The Relationship of Student Course Selection and Course Rigor Level Scores to Student Performance on the ACT

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Abstract

The purpose of this study was to determine whether there are correlations between ACT subtest scores (mathematics, English, reading, and science) and core course rigor level scores (mathematics, English, social studies, and science) and whether the correlations between ACT subtest scores and core course rigor level scores were affected by the student demographic variables of gender and socioeconomic status (SES). Another purpose of this study was to determine whether there are differences in ACT subtest (mathematics, English, reading, and science) and composite scores between students who completed an ACT Prep course and students who do not complete the ACT Prep course and whether the differences were affected by the student demographic variables of gender and SES. A quantitative methods research design using archival data with four independent variables (high school student course selection and core course rigor level, student enrollment in the ACT Prep course, gender, and SES) and five dependent variables (math, English, reading, and science ACT subtest scores and the ACT composite score) were used in this study. The participants in this study were high school students who graduated from District B in May 2017 and 2018. The sample was limited to high school students who took the ACT during the spring semester of their junior year, spring of 2016 or 2017, and attended the high school in District B their freshman, sophomore, and junior year.

Results of the data analysis indicated moderately strong positive relationships between course rigor levels and ACT subtest scores. As course rigor level scores increased, the scores on the ACT subtests increased. Demographics (gender and SES) did not affect the relationship between ACT subtest scores and course rigor levels. There

was a difference in ACT English subtest scores between students who completed an ACT prep course and those who did not. Students who took the ACT prep course did better on the English subtest than students who did not take the course. No differences were indicated in ACT mathematics, reading, and science subtest scores between students who completed the ACT prep course and those who did not. Lastly, demographics (gender and SES) did not affect differences in ACT scores between students who completed an ACT prep course and students who did not complete an ACT prep course. Based on the findings of this study, it is recommended that school district faculty encourage all students to take the most rigorous courses to raise student achievement, regardless of their SES status or gender. Recommendations for further research included replicating this study in other districts including urban and suburban districts to include additional subgroups such as ethnicity and utilize a mixed methods approach to evaluate student and teacher perceptions of ACT preparation and current curriculum.

Dedication

This dissertation is dedicated to my mom, dad, husband, and my three children, Cassandra Rueckert, Matthew Peek, and Joshua Peek. My mother has been my example of always doing your best, working hard, and never giving up. You gave up a lot having me at a young age and making our family a priority. You worked countless hours in a factory and sometimes a second job just to make sure my sisters and I had our needs met. You taught us the importance of education and finding a job that we enjoyed. Thank you for always being the rock in our lives. To my dad, although you have not been with me throughout this process, in body, I know you have in spirit. I get a chuckle thinking about the conversations we would be having regarding this degree. I love you and wish you were here.

To my husband and children, thank you for encouraging me when I was overwhelmed. You were my inspiration to continue to the end and not give up. Although I did not need to prove anything to you, I did for myself. Thank you for allowing me to do so with love and encouragement. Thank you for having faith that I could complete this process even when I was not so sure myself. As in life, this degree shows that taking one step forward, no matter how small, can get you to the finish line. Once you accomplish the goal, you will be amazed to see how far you have come and how much you can do. I love you and thank you for all your support.

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Chapter 1

Introduction

When students graduate from high school, the diploma they receive is evidence of the knowledge they have gained in preparation for a career or college admission. However, some students who graduate from high school lack the knowledge to meet admission requirements of colleges or must take remedial courses once accepted to a four-year college indicating that they have not been adequately prepared (Merisotis & Phipps, 2000; Strong American Schools, 2008). College readiness, as defined by Conley (2007), is the "level of preparation a student needs in order to enroll and succeed — without remediation — in a credit-bearing general education course at a postsecondary institution that offers a baccalaureate degree" (p. 6). Conley (2012) identified four components of college readiness: cognitive strategies, content knowledge, learning skills and techniques, and transition knowledge and skills. The content knowledge and learning skills needed for college readiness are the same knowledge and skills needed to prepare students for a career (Conley, 2012). Without these skills and this specific knowledge, students might not find success in college or a career.

To ensure students' college and career readiness, the Missouri Department of Elementary and Secondary Education (MO DESE, 2018b) started an initiative in 2017 called Show Me Success "to ensure all Missouri students graduate ready for success" (p. 3). The mission of the Show Me Success initiative is to "guarantee the superior preparation and performance of every child in school and in life" (MO DESE, 2018b, p. 2). Student performance is used to evaluate progress in these efforts. Two tools used to measure student performance are assessments and college and career ready measures

(MO DESE, 2018c, p. 3). The ACT is an example of measuring student performance through assessments (MO DESE, 2018c, p. 3). The number of students enrolled in and successfully completing dual credit classes, which are courses that provide both high school and college credit, are examples of measuring student performance through College and Career Ready Measures (MO DESE, 2018c, p. 3). The ACT composite scores of students within a district are used as assessment while the ACT subtest (mathematics, English, reading, and science) scores may be used to determine which students can enroll in dual credit courses. When they are used to determine enrollment, they become College and Career Ready Measures. Students cannot enroll in a high school dual credit course if they do not meet college requirements for a particular course, which can be based on the ACT subtest score they obtained. An example is the requirement of an ACT subtest score of 22 or higher on the mathematics subtest to take dual credit college algebra (Missouri Western State University, 2018). For dual credit courses not requiring an ACT subtest score, a student's grade point average is utilized. Without an adequate ACT subtest score, students will not be able to enroll in some dual credit courses; therefore, limiting the opportunity for increasing the College and Career Ready Measure score. In order to determine if students are prepared to take college courses, benchmark scores are used because ACT (2013a) found that students who meet ACT benchmark scores in the four subtests are approximately 50% more likely to earn a B and 75% more likely to earn a C or better in "typical credit-bearing first-year college courses" and "are more likely than those who do not to persist in college and earn a degree" (ACT, 2013a, p. 1). Beginning in 2014, Missouri required school districts to administer the ACT to at least 95% of the juniors as part of their College and Career

Readiness (CCR) evaluation in each district's Annual Performance Report (State Supervisor-Area H, personal communication, March 21, 2018).

Four-year colleges and universities utilize a college admission test, such as the ACT, as a means of predicting early success in college (Syverson, 2007). The curriculum is a key factor in the preparation of students for success on the ACT which is "a curriculum-based achievement assessment that measures the skills taught in schools and deemed important for success in first-year college courses" (ACT, 2013a, p. 3). Dougherty and Mellor (2009) recommended students begin and complete a challenging college preparatory curriculum that is supported by ACT research. Districts attempt to align their curriculum to the ACT standards and utilize the ACT for student outcomes.

As states have developed standards, which districts use as a foundation for developing curriculum, 41states have adopted the Common Core State Standards (Common Core State Standards Initiative [CCSSI], 2018a). The CCSS are a rigorous set of standards anchored in college and career readiness skills and knowledge (Center on Education Policy, 2011). The CCSSI (2018b) provide "clear and consistent learning goals to help prepare students for college, career, and life" from state to state (para. 1). Educators want to provide students with a set curriculum that may help them in preparation for the ACT. Studying the relationship between the curriculum students are taught, and their ACT composite and subtest scores can assist educators in determining if the curriculum is adequately preparing students for their future.

Background

This study was conducted in District B, a rural school district located in northwest Missouri. In 2017, 2,479 pre-kindergarten through 12th-grade students were enrolled in

the district (MO DESE, 2017). District B consists of four elementary schools (grades Pre-K-5), one middle school (grades 6-8), and one high school (grades 9-12). Of the 2017 student population, 93.3% identified themselves as Caucasian; other groups such as Hispanic and Asian enrollments were omitted due to a small sample size because of a lack of student enrollment with those characteristics (MO DESE, 2017). In 2017, District B had an average student to teacher ratio of 18:1, with an average student to administrator ratio of 178:1 (MO DESE, 2017). Of the district's students, 36% were enrolled in the free or reduced lunch program (MO DESE, 2017).

During the 2016-2017 school year, the student population of the high school in District B consisted of 750 students with 93.7% identifying as Caucasian and 29% being eligible for the free and reduced lunch program (MO DESE, 2017). Upon graduation, approximately 48% of students enrolled in a four-year college in 2017, and 5% enrolled in a two-year college (MO DESE, 2017). The high school offers a curriculum with courses of varying levels of rigor. These courses are designated as regular (level 1), honors (level 2), or college preparatory (level 3). Each of the three designations includes both core and elective courses (District B High School, 2017). The courses are weighted by the level of rigor associated with the class. Level 1 courses are weighted 1.0, level 2 courses are weighted 1.3, and level 3 courses are weighted 1.5 (District B High School, 2017). These weights are set by the school district as part of the calculation of a student's class rank (District B High School, 2017). The grade a student receives for each course they take is multiplied by the course weighting as determined by the type of course it is (regular, honors, or college preparatory). The total is divided by the number of courses the student completes to determine the student's weighted grade point average. The

weighted grade point average is used to determine the student's class rank. The higher the weighted grade point average, the higher the student's class rank (District B High School, 2017). The following table depicts each of the courses for each of the high school core subjects and its level of rigor.

Table 1

District B High School Core Courses and Course Rigor Level

Curricular Area	Level 1 (WT = 1.0)	Level 2 (WT = 1.3)	Level 3 (WT = 1.5)
Language Arts	Reading	Debate & Forensics	College English
	[a]Lit & Comp I/II/III/IV	Honors Lit & Comp I	[b]AP English Language
	Oral Communication I/II	Honors Lit & Comp II	
	Reading Enhancement I/II	Honors Lit & Comp III	
	Scholastic Journalism	Honors Lit & Comp IV	
	Speech I/II		
	Creative Writing I/II		
Mathematics	Math 9 & 10	Honors Algebra I	Pre-Calculus
	[c]HTC Math	Honors Geometry	College Algebra
	Algebra I/II	Honors Algebra II	College Calculus
	Geometry	Statistics	
	Financial Algebra	Trigonometry	
Social Studies	Geography	Honors US History	College History 200
	US History	Honors World History	College History 210
	World History	AP US History Prep	College History 213
	Government		AP Government & Politics
	Current Events		AP US History
	Psychology I/II		
	Global Studies		
Science	Science Exploration	Honors Science Exploration	Honors Chemistry
	Biology	Honors Biology	Honors Physics
	Microbiology	Chemistry	College Chemistry
	Environmental Science	Human [d]A & P	College Biology
	Human Genetics	Zoology	AP Biology

Note. Adapted from *Career and Educational Planning Guide,* District B High School, 2017.

[a]Lit & Comp = Literature and Composition (written);

[b]AP = Advanced Placement; HTC = Hillyard Technical Center; and

[c]A & P = Anatomy and Physiology.

One of the regular elective courses offered at the high school is a one-semester ACT Prep course (District B High School, 2017). The course is offered during each student's junior and senior year of high school and is taught by three teachers (District B High School, 2017). Each teacher teaches one of the three content areas: English and reading, mathematics, and science. Throughout the semester, students rotate among the different teachers to gain knowledge about a specific subject related to the ACT.

Each subtest of the ACT corresponds to a core subject in high school. The mathematics subtest corresponds to the curriculum taught in mathematics courses, the English subtest corresponds to the English courses, the reading subtest corresponds to social studies courses, and the science subtest corresponds to the curriculum taught in science courses (ACT, 2013b). The Missouri DESE collects data each year regarding ACT composite scores. District average composite and subtest scores are provided to the district by the ACT. The district's annual average ACT composite score is reflected in their student performance data provided to MO DESE (2016). Table 2 includes District B and Missouri's ACT average composite scores and the percentage of students taking the ACT from 2014 to 2017.

Table 2

District B and Missouri Average ACT Composite Scores and Percentage of Students Taking the ACT

	Academic Year		
	2014-2015	2015-2016	2016-2017
District B ACT Composite	21.2	20.1	20.4
Missouri ACT Composite	21.4	20.0	20.2
District B % of Students Taking ACT	73.8	94.4	95.1

Note. Adapted from *District B District Report Card*, by Missouri Department of Elementary and Secondary Education, 2017. Retrieved from https: //mcds.dese.mo.gov/guidedinquiry/Pages/Accountability

As part of MO DESE's evaluation of districts within the State of Missouri, districts receive an Annual Performance Report. Within this report, the district receives points for student performance in CCR. The three indicators for the CCR strand are CCR assessments, Advanced Placement (number of students enrolled), and Postsecondary Placement (number of students enrolled in post-secondary education after graduation). The ACT is one of the tests within the CCR assessments. District points are received based on the average student ACT composite score (MO DESE, 2016). In Table 3, a breakdown of the point system related to ACT composite scores can be found. If a student does not earn an adequate score (less than 22), the student is assigned a 0-0.75 point. The district points earned are an average of students' points earned (MO DESE, 2016).

Table 3

Missouri School Improvement Program 5: College and Career Readiness Assessment ACT Score Matrix

Student ACT Composite Score	District Points Earned
No Participation	0.00
<18	0.25
18-21	0.75
22-25	1.00
26-36	1.25

Note. Adapted from *Comprehensive Guide to the Missouri School Improvement Program*, by Missouri Department of Elementary and Secondary Education, 2016. Retrieved from https://dese.mo.gov/sites/default/files/MSIP_5_2016_Comprehensive_Guide.pdf

Although there are other instruments that can be used as assessments or College and Career Readiness Measures in the district (i.e., Armed Services Vocational Aptitude Battery, Industrial Recognized Credential [IRC], and Missouri Assessment Program), the ACT provides the most efficient measurement because it meets two of the three requirements of the Show Me Success initiative (MO DESE, 2016). Not only can the ACT composite score be utilized but the subtest scores are used in determining eligibility for dual credit course enrollment, which is part of the data collected for the Advanced Placement indicator. A student earns points for the district by receiving an A or B in dual credit courses (MO DESE, 2016). A student either receives a 1 or 0 related to successful completion of a dual credit course or earning an IRC (MO DESE, 2016). A district can earn up to 10 points for each indicator of College and Career Readiness (MO DESE,

2016). Table 4 depicts the number of points District B high school earned for the first two indicators of College and Career Readiness from 2014-2017.

Table 4

College and Career Readiness Assessment Points Earned by District B High School

	Academic Year			
Indicator	2014	2015	2016	2017
CCR Assessments	7.5	9.5	9.5	10.0
Advanced Placement	6.0	6.0	8.0	8.0

Note. Adapted from *Missouri Comprehensive Data System*, by Missouri Department of Elementary and Secondary Education, 2018a. Retrieved from https://mcds.dese.mo.gov/guidedinquiry/MSIP%205%20%20State%20Accountability/School%20Summary%20for%20Annual%20Performance%20Report%20-%20Public.aspx?rp:District=002097

Statement of the Problem

Preparing students for college and a career involves ensuring access to curriculum that is rigorous and relevant (Dougherty & Mellor, 2009). Before 2014, District B was not mandated to administer the ACT to all juniors. The students who typically took the ACT during that time were students who already had decided to attend college after high school graduation and prepared for college through the courses in which they enrolled. During that time, District B's average ACT composite scores were consistently above the state average (MO DESE, 2017). However, since the new mandate of testing at least 95% of all juniors, the district's average ACT composite score has fallen below the state average (MO DESE, 2017).

Students should be prepared for college and a career whether they take regular-level or honors-level courses in high school. Understanding the impact of course rigor

and successful completion of an ACT preparatory course on a student's performance on the ACT could be beneficial for the school, students, and parents because ACT scores are used in district accountability, as a component of college admission, and are often connected to college scholarships. It is also important to understand the differences in the impact of course rigor and successful completion of an ACT preparatory course on a student's performance on the ACT based on gender and SES.

