas, there is a large gap between minority and non-minority students' scores on the ACT (ACT, 2015). Strategies for increasing academic rigor in the classroom and the relationship to success on the ACT have been studied to determine best practice in increasing ACT scores. This study reported that the differences in ACT scores on the

subtests of math, English, reading, and science between students enrolled in different curricular path (AP or regular). The relationship between students' ACT composite score and GPA was also studied. Whether the student demographic variables of gender, race, and SES affected the differences in ACT scores of subset test math, English, reading, science between students enrolled in different paths (AP or regular) and the relationship between students' ACT composite scores and the student GPAs was also explored. Provided in the following sections are an overview of the study by reviewing the problem, purpose statement and research questions, review of the methodology, and major findings.

Overview of the problem. Research has been conducted on variables that affect student ACT scores. The results of the research have provided insights for school districts that are analyzing academic achievement and implementing best practices to close the achievement gap and prepare all students to perform well on the ACT. While some researchers continue to seek specific answers to closing the gap between White and minority students, few studies have analyzed a students' curricular path to determine if it affects their ACT score. Therefore, it was important to determine if students' GPAs or curricular path (AP or regular) affected their ACT scores. Additionally, there was a need to determine whether students' gender, race, SES, and GPAs affected the differences in students' ACT scores between students who enrolled in AP courses and those who enrolled in regular courses.

Purpose statement and research questions. The first purpose of the study was to determine if there was a difference in ACT scores on the subtests of math, English, reading, and science between students enrolled in different curricular paths (AP or

regular). The next purpose of the study was to determine if the differences in ACT scores on the subtests of math, English, reading, and science between students enrolled in different paths (AP or regular) are affected by the student demographics of gender, race, and SES. The third purpose of this study was to determine if there is a relationship between students' GPAs and their ACT composite scores. The final purpose of this study was to determine if the relationship between students' ACT composite score and their GPA was affected by the student demographic variables of gender, race, and SES. To guide this study, four research questions were developed, and 20 hypotheses were tested to address the purposes of the study.

Review of the methodology. Students enrolled in the Sunflower School District during 2013-2014 and 2014-2015 school year who took the ACT were included in this study. A quantitative correlational design using archival data with five independent variables was employed in this study. The five independent variables included curricular path (AP or regular), student GPA, gender, race, and SES. The dependent variables were math, English, reading, and science ACT subscores and the ACT composite scores. One-sample *t* tests, two-factor ANOVAs, Fisher *z* tests, and a Pearson product correlation were conducted to test the hypotheses.

Major findings. The results of the data analysis indicated that students who enrolled in at least one math, English, or science AP course performed better on the ACT math, English, reading, or science subtests respectively than students who enrolled in regular courses. The demographics did not affect differences for math, English, and reading, but race had an effect on the difference for science. Minority students who

enrolled in at least one AP science course performed better on the ACT science subtest than did minority students who enrolled in the regular science courses.

The results of the data analysis indicated that students with higher GPAs tended to have higher composite scores and students with lower GPAs tended to have lower ACT composite scores. The results of data analysis that indicated the relationship between GPAs and ACT composites scores was stronger for female students than for male students. The relationship between GPAs and ACT composite scores was stronger for minority than it was for non-minority students. Lastly, the results indicated the relationship between GPAs and ACT composites scores for full pay lunch students was not different from the relationship between GPAs and ACT composites scores for reduced lunch students.

Findings Related to the Literature

This section examines the current study's findings as they relate to the literature regarding the difference in ACT scores between students enrolled in different curricular paths (AP or regular) and whether the differences were affected by the student demographic variables of gender, race, and SES. Also, this section will also examine the current study's findings as they relate to the literature regarding the relationship between students' ACT composite scores and their GPAs. Previous research has been conducted by looking at what influences ACT scores (Mo et. al, 2011; Ginstead, 2013; Jones, 2008; Roberts &Noble, 2004). The findings from this study support the research in the literature review. Ringo (2008) discussed ACT scores of students in urban areas indicating some key finding about minority students and what affects their success on the ACT. In school two, Ringo found that having a culture that focused on achievement

made the demands to close the achievement gap less intense. Ringo (2008) indicated that there is value in district and building leadership. A leader, who is trying to close the achievement gap between subgroups, can influence school climate to impact student and teacher relationships. However, the results of this study suggested that the demographic variable of gender, race, and SES did not have a significant effect on ACT scores, with the exception of science in which race made a difference. The current study was conducted in a suburban area where the population of minority students is growing but not the predominant race.