Purpose of the Study

There were four purposes for this study. The first purpose was to determine whether there are correlations between ACT subtest scores (mathematics, English, reading, and science) and core course rigor level scores (mathematics, English, social studies, and science). The second purpose of the study was to determine whether correlations between ACT subtest scores (mathematics, English, reading, and science) and core course rigor level scores (mathematics, English, social studies, and science) are affected by the student demographic variables of gender and SES. The third purpose of this study was to determine whether there are differences in ACT subtest (mathematics, English, reading, and science) and composite scores between students who complete an ACT Prep course and students who do not complete the ACT Prep course. The final purpose of the study was to determine whether the differences in ACT subtest (mathematics, English, reading, and science) and composite scores between students who complete an ACT Prep course and those who do not complete the ACT Prep course are affected by the student demographic variables of gender and SES.

Significance of the Study

Research (Adelman, 2006; Conley, 2005; Jones, 2016; Saluri, 2012) has shown that students taking rigorous coursework achieved higher scores on college entrance exams. Saluri (2012) found a statistically significant relationship between participation in an ACT Prep course and ACT composite scores. Jones (2016) found that gender and SES did not have a significant impact on ACT scores. Jones (2016) also found that students enrolled in at least one Advanced Placement (AP) class performed better than students who did not enroll in at least one AP class on the ACT subtests. The current research contributes to this literature because the focus is on the impact of both rigorous coursework and an ACT preparatory course on ACT scores.

The findings of the current study could provide school districts with a recommendation for courses students should complete to ensure they have acquired the necessary knowledge and skills to achieve higher ACT results. The results of the study could also lead to the identification of courses that are not considered advanced but have an impact on ACT scores such as an ACT prep course. This information could enable parents and school counselors to better help students with course selection, which may lead students to complete courses beyond those required for graduation and might lead to better performance in postsecondary education.

Achieving a high score on the ACT might allow students acceptance into various post-secondary institutions as well as provide money for college tuition through scholarships. Selective and moderately selective colleges and universities have an automatic admission composite score of 21-24 (Missouri Department of Higher Education, 2018). Also, the higher a student's ACT composite score, the more money

they may receive from merit-based scholarships. As an example, the University of Missouri-Kansas City (2018) offers a $2,500 Chancellor's automatic scholarship for students who earn an ACT composite score of 23; however, students who earn an ACT score of 28 will receive the Curators' Scholar Award worth $3,500. Parents and school counselors can also use this information to make better-informed suggestions related to student course selection. Districts are more likely to allocate finances and personnel if an ACT Prep course is effective; however, if it is found not to be effective, the district can allocate resources to other areas.

Delimitations

According to Lunenburg and Irby (2008), "delimitations are self-imposed boundaries set by the researcher on the purpose and scope of the study" (p. 134). The following delimitations were in place for this study:

1. The setting for this study was a rural district in Missouri with one high school.
2. The study included scores on the ACT that came from the state testing period, which is in the spring of a student's junior year. The study included data from the 2016-2017 and 2017-2018 school years.
4. The ACT scores, enrollment in an ACT prep course, and core course rigor level scores were the only measurements used in this study.
5. Student gender and SES were the only demographic variables used in this study.

Assumptions

Lunenburg and Irby (2008) stated that "assumptions are postulates, premises, and propositions that are accepted as operational for the purposes of the research.

Assumptions include the nature, analysis, and interpretation of the data" (p. 135). The following assumptions were made for the current study:

1. All students performed to the best of their ability on the ACT.
2. The ACT was administered following the guidelines set forth by the testing company.
3. Teachers delivered the course curriculum in the content area for which they are certified.
4. All teachers taught the required curriculum.
5. The data collection and entry of student transcript information was accurately inputted into the Excel workbook. Any error in the process could limit the generalization of the results of the study.

Research Questions

"Research questions…are critical components of the dissertation providing a directional beam for the study" (Lunenburg & Irby, 2008, p. 126). The following questions were used as the focus of this study.

RQ1. To what extent are there correlations between ACT subtest scores (mathematics, English, reading, and science) and core course rigor level scores (mathematics, English, social studies, and science)?

RQ2. To what extent are the correlations between ACT subtest scores (mathematics, English, reading, and science) and core course rigor level scores (mathematics, English, social studies, and science) affected by the student demographic variables of gender and SES?

RQ3. To what extent are there differences in ACT subtest scores (mathematics, English, reading, and science) and composite scores between students who completed an ACT Prep course and students who did not complete an ACT Prep course?

RQ4. To what extent are the differences in ACT subtest scores (mathematics, English, reading, and science) and composite scores between students who completed an ACT prep course and students who did not complete an ACT prep course affected by the student demographic variables of gender and SES?

Definition of Terms

This study required the use of a specific vocabulary. To assist the reader by clarifying terminology, the following terms are defined based on their meaning and application to this study.

Advanced Placement (AP). As defined by the College Board (2018), the Advanced Placement program was developed to provide college-level courses and exams in a variety of subjects for high school students which, upon acquiring a high score on an exam, may allow students to obtain college credit for the course.

Dual credit. College courses taken by high school students while they are still enrolled in a secondary school are dual credit courses. The student can earn both high school and college credit (District B High School, 2017).

Level 1 course. In the District B High School (2017) *Career and Educational Planning Guide,* Level 1 courses are defined as regular coursework that is written or oral work completed by a student within a given period, which is assessed as an integral part of an educational course. The student only earns high school credit.

Level 2 course. In the District B High School (2017) *Career and Educational Planning Guide*, Level 2 courses are honor courses that require higher expectations than entry-level introductory courses. "Competent writing skills must be displayed, and some research, library work, and homework will be required. Various types of testing (assessments) will be required" (District B High School, 2017, p. 7).

Level 3 course. In the *Career and Educational Planning Guide* (District B High School, 2017), Level 3 courses are college-level courses that consist of written or oral work in a certain area of study that is completed by a student within a given period. These courses are assessed using college standards. Students could earn college credit for these courses.

Organization of the Study

This study is organized in five chapters. Chapter 1 provided the scope and nature of the study including the background, statement of the problem, the significance of the study, assumptions, delimitations, research questions, and definition of terms. Chapter 2 provides a comprehensive examination of the relevant literature related to the research questions by presenting an overview of topics involving the impact of ACT prep classes and high school coursework. Chapter 3 includes the design and methodology of the study. The results of hypothesis testing relating to the research questions are discussed in Chapter 4. Chapter 5 concludes with the study summary, findings related to the literature, and the concluding remarks.

Chapter 2

Review of the Literature

This chapter provides a synthesis and review of the literature related to the conceptual underpinnings of this study. College and career readiness is determined by student scores on exams such as the ACT (Center on Education Policy, 2012). Many four-year colleges and universities utilize a college admission test, such as the ACT, as a means for accurately identifying post-secondary preparation (Syverson, 2007). Whether a student has the opportunity to attend college may depend on the performance of the student on a standardized test like the ACT. Chapter 2 contains a literary review that includes the history of the ACT, the impact of test preparation, and the impact of high school coursework.

History of the ACT

Before 1900, colleges determined a student's college readiness by requiring the student to pass an entrance exam created by the institution (Syverson, 2007). In 1900, a group of 12 colleges in the Northeast created the College Entrance Examination Board (CEEB) due to their concerns about the number of different exams used to assess students' college readiness (Syverson, 2007). They created the "College Boards" exam in 1901 as a way to measure college readiness through testing student learning of college subjects (Atkinson & Geiser, 2009). In 1926, the Scholastic Aptitude Test (SAT) was created (Syverson, 2007). The SAT questions were "similar to those in the Army Alpha tests developed during World War I, which was modeled after IQ tests" (Syverson, 2007, p. 56). The SAT measured "students' general ability or aptitude for learning" (Atkinson & Geiser, 2009, p. 4). A small number of students took the SAT, which was used by a small number of colleges and universities; however, that number grew at the end of

World War II because of the GI Bill sending returning veterans to college (Syverson, 2007).

In 1958, at an Educational Testing Service (ETS) conference, University of Iowa professor, E. F. Lindquist presented his criticism of the college entrance tests used at that time (Popham, 2006). "Lindquist and his colleagues regarded the SAT as an entrance exam designed primarily for elite universities in the Northeast" (Popham, 2006, p. 86). The ACT (formerly known as the American College Testing Program) was developed in 1959 by Lindquist as an alternative to the SAT (ACT, 2009; Atkinson & Geiser, 2009; Popham, 2006). Unlike the SAT, the ACT was "closely linked and was an assessment of mastery of high school curriculum" (Syverson, 2007, p. 57).

The ACT was first administered on November 7, 1959, to over 75,000 students (ACT, 2009). During that testing year, 132, 963 students took the ACT (ACT, 2009). The number of students taking the ACT continued to rise. In 1967, the number of students taking the ACT was 961,184 (ACT, 2009). By 2005, 1.2 million "college-bound students" took the ACT (Syverson, 2007, p. 57). Not only did the number of students taking the ACT rise but so did the number of colleges using the ACT for admission purposes. In 1959, only 299 colleges utilized the test; however, in 1967, more than 1,400 colleges were using the test as part of the admission process (ACT, 2009). Although "the ACT was initially employed primarily by Midwestern colleges, its use expanded and now virtually every college in the nation accepts the ACT … from its admission applicants" (Syerson, 2007, p. 56).

When the ACT was first developed, the content "grew out of the Iowa Tests of Educational Development and included four sections - English, mathematics, social-

sciences reading, and natural-sciences reading - reflecting that state's curriculum" (Atkinson & Geiser, 2009). In 1989, the ACT was revised to reflect the four subject tests used today (English, mathematics, reading, and science) while the addition of the optional writing exam was added in 2005 (Atkinson & Geiser, 2009). As an achievement test, the ACT continues to measure both state learning standards and college readiness standards through "periodic ACT National Curriculum Survey" (ACT, 2006, p. 1).

The ACT National Curriculum Survey is conducted periodically (2007, 2009, 2013, and 2016) in each of the content areas (ACT, 2017a). ACT (2017a) stated their analysis includes "reviews of tests, curriculum guides, and national standards; surveys of current instructional practice; and meetings with content experts" (p. 12). ACT (2017a) evaluates the test's content periodically by utilizing curriculum frameworks for grades 7 through 12 published by states, state-approved textbooks for courses in grades 7 through 12, and consultation with secondary and post-secondary educators. College professors are surveyed to provide feedback on the academic knowledge and skills needed to be successful in the four tested content areas (ACT, 2017a). For each new test form, ACT analyzes content and statistical specifications (ACT, 2017a). If a test item is determined to be "too difficult or too easy, and items that fail to discriminate between students of high and low educational achievement as measured by their corresponding ACT scores, are eliminated or revised for future item tryouts" (ACT, 2017a, p. 14).

Although the ACT is considered an achievement test based on curricular standards, it still "falls short of being a true achievement test in several ways" (Atkinson & Geiser, 2009, p. 8). The ACT is norm-referenced, comparing students against each other rather than focusing on "assessing curriculum mastery" (Atkinson & Geiser, 2009,

p. 8). The ACT does provide standards-based interpretation of scores reflecting what examinees have learned based on their scores. However, according to Atkinson and Geiser (2009), the "interpretations are only approximations and do not necessarily identify what an examinee actually knows" (p. 8). Another concern regarding the ACT was that the scores provide a bell-shaped curve much like the SAT (Atkinson & Geiser, 2009). Lastly, Atkinson and Geiser (2009) pointed out that the ACT "lacks the depth of subject-matter coverage" (p. 9) that a person might find on the SAT subject matter tests. Although the CCSS have been developed as national curriculum standards, not all states have adopted them. Therefore, a "fundamental problem for the ACT – or for any test that aspires to serve as the nation's achievement test – is the absence of national curriculum standards in the U.S." (Atkinson & Geiser, 2009, p. 9).

Although there are points of concern, the ACT works to create a test that focuses on achievement. The ACT contains four academic area (English, mathematics, reading, and science) subtests along with an optional writing exam. Not only does the ACT report a score for each of the subject tests and composite score, but in 2015 the ACT has added STEM (Science, Technology, Engineering, and Mathematics) and ELA (English Language Arts) scores to the student reports in addition to the subject test scores, composite score, and optional writing score (ACT, 2017a).

The student score report also includes the ACT College Readiness Benchmarks to represent "the level of achievement required for students to have at least a 50% chance of obtaining a B or higher or about a 75% chance of obtaining a C or higher in specific first-year college courses in the corresponding subject area" (ACT, 2017a, p. 69). Also, ACT (2017a) stated that the subjects tested relate to credit-bearing college courses (English

reflects English Composition I, mathematics reflects College Algebra, reading reflects social science courses, and science reflects Biology) and, in 2018, had the following benchmark scores: 18 for English, 22 for mathematics and reading, and 23 for science (ACT, 2018a). To help students, parents, and educators better understand the test scores, the ACT College and Career Readiness Standards were developed in 1997 (ACT, 2017a). These standards are "empirically derived descriptions of the essential skills and knowledge students need to become ready for college and career" and "reflect a progression of skills in each of the five tests" (ACT, 2017a, pp. 79-80). These standards are reviewed periodically.

In 2014, as part of the ACT College Readiness system, ACT replaced EXPLORE and PLAN tests with one test called ACT Aspire. Originally, the EXPLORE® test was administered to students in grades 3 through 6, and the PLAN test was administered to students in grades 8 through10 as a method to evaluate student progress toward college readiness and allow opportunities for intervention (ACT, 2009). However, the new ACT Aspire has combined those two tests into one "test battery that measures students' mastery of English, mathematics, reading, and science in Grades 3 through 10" (ACT, 2017a, p. 94). The ACT Aspire also has a set of Readiness Benchmarks as they progress in meeting the benchmarks of 11th grade.

Throughout the years, ACT has evolved in meeting the needs of students, school districts, and colleges. State testing requirements mandated by federal legislation for high schools have resulted in some states adopting tests such as the ACT as part of their efforts to align their exams with college admissions and placement decisions (Brown & Conley, 2007). In 2001, Colorado and Illinois began using the ACT as statewide

assessment, which has led to many other states either using it or thinking about incorporating it into their statewide assessment program (ACT, 2006). With the rise of the number of individuals taking the ACT, the ACT College Readiness System provides school districts and state departments of education with data on how students are progressing toward college and career readiness as well as recommendations for interventions to aid in these efforts (ACT, 2017b).

Impact of Test Preparation

The ACT is one of two exams utilized for entry into colleges throughout the United States. To equip all students, whether they have decided to attend college or not, many schools are incorporating test preparation as part of their overall academic program. These efforts include offering ACT prep classes as part of a student's class schedule or a class after school hours. To successfully equip students for higher performance on the ACT, it is important to determine what has proven to be effective in these efforts.

Moss (1995) found a modest impact of ACT preparation on student ACT scores. The small sample included 19 high school students working in a summer intern program in the St. Louis area. The study used a retired ACT test, published by ACT, as a pre-test. The post-test used in the study was another retired ACT test. These tests were used to determine the results of the study. The ACT preparation was provided by a tutoring program called Focus on Learning, which utilized Focus on Learning's trained coaches (Moss, 1995). The program lasted for six weeks and took place on Saturdays. The results of the study showed an average increase in ACT scores by 1.34 points between the pre-test and post-test (Moss, 1995). Although it was a small increase, Moss (1995)

concluded that for students who show growth in their ACT score, taking an ACT preparation course might make a difference in being admitted to college.

Scholes and Lain (1997) conducted a study that included two experiments of over 69,000 students who took the ACT between October 1994 and September 1995 to determine the effect various test preparation activities have on student ACT scores. The researchers also examined whether there was a difference in preparation and outcomes on the ACT based on student ethnicity, gender, and SES. The test preparation activities surveyed were "taking practice tests, using workbooks, taking a test preparation course, or engaging in any other type of preparation" (Scholes & Lain, 1997, p. 5). Students who participated in the last type of preparation were not considered in the study because of the inability to determine the activity. In the first experiment, researchers looked at students who took the ACT only once during the time the study was conducted. Scholes and Lain (1997) found that students who used practice tests to prepare for the ACT "benefited more" (p. 6) than students who used other test preparation methods; however, the benefit was "only 0.4" (p. 7) additional points on the ACT composite score. "The impact of test preparation activities on ACT composite scores was nearly the same regardless of gender, ethnicity/race, and family income" (Scholes & Lain, 1997, p. 7). Lastly, the researchers found that test preparation activities in the study "did not help certain groups of students more than others" (p. 8); however, there was a smaller negative mean score for Caucasians (-0.3) than other ethnic groups (Indian/Alaskan Natives, -1.0; African Americans, -0.6; Mexican Americans and Asian Americans, -0.7; Puerto Ricans, Cubans, and Other Hispanics, -0.8) (Scholes & Lain, 1997, p. 7).

In Scholes and Lain's (1997) second experiment, they examined the same information; however, they looked at students who had taken the ACT more than once during the time period studied. This population consisted of 126,253 students. "Students who engaged in test preparation activities before their first testing were eliminated" (Scholes & Lain, 1997, p. 9). The results of the experiment indicated that students who took the test more than once had a mean score increase of 0.6 although they did not participate in any test preparation. Students who did participate in test practices had a mean score increase of 0.8. "No significant interactions were found for test preparations by ethnicity, gender, and financial background on how the student scored on the first test" (Scholes & Lain, 1997, p. 11). Overall, test preparation had little impact on student ACT scores whether it occurred before the first test or the second test.

In 2001, Briggs analyzed the impact of coaching on ACT scores using the National Education Longitudinal Survey. Students involved in the analysis came from high schools throughout the United States who completed the survey in 1990 and 1992. The sample included 14,617 students. Briggs (2001) found that for students who have taken the test before, the coaching provides a small gain in test scores. In breaking down the subtest scores, he found only a statistically significant relationship between coaching and the mathematics (.6 points) and English (.4 points) subtest scores (Briggs, 2001). In contrast, he found a negative effect size related to the reading subtest scores (.6 to .7 points), meaning students who had the coaching did worse on the ACT reading section than students who did not receive coaching. Briggs (2001) also found that when SES was considered, students of low SES and academic ability scored 0.3 higher on average on the mathematics subtest than those of a higher SES. Upon conclusion of the study, Briggs

(2001) stated that “coaching should be most effective and at least readily available” for students who are “much less socioeconomically advantaged than their test-taking counterparts” (p. 18).

In 2002, the Task Force on Standardized College Admission Testing (TFSCAT) determined that the effects of coaching on the ACT assessment are minimal and within the standard errors of measurement for the test. Participants in the study were University of Texas at Austin undergraduate applicants. The researchers attempted to find a gain due to coaching rather than a rigorous high school curriculum (TFSCAT, 2002). Students who enrolled in the short-term classes received less than a one-point gain for ACT English, mathematics, or reading. The TFSCAT (2002) suggested that students should take challenging high school classes to prepare themselves for tests such as the ACT because neither coaching nor retesting has much of an impact on raising these scores.

In a study conducted by Klein, Zevenbergen, and Brown (2006), generalized test preparation from the teachers’ point of view was explored. A survey was administered to 20 teachers in New York. Klein et al. (2006) found that for a majority of teachers, standardized testing drives much of their instruction. Phelps (2011) believed test preparation could be harmful to students. Phelps (2011) said that often test preparation focuses more on the format and test-taking strategies, which leads to less emphasis on the content of the curriculum. However, Klein et al. (2006) found that some of the teachers used old test questions to model and develop higher-order thinking strategies to process problems. Teachers also taught students how to pace themselves during a test, so they will not get agitated during the test (Klein et al., 2006). If educators developed the

curriculum and the test is based on the curriculum, then teaching the knowledge and skills needed for the test will correspond with the curriculum standards (Phelps, 2011).

Marsh, Vandehey, and Diekhoff (2008) investigated the risk of student academic failure in college as predicted by the student's ACT or SAT score. Data were collected on 257 students enrolled in a Southwest United States open enrollment public university who were enrolled in an introductory general psychology course. As an open enrollment university, applicants have an 870 or higher on their SAT or 18 or higher on the ACT. Students who "participated in the study filled out a self-reported demographic survey, and their five test scores in the psychology course were recorded" (Marsh et al., 2008, p. 248). The psychology exams were later added as a predictor of student college success as determined by the student's GPA. The researchers also collected the records of the students "three semesters after completing the General Psychology course" (Marsh et al., 2008, p. 248). The records included GPA, college hours attempted, and hours earned, and whether the student was still enrolled at the university. Marsh et al. (2008) found that "ACT scores showed a significant positive correlation to GPA, predicting 18 percent of the variance in GPA" (p. 248) while the General Psychology exams predicted 33% (first exam) and 40% (first and second exam) correlation to GPA. The "SAT scores also showed a significant positive correlation with GPA, predicting 19 percent of the variance in GPA" (Marsh et al., 2008, p. 249). Recommendations by the researchers include employing an early intervention system which involves a short-term and long-term referral plan. Marsh et al. (2008) also cautioned against advising students to take more than one course that has a high failure rate because it may "set a student up for failure" (p. 253).

In 2010, Justus studied the impact of an ACT preparation mathematics course on ACT scores due to a new graduation requirement of all juniors taking the ACT in Tennessee. Justus (2010) used PLAN test scores to select 36 participants for the study. The sample was determined by their PLAN results predicting that the students would not likely meet college readiness benchmark scores on the ACT (Justus, 2010). The researcher also looked at the impact of the course based on student ethnicity. The ACT mathematics preparation course took place over 18 weeks during the school day. Although there was not a significant impact based on ethnicity, the study showed the most gains for students who scored a 17-18 on the PLAN pretest. Justus suggested that school districts should implement early intervention during high school and considerations should be made regarding scheduling to allow all students with the opportunity to increase their ACT score.

In 2012, Parrott conducted a study of the impact an ACT preparation course has on student ACT scores compared to PLAN scores. The preparation course was an intervention that occurred four days a week for 30 weeks, thirty minutes each day for students who scored below benchmark scores on the PLAN test as sophomores (Parrot, 2012). He compared the ACT scores of 165 students who took the ACT preparation course with 168 students who did not take the course. Both groups of students scored below PLAN benchmark scores. Parrott (2012) found that students in the treatment group continued to be below benchmark scores on the ACT and failed to reach their predicted ACT composite score by over one-half point. However, the results of the study showed a gain of over one point in mathematics subtest scores of students in the treatment group (Parrott, 2012). Reading subtest scores showed the second most growth

while science and English subtest scores showed the least amount of growth (Parrott, 2012). Although the students did not reach their predicted ACT composite score, Parrott (2012) determined that even with a rigorous curriculum in the school district that was studied, there was "still a need for some type of ACT intervention … due to the high transient population" (p. 89).

In a causal-comparative study conducted by Donen (2012), the formalized individualized teaching (FIT) model was implemented in an ACT preparatory course to determine its impact on student ACT scores. The FIT model is an individualized instructional approach that identifies individualized student needs to modify content and the process of learning that best addresses student need and analyzes data to determine if the process was successful. Donen (2012) conducted the study in a "rural comprehensive high school in the mid-south" (p. 64). Donen (2012) also looked at the impact of the course on various student abilities on the four subtests of the ACT as well as gender. The course took place during the school day for 24 weeks with 150 juniors enrolled in the course. Scores from student EXPLORE and PLAN were used to compare and predict ACT student achievement. As the first component of the FIT model, a Pareto analysis was conducted to detail skills in each of the four ACT subtests to provide a range of areas for potential student growth. This information provided individual student needs and allowed teachers to modify content in the ACT preparatory course. Every two weeks, students focused on individual skills from one of the content areas of the ACT, each content area being taught by a different teacher. Donen (2012) compared this group of students with the previous year's juniors who did not participate in a similar ACT preparatory course.

Donen (2012) found that there was a “significant positive impact on student ACT scores” (p. 81) for students who participated in the ACT preparatory course using the FIT model. The results of the study indicated that the FIT model also “significantly impacted student performance positively on the ACT composite score for each ability level” (p. 81). However, the results did not show that the teaching model had more impact for one ability level over another. Regarding the impact on the four content areas, Donen (2012) found that the ACT preparatory course implementing FIT had a significant positive impact on the mathematics and reading scores but not on the English and science scores. Lastly, both male and female students saw a significantly positive impact on ACT composite scores. “There was no significant difference in mean for either gender, nor was the growth experienced by male students significantly different from that of the female students” (Donen, 2012, pp. 82-83). The results of the study disclosed that the FIT model had a positive impact on student ACT scores.

The purpose of the study by Moss, Chippendale, Mershon, and Carney (2012) was to determine what impact test preparation or coaching had on the ACT. The participants in the study were 52 juniors who participated in a four-week course that included 20 hours of instructional time (10 hours for English and reading and 10 hours for mathematics and science). The students were in two groups based on the prior ACT score, below 21 and 21 or higher. The instructors, who taught the coaching class, were trained by a “tutoring and test preparation company” called Focus on Learning (Moss et al., 2012, p. 18). The ACT scores of the students who participated in the course were compared to the scores of 55 students who had taken the ACT but did not participate in the ACT preparatory course (Moss et al., 2012). The results of the study showed a gain

of 2.35 points on the English subtest, 0.92 gain on the mathematics subtest, 1.77 gain on the reading subtest, and a 0.96 gain on the science subtest for students who were involved in the coaching (Moss et al., 2012). Overall, students who participated in the coaching class scored on average 0.85 points higher on their ACT composite score than students who did not participate in the class (Moss et al., 2012).

In a study by Saluri (2012), the effectiveness of an ACT after-school preparatory course to improve student performance on the ACT was examined. The course met "one day a week over six weeks for 3.5 hours per day" (Saluri, 2012, p. 14). The population in the study included students in grades 10 through 12 enrolled in a suburban school district in northwest Missouri who took both the PLAN and ACT (Saluri, 2012). The researcher utilized the predictive ACT composite score provided by the PLAN, which was administered to sophomores (Saluri, 2012). The result of the study showed a "statistically significant positive growth" in student "composite scores between the PLAN and the ACT" for the students who participated in the after-school program (Saluri, 2012, p. 63). "The mean percentage growth in composite scores of students who participated in the after-school hours ACT Prep course was 0.81% higher than the mean percentage growth in composite scores of students who did not participate in the course" (Saluri, 2012, p. 63).

Impact of High School Coursework

Noble and McNabb (1989) studied the relationship between college preparatory coursework taken by students, their grades, and student ACT scores. Demographic variables considered in the study were gender and ethnicity. The participants in the study were 11,279 juniors and seniors who took the ACT during the 1986-87 school year in 28

states. The student course data was compiled through the self-reporting Course/Grade Information Section on the ACT, which asks for information regarding 30 high school courses. Noble and McNabb (1989) found that "increased course-taking, particularly in mathematics and science, is related to improved ACT test performance" (p. 30). "The results showed that, on average, each additional mathematics course taken was associated with 2 points on the mathematics usage test and each additional natural science course was associated with 1.26 to 1.58 points on the ACT science score" (Noble & McNabb, 1989, p. 30). The researchers found that there were differences among ethnicity regarding courses taken in mathematics and science. More Caucasian and Asian students "reported taking Algebra I, Geometry, Algebra 2 as well as Biology, and Chemistry" (p. 22) than African Americans, American Indian, and Hispanic students. They also found that "being enrolled in a college preparatory curriculum added at least 1 point to each ACT subtest scores for senior females when coursework and grades were held constant" (p. 31) while only 0.5 was added for senior males and 0.9 was added for male and female juniors (Noble & McNabb, 1989). Overall, being enrolled in a college preparatory curriculum had more of an impact on ACT scores than taking more mathematics and science courses.

In 1997, Creech examined high school coursework needed to be college ready in the southern region of the United States. Creech (1997) stated that "the most important factors in considering applicants and the best indicators of success in college, admissions officers invariably stated that challenging courses in high school and the grades students make on those courses have the most influence" (p. 5). Although core courses required to graduate high school and needed for college seem similar, the courses may not be

rigorous enough for students to be ready for college (Creech, 1997). Students taking remedial college courses were found to be students who did not take a rigorous college preparatory program, received lower grades in those courses, or did not take a mathematics course during their senior year of high school (Creech, 1997). Although students taking college preparatory courses are important, Creech (1997) found that other influences on student achievement have an impact such as the "quality and rigor of the courses" (p. 13). However, Creech (1997) stated that "one point is clear – not taking challenging courses limits options for further education and for employment after high school. Taking challenging courses expands the options" (p. 13).

Roth, Crans, Carter, Ariet, and Resnick (1999) researched the impact of high school courses taken, grades, race, and gender on passing a computerized college placement test. The population of the study was 19,736 high school graduates in Florida. The study specifically examined mathematics and English courses and their degree of difficulty. Roth et al. (1999) found that students who took Algebra II did better, even with a low course grade than students who only took Algebra I. Another finding by the researchers was that African-American and Hispanic students at the same achievement level as white students experienced more difficulty acquiring mastery in reading and writing; however, this was not the case in mathematics (Roth et al., 1999). "The study findings suggested that minority students seem to encounter some sort of disadvantage in high school English classes; in mathematics, students at the same level of accomplishment, regardless of race, master its logical sequencing of topics" (Roth et al., 1999, p. 14).

Noble, Davenport, Schiel, and Pommerich (1999) utilized a survey administered to 5,489 students enrolled in 106 schools, who had taken the ACT, to examine the relationship between coursework taken and performance on the ACT. Findings of the study included:

1. Taking calculus accounts for an average increase of 2.0 on all ACT scores except science.
2. Taking chemistry is statistically significant for science while taking physics is statistically significant for mathematics, science, and the composite scores.
3. Being enrolled in college preparatory courses has more of an impact on English and reading scores than mathematics and science.
4. Family income had a moderate correlation with ACT scores. (Noble et al., 1999, pp. 17-19)

Hoyt and Sorensen (2001) examined the correlation between high school preparation and remedial college courses taken by students. Participants in the study included 887 students who attended a Utah college. Hoyt and Sorensen (2001) studied students' preparation in mathematics and English who graduated from two Utah school districts. High school transcripts were utilized. "Most of the students completed 12th grade English and intermediate algebra" (Hoyt & Sorensen, 2001, p. 27). The researchers found that high school preparation influences students' ACT scores. As students took more upper-level English and mathematics courses, the students' ACT score increased. Students who took upper-level mathematics, which includes college algebra/trigonometry, precalculus, and calculus, were more likely not to need remedial mathematics compared to students who only took intermediate mathematics. However,

Hoyt and Sorensen (2001) also found that a "substantial number of students successfully completing college algebra/trigonometry and precalculus at the local high schools also had test scores that would not admit them into college algebra on campus" (p. 28). Regarding English, grades and the level of courses taken had a greater impact on the student not having to take remedial English classes at the college. Hoyt and Sorensen (2001) studied the variables of gender and ethnicity which they did not find to have a significant effect on placement in a remedial English course. The researchers suggest that simply increasing the requirements for high school graduation may not be adequate because "curriculum and grades in college preparatory courses have been compromised so that successful completion of the course does not necessarily demonstrate competency in the subject" (p. 32).