Theokas and Saaris (2013) stated that millions of low-income families and students of color were not taking AP courses. The results from this study indicated that the minority students in the Sunflower School District are not enrolling in AP courses. This study was conducted in a middle-class, affluent area, which provides the ability to all students the opportunity to enroll in AP courses. The findings from this study are consistent with Theokas and Saaris regarding minority students not enrolling in AP courses. According to Bland and Neve (2002) and Education Trust (2006), minorities and students with low SES do not perform well on standardize test such as the ACT. This study found that in all core content areas except science, the demographic variables of student gender, race, and SES did not have a significant effect on students' ACT scores. The results of the study indicated that there were gaps between Asian and White students test scores in comparison to Black, Hispanic, and Multiracial students. The results from this study were consisted with the research from Education Trust because Asian and White students outperformed Hispanic, Black, and Multiracial students on the ACT.

Researchers (Mo et al., 2011; Jones, 2008; Noble & Schnelker, 2005; Roberts & Noble, 2004; Schiel et al., 1996) reported that students who enroll in AP courses performed higher on the ACT than students who are enrolled in regular courses. The results from this study supported prior research. In every content area, students who enrolled in AP courses performed better on the ACT than students enrolled in regular classes. The results of the current study indicated the variables of gender, race, and SES did not affect the differences in the ACT subscores, except in the area of science. The results of this study are in contrast to Ginstead (2013) who reported that ACT math scores were influenced by race and gender for students who were enrolled in AP courses. However, race affected the ACT science subscores in the current study. The findings from the current study are consistent with the research findings of Roth et al. (2007) and Woodruff and Ziomek (2004), who found that students who pass rigorous courses do better on the ACT.

The results from this study indicated if a student had a higher GPA then they had a higher ACT composite score. The results also indicated that gender, race, and SES did not significantly affect the relationship between students' GPAs and ACT composite scores. The results of both Bolek's (2011) and Mahlum's (2015) studies suggested that teacher relationships and having access to rigorous coursework were more important than the student's GPA when determining what influences enrollment in AP courses. Their research demonstrated that students with C average GPAs did well on the ACT exam. However, they were enrolled in AP classes, which prepared them for the test. In the current study, the results indicated that student GPA was an indicator of ACT

performance and that the student demographic variables of gender, race, and SES did not affect the relationship.

Conclusions

The Sunflower School District is faced with encouraging all students, especially minority and low SES students to enroll in AP courses to help prepare them for the ACT exam. The results of the current study indicated that students who enroll in AP courses in the four content areas performed better on the ACT subtests than students who enrolled in regular courses. The findings from this study have implications for district and building administrators to be intentional on providing access to more rigorous courses to all students. The findings from the study should encourage building leaders to work with counselors and teachers to develop criteria for students to enroll in AP courses and to create a plan to support any student who wants to enroll in an AP course.

Implications for action. The data indicated that students who enrolled in AP courses performed better on the ACT exam. Minority students do not enrolled in AP courses at the same rate of non-minority students. The results of the current study have implications for building leaders to work with counselors and teachers to identify all students who would benefit from being enrolled in AP courses. Based on the findings of the present study the Sunflower School District should survey teachers and parents of minority students to determine why these students are not enrolling in AP courses. The counselors could implement information nights for parents and students to learn about the AP Program. A process to identify potential students could be developed to help recruit students who are capable of performing well in AP courses. The district and building leaders should make diversity in AP courses a goal to emphasize that providing access to

rigorous courses is for everyone. If the Sunflower School District continues to allow teachers and students to dictate what classes students enroll in, then some students who are capable of success in AP courses will continue to take regular courses. The emphasis on district and building leadership might make the difference in teachers and counselors recruiting all students to enroll in AP courses. However, the district and building leaders must be on board with the initiative to recruit students who are more diverse to enroll in AP courses.

Furthermore, the current study has implications that there are significant differences in ACT science subtest scores between minority students enrolled in AP courses and minority students enrolled in regular courses. The Sunflower School District should encourage minority students to enroll in the AP science courses. Perhaps implementing a tutoring program to help minority students might increase the support needed to be successful in the science courses. Teachers could be strategic in inviting underperforming students to sessions to work on science skills.

The results of this study indicate that being enrolled in AP courses benefits students and helps prepare them for the ACT. The Sunflower Public School District should provide professional development and training for staff on some of the AP strategies and activities to enhance the rigor of all classes. Therefore, no matter what path students take in high school they will have exposure to a curriculum that prepares them for college and career opportunities. The professional development could also include strategies to help teachers build relationships with students and parents. The teachers could provide tutoring sessions or study halls outside the school day to support students who need additional help. The challenge will be to provide support for students

who enroll in AP courses that might not ordinarily be in the class and to help change the perception of teachers who philosophically disagree with opening AP courses up to everyone.