Using data collected by the National Center for Education Statistics, Adelman (2006) analyzed academics completed by students during grades 9-12 and the post-secondary opportunities derived from these academics. The sample included students throughout the United States who were eighth graders during 1988 and scheduled to graduate in 1992. Data were collected on these students through the year 2000, and the sample included over 12,000 students. Adelman (2006) used the data along with student transcripts and interviews for the analysis. There were several variables in the study including student demographics, high school background, post-secondary entry, first-year performance, financing post-secondary, attendance, and extended post-secondary performance. Adelman (2006) looked at the students' post-secondary career and degree completion by December 2000.

Adelman (2006) found that completing a rigorous high school curriculum was the biggest determining factor for obtaining a bachelor's degree. This finding was similar to the findings of Noble & Powell (1995) and Roberts & Noble (2004), which has shown that rigorous coursework is related to academic achievement. An example of a rigorous high school curriculum found by Adelman (2006) included 3.75 units of English, 3.75 units of mathematics, 2.5 units of science, more than 2 units of foreign language, more than 2 units of history, and more than 1 AP course at a minimum. Adelman (2006) asserted that "the highest level of mathematics reached in high school continues to be a key marker in pre-collegiate momentum, with the tipping point of momentum toward a bachelor's degree now firmly above Algebra II" (p. xix). The highest mathematics course taken should include "either calculus, precalculus, or trigonometry" (Adelman, 2006, p. 27) and a mathematics course should be taken during a student's senior year. Science should include at least "2 units of core laboratory science (biology, chemistry, and physics)" (Adelman, 2006, p. 27). By 2000, 95% of students who completed this curriculum earned a bachelor's degree, while 41% earned a master's, first professional, or doctoral degree.

Adelman (2006) also found that the demographics that had an impact on bachelor's degree attainment are first-generation college students, race, gender, and family income. "Bachelor's degree attainment is reduced by 21% for first-generation college students, minority status is reduced by 17%, being male reduces it by 11%, while being in the highest third of family income is marginally significant" (pp. 23-24). However, Adelman (2006) also stated that "the moment high school academic history is included, demography plays a considerably reduced role" (p. 24). Adelman (2006)

asserted that students are “agents of their own future” (p. 103) and must prepare themselves by not only taking a rigorous curriculum but also seeking out information on their own, reading to build their language, and pursuing postsecondary options through research, college visits, and dual-enrollment. Secondary schools also have the responsibility of ensuring students have access to a standards-based and challenging curriculum.

Noble and Schnelker (2007) examined the relationship of coursework on ACT benchmark scores across a variety of high schools. Students in the graduating class of 2003 who took the PLAN as a sophomore and the ACT as juniors or seniors were the participants in this study. If a student took the ACT more than once, the most recent ACT score was used. Records used for the study included student PLAN and ACT benchmark scores, ethnicity, grade level at the time of taking the ACT, and student reported coursework information. The coursework was obtained from the Course Grade Information Section of the ACT, which provides information regarding 30 specific high school courses. Noble and Schnelker (2007) found mixed results given the type (rural, urban, private, public) of school and the courses within those school districts. Examples of their findings include achieving the science benchmark. “Students from rural and suburban schools and those from the North Central and Northeastern accrediting regions” (Noble & Schnelker, 2007, p. 22) saw increased odds if they took Biology, Chemistry, and Physics compared to students in urban districts of achieving the science benchmark. However, one trend that Noble and Schnelker (2007) found was that “higher level mathematics and science courses corresponded to greater average increases in ACT Mathematics and Science scores, compared to lower-level courses” (pp. 22-23).

Being college and career ready may require more than taking the core courses needed for graduation. The rigor of those courses along with higher level coursework also has a role in ensuring students are adequately prepared for success in college or the workforce. ACT (2007) conducted a study of 400 schools throughout the United States that had "greater-than-average increases in ACT mathematics and science tests" (p. 26). ACT (2007) classified these schools as being rigorous. ACT (2007) found that taking algebra II and chemistry at a rigorous high school increased a student's likelihood of attaining ACT College Readiness Benchmark scores by 39% in mathematics and 28% in science. Students enrolled in less rigorous schools only attained the ACT College Readiness Benchmarks by 17% in mathematics and 16% in science. Students achieved greater gains when they took trigonometry and "a rigorous physics course" (p. 28). ACT (2007) also recommend the following five "action steps" (p. 30) for educators:

1. Specify the number and kinds of courses that students need to take to graduate from high school ready for college and work.
2. Align high school course outcomes with state standards that are driven by the requirements of postsecondary education and work.
3. Provide teacher support.
4. Expand access to high-quality, vertically aligned core courses.
5. Measure results at the course level. (pp. 30-32)

Jones (2008) conducted a study to determine the impact coursework a student completes has on their ACT scores. Jones (2008) also focused on the impact of gender on student ACT scores. Participants in the study attended a small, rural mid-western high school in Wisconsin during 2005 and 2006 who took the ACT. Although Jones (2008)

found relationships between courses and ACT scores, most of those relationships were considered moderate; therefore, predictions could not be made except for a few classes. The results of the study indicated that students who took more challenging courses performed better on the ACT compared to students who did not take the more challenging courses. Jones (2008) also found that gender did not have a significant relationship with the scores students earned on the ACT.

Savitz-Romer, Jager-Hyman, and Coles (2009) stated that although school districts have "pushed to increase academic rigor and set high expectations" (p. 5) progress continues to be made in supporting underserved students. Savitz-Romer et al., (2009) presented a framework for academic support for preparing students for college. Two parts of the academic framework involved curriculum content and assessment. A college preparatory curriculum should include "four years of English, three years of social studies; four years of mathematics (including geometry, Algebra I and II, and preferably at least one other advanced mathematics course), three years of laboratory science (including biology, chemistry, and physics), and two years of foreign language" (Savitz-Romer, et al., 2009, p. 7). Assessments allow for early warning signs to identify students who are not college ready and are at risk of dropping out of school; therefore, allowing educators to address academic problems earlier.

Parrott (2012) conducted a study to determine the impact of an ACT preparation course and upper-level courses have on ACT scores. The results of the study indicated there was a "statistically significant relationship between the level of mathematics and English courses taken by a student in high school and their ACT scores" (Parrott, 2012, p. 90). He noted that "nothing can replace having all students complete a rigorous

curriculum K-12" (Parrott, 2012, p. 89). He determined that there was a close relationship between the level of mathematics and English classes taken and a student's ACT score. Students who completed upper-level mathematics and English courses scored 6 points higher on the ACT than students who took the standard classes in mathematics and English (Parrott, 2012). He concluded that the findings were "not surprising, considering most students who plan on going to college take upper division core academic courses" (Parrott, 2012, p. 90).

A large group of college students is enrolled in remedial classes or fail to continue past their sophomore year. ACT (2012) examined what is taught in the core classes students take and how that impacts the students being ready for college upon graduation. The random sampling process was categorized by size, type, and geographical location. Approximately 90 schools per course were selected to participate with some schools being tested in more than one subject area. ACT (2012) used the ACT QualityCore end-of-course exam, the PLAN test, and the ACT to evaluate core course preparation for college readiness. The findings reveal that "in mathematics and science, student growth in college readiness was greatest in the earliest course in the high school course sequence and increased steadily in the subsequent course or courses" (ACT, 2012, p. 31). However, the opposite was true regarding English courses. Furthermore, ACT (2012) found that "nearly half of schools are showing no progress at all toward improving their students' college and career readiness in English, while only 10 percent or less are showing no progress in mathematics or science" (p. 31). Recommendations given by ACT (2012) are that core courses must be aligned with the requirements of postsecondary

institutions and workforce training programs, teachers must reinforce the rigor of core course content, and core courses must be progressively sequenced.

An important aspect of preparing students for college and a career is making sure students who are behind academically can make significant progress to that of their peers before they graduate. Dougherty and Fleming's (2012) study focused on how difficult it is for students who are behind to catch up in four years and be prepared for college. The population of the study included multiple cohorts of students in eighth grade who took the EXPLORE, the PLAN in 9th grade, and the ACT in 12th grade. Dougherty and Fleming (2012) also looked at grades 4-8 for analysis of students catching up in middle school if they are behind academically. The results were that 10% or fewer of the students who were far off track in eighth grade attained the ACT College Readiness Benchmarks by twelfth grade. At some higher poverty schools, however, the percentage of students catching up exceeded the average for lower poverty schools. Dougherty and Fleming (2012) found "that it is difficult for students who are far behind their well-prepared peers to catch up to them" (p. 27) by their senior year. They recommended that educators and policymakers focus on the importance of early access to content and vocabulary-rich curriculum and emphasis on prevention instead of remediation.

To allow students more opportunity for advanced level mathematics courses in high school, they must be exposed to algebraic concepts earlier so that students can take Algebra I in middle school. The purpose of Green's (2012) study was to examine the impact taking Algebra I at the middle school had on taking more advanced mathematics and science classes in high school. The 2010 and 2011 graduates of 3 high schools and a career center in Maryland were used in the study (a total of 1,334 students). Six variables

were used in the analysis: college readiness, mathematics achievement, high school algebra score from state test, curricular rigor, sequencing of mathematics courses, and attendance. The results were that having early access to Algebra I at the middle school has a larger impact on the student's college readiness than when taking the class during high school. Students who take Algebra I in middle school will take higher-level mathematics courses in high school. Taking AP mathematics and science are strongly associated with college readiness that is mathematics related. Green (2012) recommended that high schools raise their mathematics requirements for graduation because the more mathematics and science, the greater the students are prepared for college and career.

Grinstead (2013) conducted a study regarding the influence of advanced mathematics courses on the ACT. The advanced mathematics courses included trigonometry, pre-calculus, calculus, AP calculus, and AP statistics. The participants included 15,661 students who graduated from an Iowa high school in 2012. These participants took both the Iowa Test of Educational Development in the 9th grade and the ACT before graduation. Grinstead (2013) found that "all advanced mathematics courses in the analysis had a positive relationship with ACT mathematics score" (p. 58). Regarding the ACT mathematics subtest and composite scores, trigonometry, pre-calculus, AP calculus, and AP statistics had positive relationships; however, calculus did not show a statically significant relationship with ACT composite scores. The largest impact on both ACT mathematics and composite scores came from AP calculus (1.6568-point increase).

Warne, Larsen, Anderson, and Odasso (2015) researched the academic benefits of the AP program. AP students were compared to non-AP students in Utah's classes of 2010 and 2011 graduates enrolled in public schools. Non-AP students included students who never enrolled in an AP English or AP calculus course and students who enrolled in an AP English or AP calculus course but either did not take the AP exams or failed to acquire a score higher than a 2; while, AP students were students who passed an AP English or AP calculus course by earning a score between 3 and 5 on the exams. For the class of 2010, Warne et al. (2015) found that students who passed the AP English exam gained 1.861 to 3.832 points on the ACT subtest and composite scores versus students who did not pass the AP exam. Similarly, Warne et al. found that students who passed the AP calculus exam had more of an impact on the ACT subtest mathematics scores (1.844-point increase) compared to subtest reading scores (0.44-point increase).

For the class of 2011, Warne et al. (2015) found that the largest difference was between students who passed the AP exam and those who did not. Students in the class of 2011 who passed the AP English test saw an average increase of 3.419 points on the ACT mathematics subtest and 5.295 points on the ACT reading subtest compared to students who did not pass the AP exam. Students who passed the AP calculus test scored 2.268 to 3.206 points higher on the ACT than students who did not pass the AP exam. Overall, Warne et al. (2015) found that the impact of "the AP program was not slight: for AP English" the average increase "was about 2.8-4.1 for ACT composite scores; for AP calculus, the impact was about 1-2.7 points for the ACT composite scores" (p. 413). They also found that students receive the most benefit from taking and passing the AP test, instead of merely being enrolled in the AP class (Warne et al., 2015).

Jones (2016) studied not only the impact of AP mathematics but also AP classes in the three other content areas tested on the ACT. Jones' (2016) purpose "was to determine the differences in ACT scores on the subtests of mathematics, English, reading, and science between students enrolled in different curricular paths (AP or regular)" (p. 7). The researcher also studied how demographics impacted the differences in ACT scores. The population of the study was students who took the ACT during the 2013-2014 or 2014-2015 school year in a Midwestern school district. The major findings of the study included students enrolled in at least one AP class performed better in the respective subtests than students who did not. Also, "demographics did not affect differences for mathematics, English, and reading, but race did affect the difference for science" (p. 79) compared to students not enrolled in at least one AP course (Jones, 2016). Additionally, a correlation between students with higher GPAs and higher ACT composite scores, which was stronger for female and minority students than male and non-minority students was found. Regarding SES, the relationship between students on full-pay or reduced lunch was not different when looking at the relationship between GPAs and ACT composite scores.

Summary

This review of the literature in Chapter 2 contained the history of college career readiness measurements. The first section consisted of the history of the ACT. The second section contained the impact of ACT preparation classes. The third section contained the impact of rigorous high school courses on student academic achievement. The second and third sections also include research on the impact of gender and SES on

ACT scores as it pertains to taking an ACT prep course and completing rigorous courses. In Chapter 3, the methodology for this study is explained.

Chapter 3

Methods

The purpose of this research was to determine whether there were correlations between ACT subtests scores (mathematics, English, reading, and science) and core course rigor level scores. Another purpose of the study was to determine whether the correlations between ACT subtest scores and core course rigor level scores are affected by the student demographic variables of gender and SES. The researcher also explored the extent there are differences in ACT subtest scores (mathematics, English, reading, and science) and composite scores between students who completed an ACT prep course and students who did not complete an ACT Prep course. The final purpose of the study was to determine the extent the differences in ACT subtest scores (mathematics, English, reading, and science) and composite scores between students who completed an ACT prep course and students who did not complete an ACT prep course were affected by the student demographic variables of gender and SES. The methodology utilized to conduct this research is presented within this chapter, which is organized into the following sections: research design, selection of participants, measurement, data collection procedures, data analysis and hypothesis testing, and limitations.

Research Design

A quantitative methods correlation research design using archival data was chosen for this study. Lunenburg and Irby (2008) stated that "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). Causal-comparative research is used when the researcher cannot manipulate the independent variable nor control it because it

has already occurred (Lunenburg & Irby, 2008). Four independent variables and five dependent variables were used in this study. The first independent variable was course level rigor score. The second independent variable was student ACT Prep course enrollment status. The final two independent variables were the student demographics of gender and SES. Eligibility for free or reduced lunch and paying full price for lunch determined a student's SES. The dependent variables were the ACT composite and subtest (mathematics, English, reading, and science) scores.

Selection of Participants

This study utilized nonrandom purposive sampling. Lunenburg and Irby (2008) stated that "purposive sampling involves selecting a sample based on the researcher's experience or knowledge of the group to be sampled" (p. 175). The population of interest in this research was comprised of high school students who graduated from District B. The sample of this population used in the study consisted of high school students who took the ACT during the spring semester of their junior year, spring of 2016 and 2017. There are three criteria for participant selection.

1. All students in the graduating class of 2017 and 2018 were potential participants in the study.
2. Students must have attended the high school within District B their freshman, sophomore, and junior years.
3. Students must have taken the ACT as juniors.

"Clear criteria provide a basis for describing and defending purposive samples" (Lunenburg & Irby, 2008, p. 175).

Measurement

The instrument utilized for measuring the variables for this study was the ACT. The ACT is an achievement assessment many colleges use to determine a student's college readiness (ACT, 2013a). The ACT consists of four multiple-choice tests (English, mathematics, reading, and science) along with an optional writing test, that measure skills acquired in high school needed to be successful in college (ACT, 2017a). ACT composite and subtest scores range from 1 to 36 with 36 being the highest score a student can obtain. Table 5 displays the number of items and time limits for each subject tested. The subtest scores are averaged and rounded to the nearest whole number to determine the composite score (ACT, 2017a).

Table 5

ACT Assessment Information

ACT Subtest	# of Items	Time Limit (minutes)
English	75	45
Mathematics	60	60
Reading	40	35
Science	40	35

Note. Adapted from *ACT Technical Manual*, by ACT, 2017, pp. 5-6. Retrieved from http://www.act.org/aap/pdf/ACT_Technical_Manual.pdf.

When developing the ACT assessment to predict college success, ACT's (2017a) focus was on measuring "as directly as possible the degree to which each student has developed the academic skills and knowledge that are important for success in college" (p. 166). The ACT contains test questions that reflect major areas of study in high school and college curricula (ACT, 2017a). Each question is thoroughly reviewed at least 16

times for accurate measurement and administered to 1,000 randomly selected participants of similar groups (ACT, 2017a). This standardization of the ACT is important because the scores mean the same

> for all students, test forms, and test dates and they can be interpreted without reference to these characteristics unlike high school courses taken and grades earned" as means for measuring educational achievement because of the different curriculum and grading policies. (ACT, 2017a, p. 166)

The ACT uses several items to confirm test questions and forms are producing the intended results, content, and predictive validity (ACT, 2017a). According to ACT (2017a), these items include: "subject-matter experts; academic research on skill targets, sequencing of skills, and grade placement; data and evidence of student understanding collected from the ACT test; the ACT National Curriculum Survey; and survey standards frameworks such as Next Generation Science Standards" (p. 166). "Reliability coefficients quantify the level of consistency of test scores, which range from zero to one, with values near one indicating high consistency and those near zero indicating little or no consistency." (ACT, 2017a, p. 147). "The reliability estimates are fairly high, with values over 0.9 for ACT English and mathematics" subtests and ACT "composite scores and values over 0.8 for reading and science scores." (ACT, 2017a, p. 148).

The independent variables used in the study were obtained from student transcripts. Data from student transcripts were used to determine the rigor level of courses taken during high school as shown in Table 1. Two characteristics for each course taken were recorded in the Excel worksheet: (a) core course content and (b) course rigor level. By subject area, each course a student completed was noted by the rigor

score of the course below the course heading. Once all the rigor scores were entered into the spreadsheet, the sum of rigor level for a student was entered into the spreadsheet; the sum of all course rigor scores was calculated to obtain an overall subject rigor score. Each core subject rigor level score (mathematics, English, social studies, and science) were then added together to provide the overall core rigor level score for every student in the study according to each core subject.

Demographics used in the study as independent variables were gender (male, female) and student socioeconomic status (SES) (free/reduced, full pay). The gender was indicated on the student transcript. For this study, a students' SES was determined by their eligibility for free or reduced lunch. The students eligible for free or reduced lunch were compared to students who paid full price for lunch. The final variable of the study was the completion of an ACT prep course; students completing the ACT prep course were compared to students who did not. The course was noted on student transcripts.

Data Collection Procedures

In July 2018, a proposal for research was submitted to Baker University Institutional Review Board (see Appendix A), and approval was granted on July 18, 2018 (see Appendix B). Before conducting research, permission was obtained from the District B Assistant Superintendent through a letter (see Appendix C) on August 10, 2018. The archived data for this study was collected in the Summer of 2018.

Student data was collected from transcripts. The District B high school registrar printed transcripts from the student information system for the classes of 2017 and 2018. She used district information to label each student transcript FR (free or reduced lunch) or FP (full pay) to designate each student's SES. The transcript data included student

gender, course enrollment throughout high school, year of graduation, and ACT subtest and composite scores from Spring of 2016 and 2017. The transcript is evidence of the number of courses a student completed in each content area during each year (freshman, sophomore, and junior years). The rigor level of each course was obtained from the high school Career and Educational Planning Guide (District B High School, 2017). The registrar blocked out student identifying information such as name, address, date of birth, and state id number. Once the transcripts were printed and completed, the researcher drove to District B high school and was handed the transcripts by the registrar.

The printed transcripts were categorized into two groups, students who had attended the high school in District B for three years and those who had transferred during their freshman, sophomore, or junior year. The group of printed transcripts that reflected students not attending District B for three years was shredded. The group of transcripts for those students who attended District B for three years was then grouped by those who had taken the ACT during the spring of their junior year and those who had not. The printed transcripts of those students who did not take the ACT during the spring of their junior year were shredded. The transcripts for students who had taken the ACT and were enrolled for three years were used in the data analysis for this study.

An Excel workbook was created to input student information. The columns in the first worksheet in the workbook were labeled Student Number, Gender (female = F, male = M), SES (Free/Red = FR, Full Pay = P), ACT Prep (yes = Y, no = N), ACT Mathematics, ACT English, ACT Reading, ACT Science, ACT Composite, Rigor Mathematics, Rigor English, Rigor Social Studies (SS), and Rigor Science. Four other worksheets were created to reflect the four core subjects (mathematics, English, social

studies, and science). Each of those worksheets listed the courses offered in the core subject (see Table 1) and their rigor level score (1 for Level 1, 1.3 for Level 2, 1.5 for Level 3).

Each student represented by a transcript was assigned a number, labeled, and input into the Excel spreadsheet along with the student gender, SES, ACT Prep course enrollment, and ACT mathematics, English, reading, science, and composite scores. Each transcript was then evaluated for course enrollment and rigor level. During the process of evaluating transcripts, each of the core subject courses was highlighted (mathematics = blue, English = yellow, social studies = green, and science = pink). Information for each core course the student was enrolled in was input into the spreadsheet. After the courses were input into the spreadsheet, the courses the student did not take were designated by a blank entry. Once all core subject courses were entered into Excel, the spreadsheet was re-examined to ensure all the information was correct and in the correct location. A rigor score was then calculated for each subject. Data from the Excel workbook was uploaded to IBM SPSS Statistics Faculty Pack 25 for Windows for analysis.

Data Analysis and Hypothesis Testing

The data from District B student transcripts were uploaded for analysis. Below is a listing of the research questions, the hypotheses, and the statistical tests used to analyze the data for this study. Pearson product moment correlation coefficients were calculated. One-sample *t* tests, Fisher's *z* tests for two correlations, and two-factor ANOVAs were used to test the hypotheses.

RQ1. To what extent are there correlations between ACT subtest scores (mathematics, English, reading, and science) and core course rigor level scores (mathematics, English, social studies, and science)?

H1. There is a correlation between the ACT mathematics subtest score and the mathematics course rigor level score.

A Pearson product moment correlation coefficient was calculated to index the strength and direction of the relationship between the ACT mathematics subtest score and the mathematics course rigor level score. 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.

H2. There is a correlation between the ACT English subtest score and the English course rigor level score.

A Pearson product moment correlation coefficient was calculated to index the strength and direction of the relationship between the ACT English subtest score and the English course rigor level score. 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.

H3. There is a correlation between the ACT reading subtest score and the social studies course rigor level score.

A Pearson product moment correlation coefficient was calculated to index the strength and direction of the relationship between the ACT reading subtest score and the social studies course rigor level score. 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.

H4. There is a correlation between the ACT science subtest score and the science course rigor level score.

A Pearson product moment correlation coefficient was calculated to index the strength and direction of the relationship between the ACT science subtest score and the science course rigor level score. 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.

RQ2. To what extent are the correlations between ACT subtest scores (mathematics, English, reading, and science) and core course rigor level scores (mathematics, English, social studies, and science) affected by the student demographic variables of gender and SES?

H5. The correlation between ACT mathematics subtest scores and mathematics course rigor level scores is affected by student gender.

Prior to conducting the hypothesis test for H5, the data were disaggregated by gender. A Pearson product moment correlation coefficient was calculated to index the strength and direction of the relationship between ACT mathematics subtest scores and mathematics course rigor level scores for males. A second Pearson product moment correlation coefficient was calculated to index the strength and direction of the relationship between ACT mathematics subtest scores and mathematics course rigor level scores for females. A Fisher's z test for two correlations was conducted to test H5. The two sample correlations were compared. The level of significance was set at .05.

H6. The correlation between ACT English subtest scores and English course rigor level scores is affected by student gender.

Prior to conducting the hypothesis test for H6, the data were disaggregated by gender. A Pearson product moment correlation coefficient was calculated to index the strength and direction of the relationship between ACT English subtest scores and English course rigor level scores for males. A second Pearson product moment correlation coefficient was calculated to index the strength and direction of the relationship between ACT English subtest scores and English course rigor level scores for females. A Fisher's *z* test for two correlations was conducted to test H6. The two sample correlations were compared. The level of significance was set at .05.

H7. The correlation between ACT reading subtest scores and social studies course rigor level scores is affected by student gender.

Prior to conducting the hypothesis test for H7, the data were disaggregated by gender. A Pearson product moment correlation coefficient was calculated to index the strength and direction of the relationship between ACT reading subtest scores and social studies course rigor level scores for males. A second Pearson product moment correlation coefficient was calculated to index the strength and direction of the relationship between ACT reading subtest scores and social studies course rigor level scores for females. A Fisher's *z* test for two correlations was conducted to test H7. The two sample correlations were compared. The level of significance was set at .05.

H8. The correlation between ACT science subtest scores and science course rigor level scores is affected by student gender.

Prior to conducting the hypothesis test for H8, the data were disaggregated by gender. A Pearson product moment correlation coefficient was calculated to index the strength and direction of the relationship between ACT science subtest scores and science course rigor level scores for males. A second Pearson product moment correlation coefficient was calculated to index the strength and direction of the relationship between ACT science subtest scores and science course rigor level scores for females. A Fisher's *z* test for two correlations was conducted to test H8. The two sample correlations were compared. The level of significance was set at .05.

H9. The correlation between ACT mathematics subtest scores and mathematics course rigor level scores is affected by student SES.

Prior to conducting the hypothesis test for H9, the data were disaggregated by SES. A Pearson product moment correlation coefficient was calculated to index the strength and direction of the relationship between ACT mathematics subtest scores and mathematics course rigor level scores for free/reduced lunch program students. A second Pearson product moment correlation coefficient was calculated to index the strength and direction of the relationship between ACT mathematics subtest scores and mathematics course rigor level scores for full-pay lunch students. A Fisher's *z* test for two correlations was conducted to test H9. The two sample correlations were compared. The level of significance was set at .05.

H10. The correlation between ACT English subtest scores and English course rigor level scores is affected by student SES.

Prior to conducting the hypothesis test for H10, the data were disaggregated by SES. A Pearson product moment correlation coefficient was calculated to index the

strength and direction of the relationship between ACT English subtest scores and English course rigor level scores for free/reduced lunch program students. A second Pearson product moment correlation coefficient was calculated to index the strength and direction of the relationship between ACT English subtest scores and English course rigor level scores for full-pay lunch students. A Fisher's *z* test for two correlations was conducted to test H10. The two sample correlations were compared. The level of significance was set at .05.

H11. The correlation between ACT reading subtest scores and social studies course rigor level scores is affected by student SES.

Prior to conducting the hypothesis test for H11, the data were disaggregated by SES. A Pearson product moment correlation coefficient was calculated to index the strength and direction of the relationship between ACT reading subtest scores and social studies course rigor level scores for free/reduced lunch program students. A second Pearson product moment correlation coefficient was calculated to index the strength and direction of the relationship between ACT reading subtest scores and social studies course rigor level scores for full-pay lunch students. A Fisher's *z* test for two correlations was conducted to test H11. The two sample correlations were compared. The level of significance was set at .05.

H12. The correlation between ACT science subtest scores and science course rigor level scores is affected by student SES.

Prior to conducting the hypothesis test for H12, the data were disaggregated by SES. A Pearson product moment correlation coefficient was calculated to index the strength and direction of the relationship between ACT science subtest scores and science

course rigor level scores for free/reduced lunch program students. A second Pearson product moment correlation coefficient was calculated to index the strength and direction of the relationship between ACT science subtest scores and science course rigor level scores for full-pay lunch students. A Fisher's *z* test for two correlations was conducted to test H12. The two sample correlations were compared. The level of significance was set at .05.

RQ3. To what extent are there differences in ACT subtest scores (mathematics, English, reading, and science) and composite scores between students who completed an ACT prep course and students who did not complete an ACT prep course?

H13. There is a difference in ACT mathematics subtest scores between students who completed an ACT prep course and students who did not complete an ACT prep course.

A two-factor analysis of variance (ANOVA) was conducted to test H13 and H18. The two categorical variables used to group the ACT mathematics subtest scores were ACT prep course completion (completed, did not complete) and gender (male, female). The two-factor ANOVA can be used to test three hypotheses including a main effect for ACT prep course completion, a main effect for gender, and a two-way interaction effect (ACT Prep Course Completion X Gender). The main effect for ACT prep course completion was used to test H13. The level of significance was set at .05.

H14. There is a difference in ACT English subtest scores between students who completed an ACT prep course and students who did not complete an ACT prep course.

A second two-factor ANOVA was conducted to test H14 and H19. The two categorical variables used to group the ACT English subtest scores were ACT prep

course completion (completed, did not complete) and gender (male, female). The two-factor ANOVA can be used to test three hypotheses including a main effect for ACT prep course completion, a main effect for gender, and a two-way interaction effect (ACT Prep Course Completion X Gender). The main effect for ACT prep course completion was used to test H14. The level of significance was set at .05.

H15. There is a difference in ACT reading subtest scores between students who completed an ACT prep course and students who did not complete an ACT prep course.

A third two-factor ANOVA was conducted to test H15 and H20. The two categorical variables used to group the ACT reading subtest scores were ACT prep course completion (completed, did not complete) and gender (male, female). The two-factor ANOVA can be used to test three hypotheses including a main effect for ACT prep course completion, a main effect for gender, and a two-way interaction effect (ACT Prep Course Completion X Gender). The main effect for ACT prep course completion was used to test H15. The level of significance was set at .05.

H16. There is a difference in ACT science subtest scores between students who completed an ACT prep course and students who did not complete an ACT prep course.

A fourth two-factor analysis ANOVA was conducted to test H16 and H21. The two categorical variables used to group the ACT science subtest scores were ACT prep course completion (completed, did not complete) and gender (male, female). The fourth two-factor ANOVA can be used to test three hypotheses including a main effect for ACT prep course completion, a main effect for gender, and a two-way interaction effect (ACT Prep Course Completion X Gender). The main effect for ACT prep course completion was used to test H16. The level of significance was set at .05.

H17. There is a difference in ACT composite scores between students who completed an ACT prep course and students who did not complete an ACT prep course.

A fifth two-factor ANOVA was conducted to test H17 and H22. The two categorical variables used to group the ACT composite scores were ACT prep course completion (completed, did not complete) and gender (male, female). The two-factor ANOVA can be used to test three hypotheses including a main effect for ACT prep course completion, a main effect for gender, and a two-way interaction effect (ACT Prep Course Completion X Gender). The main effect for ACT prep course completion was used to test H17. The level of significance was set at .05.