Finally, this study has implications for district administrators to evaluate the consistency across the district of what ACT prep courses are available in the high schools. The district administrators could also look at implementing ACT strategies in elementary and middle schools within the curriculum. Also, providing training to all teachers, not just AP teachers, about best practice or strategies that are used in AP courses and make them building wide.

Recommendations for future research. Several recommendations have been generated to help close the gap between minority and non-minority students ACT scores. The first recommendation is replicate the study in all school districts in Kansas. This expanded study could provide research that allows for the comparison of districts of various sizes and student demographics on the variables included in this study.

The second recommendation is to conduct a qualitative study with a survey research design. Students could be surveyed to determine why they do not enroll in AP courses. The study would allow student interviews and gain valuable insight on the factors that are keeping them from enrolling in AP courses or how they feel about what affects their ACT scores. Parents, teachers, and staff could be surveyed to determine what barriers are in place that hinder minority students from enrolling in AP courses. The benefit from this study might help school districts develop a criteria or structure to provide a more diverse population of students enrolling in AP courses.

The third recommendation is to conduct a similar study that analyzes students' enrollment in different AP courses that were not analyzed in this study (AP World History, AP U.S. History, AP Governmental and Politics, and AP European History) to determine if there is an affect on ACT English and reading subscores. Additionally, the examination of different variables such as participation in athletic or other extracurricular activities might provide additional insights into student achievement. The results could provide data on student athletes ACT scores and AP enrollment in comparison to students who are not involved in sports or extracurricular activities.

The fourth recommendation is to conduct a similar study that analyzes students who took an AP exam and passed and how their ACT score was in comparison of students who took AP courses but did not take or pass the AP exam. The study would provide insight on the importance of passing the AP exam. This study could demonstrate that by not only having access to the AP curriculum but also passing the test, all students could be successful on the ACT.

Concluding remarks. The Sunflower School District has done relatively well increasing student ACT scores over the past five years. The gap between subgroups may continue to be present if the district is not intentional in providing access to rigorous coursework for all students who are willing to work hard. The Sunflower Public School District should create a universal ACT prep course within the school district that implements ACT concepts in the curriculum. Implementing ACT benchmarks into the curriculum could help prepare students as early as middle school on related content items to help prepare students for the exam. Additionally, by implementing ACT standards into the curriculum, it would encourage every teacher to teach the concepts. Currently,

there is not set program district wide and different programs are taking place at each high school.

The Sunflower Public School District needs to develop a process for all students to enroll in AP courses. By developing a structure to recruit students into the AP program, more students will have access to the rigorous curriculum. Currently, the system relies on individual teachers and counselors to encourage the specific student to enroll in AP courses. School districts must be consistent across the entire district and not allow schools to have autonomy or develop their programs. Actions such as this create equity problems, which were indicated in the results of minority students ACT scores being affected in the science subset ACT scores.

The study results helped alleviate the stereotypes that gender, SES, and race have a significant impact on ACT scores. Race was the only variable that affected the science ACT subset scores. However, the school district should be aware of the lack of diversity in AP courses and determine the reasons minority students do not enroll in AP courses. The task of closing the gap between subgroups can be challenging in any school district. Being intentional and developing specific strategies to implement programs district wide to help all students prepare for the ACT is key to be college and career ready. Therefore, developing criteria for the enrollment of the AP program, engaging parents and minority students about the benefits of taking AP courses might dispel the myth that AP courses are not for them.

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Appendices

Appendix A: Sunflower Public School District Application Proposal

APPLICATION TO CONDUCT RESEARCH IN [redacted] PUBLIC SCHOOLS

Name Keith Jones Local Address 1003 Alma Drive Lawrence, KS 66049

Email Address Kjones@tps501.org

[redacted]ary 29, 2016 Department Baker University Phone 785-218-9895

IRB (Protection of Human Subjects of Research) approval number

Date granted

State briefly the purposes of the study and summarize the procedures to be employed including unique educational values to the Lawrence schools.

The purpose of this study was to determine the relationship between students' curricular paths (AP or Regular) and their ACT scores. The second purpose of this study was to determine whether the relationship between students' curricular paths (AP and Regular) and their ACT scores is affected by the student demographic variables of gender, race, and SES. The third purpose of this study was to determine the relationship between students' GPAs and their ACT scores. The final purpose of this study was to determine if the relationship between students' ACT scores and their GPAs is affected by the student demographic variables of gender, race, and SES.

The significance of this study is that the Sunflower School District may be able to determine if the curricular path a student takes (AP or regular) impacts their ACT score. Currently, there are no criteria to enroll in an AP course in the Sunflower School District. Also, learning the demographics of a student's race, gender, and SES and if it influences a student's ACT score might help the district create programs or interventions to address the areas of deficiency. The study could help teachers and counselors communicate with parents about their students' needs to increase their ACT scores. The study could highlight the positives effects of enrolling in specific AP courses that could help increase a students' ACT scores. This study could provide insight into the type of curriculum that could help prepare students for higher educational institutions. This study is valuable because it could help the Sunflower School District put strategies together to close the gap between white students and students of color.

School(s) and/or grades(s) to be involved District Data of High School Students 10-12

We are requesting archival data. There will be no contact with any students.

Number of pupils or subjects involved Grade levels(s) 10-12

Starting date Feb. 29. 2016

Amount of pupil/subject time required Ending date

Date project report available

By signing below the researcher agrees:

- ◊ to respect the highly confidential nature of the information collected.
- ◊ to reimburse the district for any additional district staff time required to complete the project.
- ◊ that data collected in connection with an approved study may not be used for purposes other than those stated on this application form.
- ◊ to obtain specific approval prior to publication of such research (other than as specified in this proposal).

Signature of Applicant _____

Signature of Department Chairperson _____

Date Approved _____ Date Denied _____

_____

[redacted]

Director Assessment, Research, and School Improvement

Appendix B: Sunflower Public School District Approval Letter

March 15, 2016

Mr. Keith Jones
1003 Alma Drive
Lawrence, KS 66049

Re: RS4875

Dear Keith,

Your application to conduct research in the [redacted] Public Schools has been reviewed and approved. While we recognize the importance of your research, it may not interfere with the district's educational program. At all times during your project, researchers and subjects must be in view of school district staff. All costs associated with this research are the responsibility of the researcher. Any changes in your project must have approval from this office prior to implementing the changes.

Please note that your research project has been assigned [redacted] Public Schools research number RS4875. Your permission to conduct research in the District expires one year from the date of this notice. If your project is to extend beyond this date, you will need to reapply for authorized permission prior to the expiration date and obtain the requisite principal signature(s). Failure to reapply will result in the inability of the principal investigator to conduct further research in the [redacted] Public Schools. Until such time as a new application to conduct research is approved by the district's Institutional Review Board, no research may be conducted. Thank you for your cooperation with our district policies and procedures.

We request that you submit an abstract of your findings as soon as they are available for possible dissemination among interested educators. We appreciate your interest in [redacted] Public Schools and hope that meaningful data is gained from your efforts.

Sincerely,

[redacted]
Director, Assessments, Research, and School Improvement

Enc: Principal's Consent Form

CC: Baker University IRB
[redacted], Assistant Superintendent, Teaching & Learning

Appendix C: Baker IRB Proposal Application

BAKER UNIVERSITY

SCHOOL OF EDUCATION
GRADUATE DEPARTMENT

Date:
IRB PROTOCOL NUMBER _____
(IRB USE ONLY)

IRB REQUEST
Proposal for Research
Submitted to the Baker University Institutional Review Board

I. Research Investigator(s) (Students must list faculty sponsor first)

Department(s) **School of Education Graduate Department**

Name	Signature	
1. Dr. Susan Rogers	Susan K Rogers	Major Advisor
2. Margaret Waterman	Margaret Waterman	Research Analyst
3. Dr. Verneda Edwards		University Committee Member
4. Dr. Angelique Nedved		External Committee Member

Principal Investigator: Keith Jones
Phone: 785-218-9895
Email: wiz0115@aol.com
Mailing address: 1003 Alma Dr., Lawrence, KS 66049

Faculty sponsor: Dr. Susan Rogers
Phone: 913-344-1226 (office) 785-230-2801 (cell)
Email: srogers@bakeru.edu

Expected Category of Review: _X_ Exempt ___ Expedited ___ Full

II: Protocol: (Type the title of your study)

The Impact of Students' Curricular Paths and Their GPA on ACT Scores

Summary

In a sentence or two, please describe the background and purpose of the research.

The [redacted] Public School District is scoring above the state and national ACT average with an average of 23.7%. Over the past 10 years, the [redacted] student demographics have become more diverse. Despite the above average ACT scores there is a distinct gap between white and students of color ACT scores. The purpose of this study is to determine the difference in ACT subscores (math, English, reading, science) between students enrolled in different curricular paths (AP or regular). The second purpose of this study is to determine the relationship between student GPAs and ACT composite score. Additionally, the purpose is to determine whether the difference in ACT subscores (math, English, reading, science) between students enrolled in different curricular paths (AP or regular) and the relationship between student GPA and ACT composite score are affected by the student demographic variables of gender, race, and SES.