RQ4. To what extent are the differences in ACT subtest scores (mathematics, English, reading, and science) and composite scores between students who completed an ACT prep course and students who did not complete an ACT prep course affected by the student demographic variables of gender and SES?

H18. The difference in ACT mathematics subtest scores between students who completed an ACT prep course and students who did not complete an ACT prep course is affected by student gender.

The interaction effect from the first two-factor ANOVA (ACT Prep Course Completion X Gender) was used to test H18. The level of significance was set at .05.

H19. The difference in ACT English subtest scores between students who completed an ACT prep course and students who did not complete an ACT prep course is affected by student gender.

The interaction effect from the second two-factor ANOVA (ACT Prep Course Completion X Gender) was used to test H19. The level of significance was set at .05.

H20. The difference in ACT reading subtest scores between students who completed an ACT prep course and students who did not complete an ACT prep course is affected by student gender.

The interaction effect from the third two-factor ANOVA (ACT Prep Course Completion X Gender) was used to test H20. The level of significance was set at .05.

H21. The difference in ACT science subtest scores between students who completed an ACT prep course and students who did not complete an ACT prep course is affected by student gender.

The interaction effect from the fourth two-factor ANOVA (ACT Prep Course Completion X Gender) was used to test H21. The level of significance was set at .05.

H22. The difference in ACT composite scores between students who completed an ACT prep course and students who did not complete an ACT prep course is affected by student gender.

The interaction effect from the fifth two-factor ANOVA (ACT Prep Course Completion X Gender) was used to test H22. The level of significance was set at .05.

H23. The difference in ACT mathematics subtest scores between students who completed an ACT prep course and students who did not complete an ACT prep course is affected by student SES.

A sixth two-factor ANOVA was conducted to test H23. The two categorical variables used to group the ACT mathematics subtest scores were ACT prep course completion (completed, did not complete) and SES (Free/reduced, full pay). The two-factor ANOVA can be used to test three hypotheses including a main effect for ACT prep course completion, a main effect for SES, and a two-way interaction effect (ACT Prep

Course Completion X SES). The interaction effect for ACT prep course completion by SES was used to test H23. The level of significance was set at .05.

H24. The difference in ACT English subtest scores between students who completed an ACT prep course and students who did not complete an ACT prep course is affected by student SES.

A seventh two-factor ANOVA was conducted to test H24. The two categorical variables used to group the ACT English subtest scores were ACT prep course completion (completed, did not complete) and SES (Free/reduced, full pay). The two-factor ANOVA can be used to test three hypotheses including a main effect for ACT prep course completion, a main effect for SES, and a two-way interaction effect (ACT Prep Course Completion X SES). The interaction effect for ACT prep course completion by SES was used to test H24. The level of significance was set at .05.

H25. The difference in ACT reading subtest scores between students who completed an ACT prep course and students who did not complete an ACT prep course is affected by student SES.

An eighth two-factor ANOVA was conducted to test H25. The two categorical variables used to group the ACT reading subtest scores were ACT prep course completion (completed, did not complete) and SES (Free/reduced, full pay). The two-factor ANOVA can be used to test three hypotheses including a main effect for ACT prep course completion, a main effect for SES, and a two-way interaction effect (ACT Prep Course Completion X SES). The interaction effect for ACT prep course completion by SES was used to test H25. The level of significance was set at .05.

H26. The difference in ACT science subtest scores between students who completed an ACT prep course and students who did not complete an ACT prep course is affected by student SES.

A ninth two-factor ANOVA was conducted to test H26. The two categorical variables used to group the ACT science subtest scores were ACT prep course completion (completed, did not complete) and SES (Free/reduced, full pay). The two-factor ANOVA can be used to test three hypotheses including a main effect for ACT prep course completion, a main effect for SES, and a two-way interaction effect (ACT Prep Course Completion X SES). The interaction effect for ACT prep course completion by SES was used to test H26. The level of significance was set at .05.

H27. The difference in ACT composite scores between students who completed an ACT prep course and students who did not complete an ACT prep course is affected by student SES.

A tenth two-factor ANOVA was conducted to test H27. The two categorical variables used to group the ACT composite subtest scores were ACT prep course completion (completed, did not complete) and SES (Free/reduced, full pay). The two-factor ANOVA can be used to test three hypotheses including a main effect for ACT prep course completion, a main effect for SES, and a two-way interaction effect (ACT Prep Course Completion X SES). The interaction effect for ACT prep course completion by SES was used to test H27. The level of significance was set at .05.

Limitations

Limitations may stem from the methodology or data collected and are factors out of the control of the researcher which may impact the interpretation of the results

(Lunenburg & Irby, 2008). One limitation of this study is that parents might have used other resources to prepare students for the ACT examination. Parents could have hired a company, such as Sylvan Learning Center, which offers tutoring in mathematics and ACT preparation. Parents and students might have researched online to find sites such as 4Tests, Number2, Prep Factory that offer practice questions and tips for taking the ACT examination. There are also books published by ACT, Princeton Review, and Kaplan that could have been used by students to prepare for the ACT. A second limitation of this study is that not all students start at the same academic or motivation level. Students may be in gifted or special education programs. Students might enroll in the ACT Prep course due to a lack of course offerings during the hour it was offered. Some students may not have had a desire to attend college after their high school graduation and did not put as much effort into the test as those students planning to attend college upon graduation. The small number of students who completed the ACT Prep class and were free and reduced lunch students add a limitation to the study.

Summary

The methodology for this study was described in Chapter 3. Topics in this chapter included the research design, selection of participants, measurement, data collection procedures, data analysis and hypothesis testing, and limitations. Chapter 4 includes the descriptive statistics and results of the hypothesis testing.

Chapter 4

Results

The purpose of this study was to determine whether there are correlations between ACT subtest scores (mathematics, English, reading, and science) and core course rigor level scores (mathematics, English, social studies, and science). The second purpose of the study was to determine whether correlations between ACT subtest scores (mathematics, English, reading, and science) and core course rigor level scores (mathematics, English, social studies, and science) are affected by the student demographic variables of gender and SES. The third purpose of this study was to determine whether there are differences in ACT subtest (mathematics, English, reading, and science) and composite scores between students who complete an ACT Prep course and students who do not complete the ACT Prep course. The final purpose of the study was to determine whether the differences in ACT subtest (mathematics, English, reading, and science) and composite scores between students who complete an ACT Prep course and those who do not complete the ACT Prep course are affected by the student demographic variables of gender and SES. This chapter includes the descriptive statistics and the results of the hypothesis testing.

Descriptive Statistics

Table 6 depicts the frequencies and percentages for the participant characteristics. Of the total participants, 21% qualified for free or reduced lunch. Only 10.5% of the participants enrolled in the ACT Prep course.

Table 6

Frequencies and Percentages for Student Characteristics

Student Characteristic	*f*	%
Gender		
Female	163	51.7
Male	152	48.3
SES		
Free and Reduced	66	21.0
Full Pay	249	79.0
Prep Class		
Completed	33	10.5
Did Not Complete	282	89.5

Hypothesis Testing

Based on the relevant variables to this study, 27 hypotheses were identified and tested. To test the hypotheses, the statistical tools used in the study were one-sample *t* tests, Fisher's *z* tests for two correlations, and two-factor ANOVAs. The results of the hypotheses are explained in this section.

RQ1. To what extent are there correlations between ACT subtest scores (mathematics, English, reading, and science) and core course rigor level scores (mathematics, English, social studies, and science)?

H1. There is a correlation between the ACT mathematics subtest score and the mathematics course rigor level score.

A Pearson product moment correlation coefficient was calculated to index the strength and direction of the relationship between the ACT mathematics subtest score and the mathematics course rigor level score. 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 = .547) provided evidence for a moderately strong positive relationship between ACT mathematics subtest score and the mathematics course rigor level score. The results of the one sample *t* test indicated a statistically significant relationship between ACT mathematics subtest score and the mathematics course rigor level score, df = 313, p = .000. As the course rigor scores increased, the scores on the ACT mathematics subtest increased. H1 was supported.

H2. There is a correlation between the ACT English subtest score and the English course rigor level score.

A Pearson product moment correlation coefficient was calculated to index the strength and direction of the relationship between the ACT English subtest score and the English course rigor level score. 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 = .475) provided evidence for a moderately strong positive relationship between ACT English subtest score and the English course rigor level score. The results of the one sample *t* test indicated a statistically significant relationship between ACT English subtest score and the English course rigor level score,

df = 313, *p* = .000. As the course rigor scores increased, the scores on the ACT English subtest increased. H2 was supported.

H3. There is a correlation between the ACT reading subtest score and the social studies course rigor level score.

A Pearson product moment correlation coefficient was calculated to index the strength and direction of the relationship between the ACT reading subtest score and the social studies course rigor level score. 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* = .472) provided evidence for a moderately strong positive relationship between ACT reading subtest score and the social studies course rigor level score. The results of the one sample *t* test indicated a statistically significant relationship between ACT reading subtest score and the social studies course rigor level score, *df* = 313, *p* = .000. As the course rigor scores increased, the scores on the ACT reading subtest increased. H3 was supported.

H4. There is a correlation between the ACT science subtest score and the science course rigor level score.

A Pearson product moment correlation coefficient was calculated to index the strength and direction of the relationship between the ACT science subtest score and the science course rigor level score. 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 = .475) provided evidence for a moderately strong positive relationship between ACT science subtest score and the science course rigor level score. The results of the one sample t test indicated a statistically significant relationship between ACT science subtest score and the science course rigor level score, df = 313, p = .000. As the course rigor scores increased, the scores on the ACT science subtest increased. H4 was supported.

RQ2. To what extent are the correlations between ACT subtest scores (mathematics, English, reading, and science) and core course rigor level scores (mathematics, English, social studies, and science) affected by the student demographic variables of gender and SES?

H5. The correlation between ACT mathematics subtest scores and mathematics course rigor level scores is affected by student gender.

Prior to conducting the hypothesis test for H5, the data were disaggregated by gender. A Pearson product moment correlation coefficient was calculated to index the strength and direction of the relationship between ACT mathematics subtest scores and mathematics course rigor level scores for males. A second Pearson product moment correlation coefficient was calculated to index the strength and direction of the relationship between ACT mathematics subtest scores and mathematics course rigor level scores for females. A Fisher's z test for two correlations was conducted to test H5. The two sample correlations were compared. The level of significance was set at .05.

The results of the Fisher's z test for two correlations indicated there was not a statistically significant difference between the two values, z = 0.230, p = .818. The correlation for male students (r = .558) was not different from the correlation for female

students (r = .540). The correlation between ACT mathematics subtest scores and mathematics course rigor level scores was not affected by student gender. H5 was not supported.

H6. The correlation between ACT English subtest scores and English course rigor level scores is affected by student gender.

Prior to conducting the hypothesis test for H6, the data were disaggregated by gender. A Pearson product moment correlation coefficient was calculated to index the strength and direction of the relationship between ACT English subtest scores and English course rigor level scores for males. A second Pearson product moment correlation coefficient was calculated to index the strength and direction of the relationship between ACT English subtest scores and English course rigor level scores for females. A Fisher's z test for two correlations was conducted to test H6. The two sample correlations were compared. The level of significance was set at .05.

The results of the Fisher's z test for two correlations indicated there was not a statistically significant difference between the two values, z = -0.62, p = .535. The correlation for male students (r = .445) was not different from the correlation for female students (r = .500). The correlation between ACT English subtest scores and mathematics course rigor level scores was not affected by student gender. H6 was not supported.

H7. The correlation between ACT reading subtest scores and social studies course rigor level scores is affected by student gender.

Prior to conducting the hypothesis test for H7, the data were disaggregated by gender. A Pearson product moment correlation coefficient was calculated to index the

strength and direction of the relationship between ACT reading subtest scores and social studies course rigor level scores for males. A second Pearson product moment correlation coefficient was calculated to index the strength and direction of the relationship between ACT reading subtest scores and social studies course rigor level scores for females. A Fisher's *z* test for two correlations was conducted to test H7. The two sample correlations were compared. The level of significance was set at .05.

The results of the Fisher's *z* test for two correlations indicated there was not a statistically significant difference between the two values, $z = -0.47$, $p = .638$. The correlation for male students ($r = .450$) was not different from the correlation for female students ($r = .492$). The correlation between ACT reading subtest scores and social studies course rigor level scores was not affected by student gender. H7 was not supported.

H8. The correlation between ACT science subtest scores and science course rigor level scores is affected by student gender.

Prior to conducting the hypothesis test for H8, the data were disaggregated by gender. A Pearson product moment correlation coefficient was calculated to index the strength and direction of the relationship between ACT science subtest scores and science course rigor level scores for males. A second Pearson product moment correlation coefficient was calculated to index the strength and direction of the relationship between ACT science subtest scores and science course rigor level scores for females. A Fisher's *z* test for two correlations was conducted to test H8. The two sample correlations were compared. The level of significance was set at .05.

The results of the Fisher's *z* test for two correlations indicated there was not a statistically significant difference between the two values, $z = -1.01$, $p = .313$. The correlation for male students ($r = .439$) was not different from the correlation for female students ($r = .547$). The correlation between ACT science subtest scores and science course rigor level scores was not affected by student gender. H8 was not supported.

H9. The correlation between ACT mathematics subtest scores and mathematics course rigor level scores is affected by student SES.

Prior to conducting the hypothesis test for H9, the data were disaggregated by SES. A Pearson product moment correlation coefficient was calculated to index the strength and direction of the relationship between ACT mathematics subtest scores and mathematics course rigor level scores for free/reduced lunch program students. A second Pearson product moment correlation coefficient was calculated to index the strength and direction of the relationship between ACT mathematics subtest scores and mathematics course rigor level scores for full-pay lunch students. A Fisher's *z* test for two correlations was conducted to test H9. The two sample correlations were compared. The level of significance was set at .05.

The results of the Fisher's *z* test for two correlations indicated there was not a statistically significant difference between the two values, $z = 1.31$, $p = .190$. The correlation for full pay lunch students ($r = .570$) was not different from the correlation for free and reduced lunch students ($r = .432$). The correlation between ACT mathematics subtest scores and mathematics course rigor level scores was not affected by student SES. H9 was not supported.

H10. The correlation between ACT English subtest scores and English course rigor level scores is affected by student SES.

Prior to conducting the hypothesis test for H10, the data were disaggregated by SES. A Pearson product moment correlation coefficient was calculated to index the strength and direction of the relationship between ACT English subtest scores and English course rigor level scores for free/reduced lunch program students. A second Pearson product moment correlation coefficient was calculated to index the strength and direction of the relationship between ACT English subtest scores and English course rigor level scores for full-pay lunch students. A Fisher's *z* test for two correlations was conducted to test H10. The two sample correlations were compared. The level of significance was set at .05.

The results of the Fisher's *z* test for two correlations indicated there was not a statistically significant difference between the two values, $z = -1.40$, $p = .162$. The correlation for full pay lunch students ($r = .430$) was not different from the correlation for free and reduced lunch students ($r = .577$). The correlation between ACT English subtest scores and English course rigor level scores was not affected by student SES. H10 was not supported.

H11. The correlation between ACT reading subtest scores and social studies course rigor level scores is affected by student SES.

Prior to conducting the hypothesis test for H11, the data were disaggregated by SES. A Pearson product moment correlation coefficient was calculated to index the strength and direction of the relationship between ACT reading subtest scores and social studies course rigor level scores for free/reduced lunch program students. A second

Pearson product moment correlation coefficient was calculated to index the strength and direction of the relationship between ACT reading subtest scores and social studies course rigor level scores for full-pay lunch students. A Fisher's *z* test for two correlations was conducted to test H11. The two sample correlations were compared. The level of significance was set at .05.

The results of the Fisher's *z* test for two correlations indicated there was a marginally significant difference between the two values, $z = 1.92$, $p = .055$. Although not statistically significant, the correlation for full pay lunch students ($r = .502$) was stronger than the correlation for free and reduced lunch students ($r = .274$). The correlation between ACT reading subtest scores and social studies course rigor level scores was affected by student SES. H11 was supported.

H12. The correlation between ACT science subtest scores and science course rigor level scores is affected by student SES.

Prior to conducting the hypothesis test for H12, the data were disaggregated by SES. A Pearson product moment correlation coefficient was calculated to index the strength and direction of the relationship between ACT science subtest scores and science course rigor level scores for free/reduced lunch program students. A second Pearson product moment correlation coefficient was calculated to index the strength and direction of the relationship between ACT science subtest scores and science course rigor level scores for full-pay lunch students. A Fisher's *z* test for two correlations was conducted to test H12. The two sample correlations were compared. The level of significance was set at .05.

The results of the Fisher's *z* test for two correlations indicated there was not a statistically significant difference between the two values, $z = 0.230$, $p = .818$. The correlation for full pay lunch students ($r = .558$) was not different from the correlation for free and reduced lunch students ($r = .540$). The correlation between ACT science subtest scores and science course rigor level scores was not affected by student SES. H12 was not supported.

RQ3. To what extent are there differences in ACT subtest scores (mathematics, English, reading, and science) and composite scores between students who completed an ACT prep course and students who did not complete an ACT prep course?

H13. There is a difference in ACT mathematics subtest scores between students who completed an ACT prep course and students who did not complete an ACT prep course.

A two-factor analysis of variance (ANOVA) was conducted to test H13 and H18. The two categorical variables used to group the ACT mathematics subtest scores were ACT prep course completion (completed, did not complete) and gender (male, female). The two-factor ANOVA can be used to test three hypotheses including a main effect for ACT prep course completion, a main effect for gender, and a two-way interaction effect (ACT Prep Course Completion X Gender). The main effect for ACT prep course completion was used to test H13. The level of significance was set at .05.

The results of the analysis indicated there was not a statistically significant difference between the means, $F = 1.936$, $df = 1, 311$, $p = .165$. See Table # for the means and standard deviations for this analysis. There was not a difference in ACT

mathematics subtest scores between students who completed an ACT prep course and students who did not complete an ACT prep course. H13 was not supported.

Table 7

Descriptive Statistics for the Results of the Test for H13

ACT Prep Course	*M*	*SD*	*N*
Completed	20.24	3.48	33
Did Not Complete	19.30	4.18	282

H14. There is a difference in ACT English subtest scores between students who completed an ACT prep course and students who did not complete an ACT prep course.

A second two-factor ANOVA was conducted to test H14 and H19. The two categorical variables used to group the ACT English subtest scores were ACT prep course completion (completed, did not complete) and gender (male, female). The two-factor ANOVA can be used to test three hypotheses including a main effect for ACT prep course completion, a main effect for gender, and a two-way interaction effect (ACT Prep Course Completion X Gender). The main effect for ACT prep course completion was used to test H14. The level of significance was set at .05.

The results of the analysis indicated there was a marginally significant difference between the means, $F = 3.563$, $df = 1, 311$, $p = .060$. See Table # for the means and standard deviations for this analysis. Though not statistically significant, the average of the ACT English subtest scores for students who completed an ACT prep course ($M = 20.30$) was higher than the average of the ACT mathematics subtest scores for students who did not complete an ACT prep course ($M = 18.37$). H14 was supported.

Table 8

Descriptive Statistics for the Results of the Test for H14

ACT Prep Course	*M*	*SD*	*N*
Completed	20.30	4.58	33
Did Not Complete	18.37	5.90	282

H15. There is a difference in ACT reading subtest scores between students who completed an ACT prep course and students who did not complete an ACT prep course.

A third two-factor ANOVA was conducted to test H15 and H20. The two categorical variables used to group the ACT reading subtest scores were ACT prep course completion (completed, did not complete) and gender (male, female). The two-factor ANOVA can be used to test three hypotheses including a main effect for ACT prep course completion, a main effect for gender, and a two-way interaction effect (ACT Prep Course Completion X Gender). The main effect for ACT prep course completion was used to test H15. The level of significance was set at .05.

The results of the analysis indicated there was not a statistically significant difference between the means, $F = 0.134$, $df = 1, 311$, $p = .715$. See Table # for the means and standard deviations for this analysis. There was not a difference in ACT reading subtest scores between students who completed an ACT prep course and students who did not complete an ACT prep course. H15 was not supported.

Table 9

Descriptive Statistics for the Results of the Test for H15

ACT Prep Course	*M*	*SD*	*N*
Completed	20.15	5.83	33
Did Not Complete	19.76	5.96	282

H16. There is a difference in ACT science subtest scores between students who completed an ACT prep course and students who did not complete an ACT prep course.

A fourth two-factor analysis ANOVA was conducted to test H16 and H21. The two categorical variables used to group the ACT science subtest scores were ACT prep course completion (completed, did not complete) and gender (male, female). The fourth two-factor ANOVA can be used to test three hypotheses including a main effect for ACT prep course completion, a main effect for gender, and a two-way interaction effect (ACT Prep Course Completion X Gender). The main effect for ACT prep course completion 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, $F = 0.134$, $df = 1, 311$, $p = .715$. See Table # for the means and standard deviations for this analysis. There was not a difference in ACT science subtest scores between students who completed an ACT prep course and students who did not complete an ACT prep course. H16 was not supported.

Table 10

Descriptive Statistics for the Results of the Test for H16

ACT Prep Course	*M*	*SD*	*N*
Completed	20.64	3.50	33
Did Not Complete	19.78	4.26	282

H17. There is a difference in ACT composite scores between students who completed an ACT prep course and students who did not complete an ACT prep course.

A fifth two-factor ANOVA was conducted to test H17 and H22. The two categorical variables used to group the ACT composite scores were ACT prep course completion (completed, did not complete) and gender (male, female). The two-factor ANOVA can be used to test three hypotheses including a main effect for ACT prep course completion, a main effect for gender, and a two-way interaction effect (ACT Prep Course Completion X Gender). The main effect for ACT prep course completion was used to test H17. The level of significance was set at .05.

The results of the analysis indicated there was not a statistically significant difference between the means, $F = 0.134$, $df = 1, 311$, $p = .715$. See Table # for the means and standard deviations for this analysis. There was not a difference in ACT composite scores between students who completed an ACT prep course and students who did not complete an ACT prep course. H15 was not supported.

Table 11

Descriptive Statistics for the Results of the Test for H17

ACT Prep Course	*M*	*SD*	*N*
Completed	20.61	3.45	33
Did Not Complete	19.44	4.49	282

RQ4. To what extent are the differences in ACT subtest scores (mathematics, English, reading, and science) and composite scores between students who completed an ACT prep course and students who did not complete an ACT prep course affected by the student demographic variables of gender and SES?

H18. The difference in ACT mathematics subtest scores between students who completed an ACT prep course and students who did not complete an ACT prep course is affected by student gender.

The interaction effect from the first two-factor ANOVA (ACT Prep Course Completion X Gender) was used to test H18. 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 of the means, $F = 1.548$, $df = 1, 311$, $p = .214$. See Table # for the means and standard deviations for this analysis. A follow-up post hoc was not warranted. The difference in ACT mathematics subtest scores between students who completed an ACT prep course and students who did not complete an ACT prep course was not affected by student gender. H18 was not supported.

Table 12

Descriptive Statistics for the Results of the Test for H18

ACT Prep Course	Gender	*M*	*SD*	*N*
Completed	Females	19.75	3.01	20
	Males	21.00	4.12	13
Did Not Complete	Females	19.64	3.79	143
	Males	18.96	4.54	139

H19. The difference in ACT English subtest scores between students who completed an ACT prep course and students who did not complete an ACT prep course is affected by student gender.

The interaction effect from the second two-factor ANOVA (ACT Prep Course Completion X Gender) was used to test H19. 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 of the means, $F = 1.438$, $df = 1, 311$, $p = .231$. See Table # for the means and standard deviations for this analysis. A follow-up post hoc was not warranted. The difference in ACT English subtest scores between students who completed an ACT prep course and students who did not complete an ACT prep course was not affected by student gender. H19 was not supported.

Table 13

Descriptive Statistics for the Results of the Test for H14

ACT Prep Course	Gender	*M*	*SD*	*N*
Completed	Females	20.00	4.28	20
	Males	20.77	5.15	13
Did Not Complete	Females	19.26	5.58	143
	Males	17.45	6.10	139

H20. The difference in ACT reading subtest scores between students who completed an ACT prep course and students who did not complete an ACT prep course is affected by student gender.

The interaction effect from the third two-factor ANOVA (ACT Prep Course Completion X Gender) was used to test H20. 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 of the means, $F = 0.425$, $df = 1, 311$, $p = .515$. See Table # for the means and standard deviations for this analysis. A follow-up post hoc was not warranted. The difference in ACT reading subtest scores between students who completed an ACT prep course and students who did not complete an ACT prep course was not affected by student gender. H20 was not supported.

Table 14

Descriptive Statistics for the Results of the Test for H20

ACT Prep Course	Gender	*M*	*SD*	*N*
Completed	Females	20.15	6.47	20
	Males	20.15	4.93	13
Did Not Complete	Females	20.47	5.70	143
	Males	19.02	6.15	139

H21. The difference in ACT science subtest scores between students who completed an ACT prep course and students who did not complete an ACT prep course is affected by student gender.

The interaction effect from the fourth two-factor ANOVA (ACT Prep Course Completion X Gender) was used to test H21. 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 of the means, $F = 0.403$, $df = 1, 311$, $p = .526$. See Table # for the means and standard deviations for this analysis. A follow-up post hoc was not warranted. The difference in ACT science subtest scores between students who completed an ACT prep course and students who did not complete an ACT prep course was not affected by student gender. H21 was not supported.

Table 15

Descriptive Statistics for the Results of the Test for H21

ACT Prep Course	Gender	*M*	*SD*	*N*
Completed	Females	20.30	3.28	20
	Males	21.15	3.89	13
Did Not Complete	Females	19.85	3.92	143
	Males	19.71	4.60	139

H22. The difference in ACT composite scores between students who completed an ACT prep course and students who did not complete an ACT prep course is affected by student gender.

The interaction effect from the fifth two-factor ANOVA (ACT Prep Course Completion X Gender) was used to test H22. 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 of the means, $F = 0.690$, $df = 1, 311$, $p = .407$. See Table # for the means and standard deviations for this analysis. A follow-up post hoc was not warranted. The difference in ACT composite scores between students who completed an ACT prep course and students who did not complete an ACT prep course was not affected by student gender. H22 was not supported.

Table 16

Descriptive Statistics for the Results of the Test for H22

ACT Prep Course	Gender	*M*	*SD*	*N*
Completed	Females	20.45	3.25	20
	Males	20.85	3.87	13
Did Not Complete	Females	19.92	4.21	143
	Males	18.95	4.74	139

H23. The difference in ACT mathematics subtest scores between students who completed an ACT prep course and students who did not complete an ACT prep course is affected by student SES.

A sixth two-factor ANOVA was conducted to test H23. The two categorical variables used to group the ACT mathematics subtest scores were ACT prep course completion (completed, did not complete) and SES (Free/reduced, full pay). The two-factor ANOVA can be used to test three hypotheses including a main effect for ACT prep course completion, a main effect for SES, and a two-way interaction effect (ACT Prep Course Completion X SES). The interaction effect for ACT prep course completion by SES was used to test H23. 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 of the means, $F = 0.035$, $df = 1, 311$, $p = .851$. See Table # for the means and standard deviations for this analysis. A follow-up post hoc was not warranted. The difference in ACT mathematics subtest scores between students who completed an ACT prep course and students who did not complete an ACT prep course was not affected by student SES. H23 was not supported.

Table 17

Descriptive Statistics for the Results of the Test for H23

ACT Prep Course	SES	*M*	*SD*	*N*
Completed	Free/Reduced	18.80	1.92	5
	Full Pay	20.50	3.66	28
Did Not Complete	Free/Reduced	18.28	3.60	61
	Full Pay	19.59	4.29	221

H24. The difference in ACT English subtest scores between students who completed an ACT prep course and students who did not complete an ACT prep course is affected by student SES.

A seventh two-factor ANOVA was conducted to test H24. The two categorical variables used to group the ACT English subtest scores were ACT prep course completion (completed, did not complete) and SES (Free/reduced, full pay). The two-factor ANOVA can be used to test three hypotheses including a main effect for ACT prep course completion, a main effect for SES, and a two-way interaction effect (ACT Prep Course Completion X SES). The interaction effect for ACT prep course completion by SES was used to test H24. 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 of the means, $F = 0.467$, $df = 1, 311$, $p = .495$. See Table # for the means and standard deviations for this analysis. A follow-up post hoc was not warranted. The difference in ACT English subtest scores between students who completed an ACT prep course and students who did not complete an ACT prep course was not affected by student SES. H24 was not supported.

Table 18

Descriptive Statistics for the Results of the Test for H24

ACT Prep Course	SES	*M*	*SD*	*N*
Completed	Free/Reduced	16.60	3.78	5
	Full Pay	20.96	4.44	28
Did Not Complete	Free/Reduced	16.49	4.84	61
	Full Pay	18.88	6.07	221

H25. The difference in ACT reading subtest scores between students who completed an ACT prep course and students who did not complete an ACT prep course is affected by student SES.

An eighth two-factor ANOVA was conducted to test H25. The two categorical variables used to group the ACT reading subtest scores were ACT prep course completion (completed, did not complete) and SES (Free/reduced, full pay). The two-factor ANOVA can be used to test three hypotheses including a main effect for ACT prep course completion, a main effect for SES, and a two-way interaction effect (ACT Prep Course Completion X SES). The interaction effect for ACT prep course completion by SES was used to test H25. 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 of the means, $F = 0.280$, $df = 1, 311$, $p = .597$. See Table # for the means and standard deviations for this analysis. A follow-up post hoc was not warranted. The difference in ACT reading subtest scores between students who completed an ACT prep course and students who did not complete an ACT prep course was not affected by student SES. H25 was not supported.

Table 19

Descriptive Statistics for the Results of the Test for H25

ACT Prep Course	SES	*M*	*SD*	*N*
Completed	Free/Reduced	17.00	3.54	5
	Full Pay	20.71	6.02	28
Did Not Complete	Free/Reduced	18.08	5.57	61
	Full Pay	20.22	5.99	221

H26. The difference in ACT science subtest scores between students who completed an ACT prep course and students who did not complete an ACT prep course is affected by student SES.

A ninth two-factor ANOVA was conducted to test H26. The two categorical variables used to group the ACT science subtest scores were ACT prep course completion (completed, did not complete) and SES (Free/reduced, full pay). The two-factor ANOVA can be used to test three hypotheses including a main effect for ACT prep course completion, a main effect for SES, and a two-way interaction effect (ACT Prep Course Completion X SES). The interaction effect for ACT prep course completion by SES was used to test H26. 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 of the means, $F = 0.079$, $df = 1, 311$, $p = .779$. See Table # for the means and standard deviations for this analysis. A follow-up post hoc was not warranted. The difference in ACT science subtest scores between students who completed an ACT prep course and students who did not complete an ACT prep course was not affected by student SES. H26 was not supported.