Briefly describe each condition or manipulation to be included within the study.

There are no conditions or manipulations in this study.

What measures or observations will be taken in the study? If any questionnaire or other instruments are used, provide a brief description and attach a copy.

The investigator has received permission from the [redacted] Public School District to use archival data for this study. The student information will be provided by [redacted] Data Department that list student gender, race, SES, ACT scores, and the AP courses taken.

Will the subjects encounter the risk of psychological, social, physical or legal risk? If so, please describe the nature of the risk and any measures designed to mitigate that risk

Since only archival data will be used in this study, no subject will encounter the risk of psychological, social, physical, or legal risk.

Will any stress to subjects be involved? If so, please describe.

There will be no stress to subjects involved in this study.

Will the subjects be deceived or misled in any way? If so, include an outline or script of the debriefing.

No participants will not be deceived or misled in this study.

Will there be a request for information which subjects might consider to be personal or sensitive? If so, please include a description.

None of the information is considered sensitive. Students will be identified as Student 1 and so on without revealing any participants names.

Will the subjects be presented with materials which might be considered to be offensive, threatening, or degrading? If so, please describe.

There will be no materials that might be considered offensive, threatening, or degrading presented to study participants. The data given to the investigator will not have any names included; therefore the investigator will not know who the students are participating in the study.

Approximately how much time will be demanded of each subject?

There will be no additional time demanded of participants in this study as archival data will be used.

Who will be the subjects in this study? How will they be solicited or contacted? Provide an outline or script of the information which will be provided to subjects prior to their volunteering to participate. Include a copy of any written solicitation as well as an outline of any oral solicitation.

The data provided for this study will be for students in the [redacted] School District who took the ACT during the 2013-2014 and 2014-2015 school years. Subjects will not be contacted as the data collected is archival in nature.

What steps will be taken to insure that each subject's participation is voluntary? What if any inducements will be offered to the subjects for their participation?

Student's ACT scores and information are archival data; therefore, steps for voluntary participation are not warranted. There are no inducements to participate in this study.

How will you insure that the subjects give their consent prior to participating? Will a written consent form be used? If so, include the form. If not, explain why not.

Archival district data will be used; therefore, a written consent form is not necessary.

Will any aspect of the data be made a part of any permanent record that can be identified with the subject? If so, please explain the necessity.

In this study, there will be no permanent record that can be identified with the subject.

Will the fact that a subject did or did not participate in a specific experiment or study be made part of any permanent record available to a supervisor, teacher or employer? If so, explain.

There will be no permanent record that will be made available to a supervisor, teacher, or employer.

What steps will be taken to insure the confidentiality of the data? Where will it be stored? How long will it be stored? What will be done with it after the study is completed?

Student names will be removed from the archival data and replaced with numbers. The data compiled for the study will be in a spreadsheet kept on a flash drive by the researcher. The researcher will keep the information up to three years after the study and after that period of time the data will be destroyed.

If there are any risks involved in the study, are there any offsetting benefits that might accrue to either the subjects or society?

There are no risk involved in participating in this study.

Will any data from files or archival data be used? If so, please describe.

The data used from this study is archival data from student's ACT scores during the 2013-14 and 2014-15 school year. The other data utilized in this study were specific to student's gender, race, and SES.

Appendix D: Baker IRB Acceptance Approval Letter

Baker University Institutional Review Board

02/22/16

Dear Keith Jones and Dr. Rogers,

The Baker University IRB has reviewed your research project application and approved this project under Expedited Status Review. As described, the project complies with all the requirements and policies established by the University for protection of human subjects in research. Unless renewed, approval lapses one year after approval date.

Please be aware of the following:

1. Any significant change in the research protocol as described should be reviewed by this Committee prior to altering the project.
2. Notify the IRB about any new investigators not named in original application.
3. When signed consent documents are required, the primary investigator must retain the signed consent documents of the research activity.
4. If this is a funded project, keep a copy of this approval letter with your proposal/grant file.
5. If the results of the research are used to prepare papers for publication or oral presentation at professional conferences, manuscripts or abstracts are requested for IRB as part of the project record.

Please inform this Committee or myself when this project is terminated or completed. As noted above, you must also provide IRB with an annual status report and receive approval for maintaining your status. If you have any questions, please contact me at CTodden@BakerU.edu or 785.594.8440.

Sincerely,

Chris Todden EdD
Chair, Baker University IRB

Baker University IRB Committee
Verneda Edwards EdD
Sara Crump PhD
Erin Morris PhD
Scott Crenshaw