Table 20

Descriptive Statistics for the Results of the Test for H26

ACT Prep Course	SES	*M*	*SD*	*N*
Completed	Free/Reduced	18.60	4.16	5
	Full Pay	21.00	3.32	28
Did Not Complete	Free/Reduced	18.36	3.70	61
	Full Pay	20.17	4.33	221

H27. The difference in ACT composite scores between students who completed an ACT prep course and students who did not complete an ACT prep course is affected by student SES.

A tenth two-factor ANOVA was conducted to test H27. The two categorical variables used to group the ACT composite subtest scores were ACT prep course completion (completed, did not complete) and SES (Free/reduced, full pay). The two-factor ANOVA can be used to test three hypotheses including a main effect for ACT prep course completion, a main effect for SES, and a two-way interaction effect (ACT Prep Course Completion X SES). The interaction effect for ACT prep course completion by SES was used to test H27. 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 of the means, $F = 0.385$, $df = 1, 311$, $p = .535$. See Table # for the means and standard deviations for this analysis. A follow-up post hoc was not warranted. The difference in ACT composite scores between students who completed an ACT prep course and students who did not complete an ACT prep course was not affected by student SES. H27 was not supported.

Table 21

Descriptive Statistics for the Results of the Test for H27

ACT Prep Course	SES	*M*	*SD*	*N*
Completed	Free/Reduced	17.80	2.77	5
	Full Pay	21.11	3.36	28
Did Not Complete	Free/Reduced	17.92	3.73	61
	Full Pay	19.86	4.60	221

Summary

The results from research question one indicated that students taking more rigorous courses have higher ACT subtest scores in mathematics, English, reading, and science. The results from research question two indicated that the relationship between ACT subtest scores (mathematics, English, and science) and core course rigor level scores (mathematics, English, and science) were not affected by student demographics of gender or SES. However, the analysis did show that the relationship between the ACT reading subtest and social studies course rigor level score for full pay lunch students was stronger than the correlation for free and reduced lunch students. The results from the third research question indicated that there was no difference in ACT subtest scores in mathematics, reading, and science and composite scores between students who completed an ACT prep course and those who did not. However, the analysis did show that students who completed the ACT prep course did score higher on the ACT English subtest than students who did not complete the course. The results of the fourth research question did not indicate the difference in ACT subtest and composite scores for students who took the

ACT prep course and those who did not was affected by demographic variables of gender and SES.

The hypothesis testing results for this study were provided in Chapter 4. In Chapter 5, a study summary, which consists of the overview of the problem, purpose statement and research questions, a review of methodology, and major findings are presented. Chapter 5 also includes the findings related to research and concluding remarks, consisting of implications for action, recommendations for further research, and concluding remarks.

Chapter 5

Interpretation and Recommendations

Standardized testing is a topic of concern in education because student performance on these tests is used to hold districts accountable for student achievement but can be a determinant in student post-secondary education. School districts search for how best to prepare students for standardized tests such as the ACT. Using researched best practices may allow districts to focus their efforts on raising student achievement on standardized exams while also working to close the achievement gap on these exams. Determining the effectiveness of an ACT preparatory class will allow schools to continue the class as is, make improvements to the course, or discontinue the course and utilize the resources in other areas to better prepare students. The ACT exam is "deemed important for success in first-year college courses" (ACT, 2013a, p. 3). Understanding the most effective high school courses for obtaining a high ACT score will help students gain admission to college and be successful in their college courses. This chapter includes a summary of the study, findings related to literature, and conclusions.

Study Summary

Student performance on a standardized test such as the ACT can have an important impact on the path a student embarks on after graduating from high school. Performing well on the ACT can open more opportunities for students than if they did not acquire the necessary scores to be admitted into college and receive scholarships to pay tuition for post-secondary education. Strategies for improving student performance on the ACT have been the focus of many studies throughout the years. Strategies researched are the importance of providing a rigorous curriculum for all students and the impact of

various ACT prep programs. Provided in the following sections are an overview of the problem, purpose statement and research questions, a review of methodology, and major findings.

Overview of the problem. Ensuring the college and career readiness of students requires school districts providing a curriculum that prepares students to take the ACT. Research has been conducted on best practices in equipping students to perform well on the ACT. Many students who typically take the ACT have decided to attend college after high school graduation; however, it is important that all students be prepared for a variety of opportunities upon graduation. Students should be prepared for college and a career whether they take regular-level or honors-level courses in high school. School districts in Missouri are evaluated on student academic achievement. One of the assessments used in this evaluation is the ACT scores of students. Therefore, it is important to determine if districts are providing a rigorous curriculum to ensure increased academic achievement while also closing the achievement gap among students of different genders and SES. The ACT score is crucial to understanding the impact of course rigor and successful completion of an ACT preparatory course on a student's performance on the ACT.

Purpose statement and research questions. There were four purposes for this study. The first purpose was to determine whether there are correlations between ACT subtest scores (mathematics, English, reading, and science) and core course rigor level scores (mathematics, English, social studies, and science). The second purpose of the study was to determine whether correlations between ACT subtest scores (mathematics, English, reading, and science) and core course rigor level scores (mathematics, English, social studies, and science) are affected by the student demographic variables of gender

and SES. The third purpose of this study was to determine whether there are differences in ACT subtest (mathematics, English, reading, and science) and composite scores between students who complete an ACT Prep course and students who do not complete the ACT Prep course. The final purpose of the study was to determine whether the differences in ACT subtest (mathematics, English, reading, and science) and composite scores between students who complete an ACT Prep course and those who do not complete the ACT Prep course are affected by the student demographic variables of gender and SES. Four research questions were developed for the study, and 27 hypotheses were tested.

Review of the methodology. A quantitative methods research design using archival data with four independent variables, which included student course selection and core course rigor level, participation in an ACT prep course, gender, and SES were used for this study. The dependent variables were ACT composite and subtest (mathematics, English, reading, and science) scores. Data was collected from student transcripts. Students who graduated from District B in May of 2017 and 2018 and took the ACT during the spring of their junior year were included in this study. Pearson product moment correlation coefficients were calculated. One-sample *t* tests, Fisher's *z* tests for two correlations, and two-factor ANOVAs were used to test the hypotheses.

Major findings. Results of the calculation of the correlation coefficients indicated moderately strong positive relationships between course rigor levels and ACT subtest scores. As course rigor level scores increased, the scores on the ACT subtests increased. Demographics (gender and SES) did not affect differences in the relationship between ACT subtest scores and course rigor levels with the exception of SES affecting

the relationship between the ACT reading subtest score and social studies course rigor level scores. The results of the data analysis also indicated that there was a difference in ACT English subtest scores between students who completed an ACT prep course and those who did not. Students who took the ACT prep course scored higher on the English subtest than students who did not take the course. No differences were indicated in ACT mathematics, reading, and science subtest scores between students who completed the ACT prep course and those who did not. Lastly, demographics (gender and SES) did not affect differences in ACT scores between students who completed an ACT prep course and students who did not complete an ACT prep course.

Findings Related to the Literature

This section examines the current study's findings as they relate to the literature regarding the relationship between core course rigor and ACT subtest scores and whether the demographic variables of gender and SES affected the relationship. Also, this section includes an examination of the literature as it relates to the findings of the difference in ACT composite and subtest scores between students who participated in an ACT Prep course and those who did not. Demographics were also used to determine their impact on the difference in ACT composite and subtest scores between students who completed an ACT prep course and students who did not complete an ACT prep course.

Previous research has been conducted to examine the influences on ACT scores (Grinstead, 2013; Jones, 2016; Justus, 2010; TFSCAT, 2002). This study confirms previous research regarding the effect of students taking rigorous courses throughout high school on ACT scores (Hoyt & Sorensen, 2001; Jones, 2008; Noble & Schnelker, 2007). The findings from the current study also support previous research regarding the impact

of students taking an ACT Prep course on ACT scores (Moss, 1995; Scholes & Lain, 1997). However, the findings of the current study are in contrast to other previously conducted research concerning the impact of an ACT prep course on ACT scores (Donen, 2012; Saluri, 2012).

Parrott's (2012) study indicated there was a "statistically significant relationship between the level of mathematics and English courses taken by a student in high school and their ACT scores" (p. 90). Similarly, the results of the current study indicated a moderately strong positive, statistically significant, relationship between the rigor level scores in math, English, social studies and science and the ACT subtests (mathematics, English, reading, and science). Grinstead (2013) also found that "all advanced mathematics courses had a positive relationship with ACT mathematics score" (p. 58). According to Grinstead (2013), the largest impact on both ACT mathematics and composite scores came from students completing an AP calculus course. Warne et al. (2015) studied the impact of the rigorous AP program on ACT scores. The researchers found that "the AP program was not slight," ranging from a 1-4.1 increase in ACT composite score depending on the AP course taken by students (Warne et al., 2015, p. 413). They also found that students receive the most benefit from taking and passing the AP test, instead of merely being enrolled in the AP class (Warne et al., 2015). The current study also supports research by Jones (2016) who found students taking rigorous courses such as AP perform better on ACT subtests than students that did not take rigorous AP courses. Jones (2016) found that "demographics did not affect differences for mathematics, English, and reading, but race did affect the difference for science" (p. 79) ACT subtest scores between students enrolled in at least one AP course and students

not enrolled in an AP course. Savitz-Romer et al. (2009) noted that schools need to do more in encouraging students with low SES to take rigorous courses throughout high school to prepare students for college.

Regarding the impact of ACT preparatory activities on student ACT scores, Scholes and Lain (1997) found that students who used practice tests in preparation for the ACT received higher scores than students who did not but only by "0.4" (p. 7) additional points to the ACT composite. One of the components to the District B's ACT Prep course is the use of ACT practice tests. Similarly, District B only saw a small gain in composite scores among students who took the course and students who did not complete the course. Another aspect of the Scholes and Lain (1997) study was "the impact of test preparation activities on ACT composite scores" (p. 7). The researchers found "nearly the same ACT composite scores regardless of gender and family income" (p. 7). Similarly, the current study found no statistically significant relationship between the impact of an ACT prep course on ACT composite scores was impacted by gender or SES. Scholes and Lain (1997) indicated that test preparation had little impact on student ACT scores. The Task Force on Standardized College Admission Testing (2002) also found that effects of coaching for the ACT assessment are minimal and within the standard errors of measurement for the test.

The results of the current study are in contrast to Donen (2012) who found a "significant positive impact on student ACT scores" (p. 81) for students who participated in an ACT prep course. Donen (2012) also found the prep course had a positive impact on mathematics and reading scores but not on English and science. In contrast, the current study only found a marginally significant impact on the ACT English subtest

score for students that participated in the ACT prep course. In the study conducted by Saluri (2012) a "statistically significant positive growth" (p. 63) was found in ACT composite scores among students who participated in an ACT prep course after school and those who did not participate in the prep course. The results from the current study indicated that there was not a significant difference in ACT scores among students who participated in an ACT prep course and students who did not except on the ACT English subtest. Saluri (2012) reported that the "mean percentage growth in composite scores of students" who participated in an ACT prep course was "81% higher than those who did not participate in the course" (p. 63). The researcher of the current study found a difference in the mean composite score among students who completed the ACT prep course of 0.17 higher than for students who did not.

Conclusions

At the time of this study, District B was challenged with encouraging all students, especially students of low SES, to take rigorous courses throughout high school to help prepare them to do well on the ACT. The results of the current study indicated that core course rigor levels scores, regardless of SES and gender, had a moderately strong relationship on ACT subtests. The findings from this study have implications for district and building administrators to provide rigorous courses for all students. Building administrators should also work with counselors and teachers to create a plan of support for any students who want to take a more rigorous course load.

Implications for action. Based on the findings of this study, it is recommended that school district faculty encourage students, including free and reduced lunch pay students, to take the most rigorous courses, so student achievement increases. Districts

can offer seminars to parents to provide information and a better understanding of the requirements and benefits of taking rigorous courses. Regarding the ACT Prep course, it is recommended that the curriculum for the course be adjusted for the mathematics, science, and reading sections and that more free and reduced students are encouraged to take the course. Determining the impact of the ACT Prep course can aid in decisions to keep offering the course or discontinue the course. Another option would be to adjust the material being taught in the course, so it more adequately reflects the content of the ACT. The ACT Prep course teacher should use retired ACT items and free test prep materials provided by ACT to ensure that the information covered in the course resembles test items on ACT. The teacher can also attend the Annual ACT Conference to acquire knowledge of best practices offered by ACT and other districts in preparing students to increase student ACT scores. Lastly, ACT allows tests and answers to be purchased by a student and released to them after taking the test during specific testing periods (December, April, and June) (ACT, 2018b). The Test Information Release (TIR) will provide the student's answers to each question, the correct answers, and the category of each question. Having this information could inform teachers and students about areas improvement could be made for instruction and areas of focus for the students. Districts could reimburse students who order the TIR to assist other students enrolled in the ACT Prep course. It is important as an administrator to make decisions based on research to determine the best use of resources for increasing student achievement.

Other recommendations include talking with teachers to see what their thoughts are for improving student performance on the ACT including how to improve the ACT Prep course. Talking with teachers could lead to the need for providing training for

teachers who teach ACT prep and offering teachers who do not teach the course training on test-taking strategies. Another recommendation is a review of the curriculum to ensure the content that is taught includes all elements on the ACT, which include content and test-taking strategies. Districts can use the school's ACT Profile Report to analyze how students performed on academic categories within the core subjects tested to determine if there is an area that needs more focus in the district's curriculum. Also, the profile report breaks down achievement based on core course selection and gender. This information can also inform a district about the impact these variables had on the test. District and school administrators could research the effectiveness of offering a weekend or weeklong prep course outside of the school day. The findings of these studies, however, should be shared with the administrators and teachers so that schools' intervention programs in other districts can improve. Once certain strategies and interventions have been proven effective, these should be shared and incorporated in all districts.

Recommendations for future research. This study should be replicated by other districts including urban and suburban districts to determine the impact ethnicity has on course rigor and ACT prep workshops on ACT scores. Although most of the findings of this study were not statistically significant, the researcher suggests other districts replicate the study to determine the effectiveness of their rigorous courses and their ACT preparatory courses. It is difficult to compare the effectiveness of District B's courses and ACT Prep course with other districts. The researcher believes that this research would be more beneficial when used within each district. Future research should also be conducted on various other standardized tests at both state and national levels. Using the

SAT as the measurement instrument would allow districts to determine how effective their curriculum is across various standardized tests.

Lastly, other studies should be conducted using a mixed methods approach. Examining teachers' and students' perceptions of the curriculum taught, rigor of courses, and methods of improving student achievement could help in determining where changes can be made and what the school is doing well. Another aspect of a mixed methods approach is interviewing students after the course is completed and after the student takes the ACT to determine what changes need to be made while also continuing parts of the curriculum that appear to be effective based on student perception. Districts can also create focus groups to determine how to enhance the course to fit the needs of the student. The focus group can incorporate administrators, curriculum directors, ACT prep teachers, and students.

Future considerations for this study would be to determine the effect of student ethnicity. Focusing on helping all students perform better on the ACT should be the primary goal. Breaking this study down into more subgroups might help reach that goal.

Concluding remarks. District B has implemented various programs for students to succeed academically. Once all juniors began taking the ACT, the high school began offering a semester ACT Prep course instead of an after-school course. The ACT Prep course allowed all students the opportunity to take the course since it was offered during the school day. The district also implemented the AP program at the high school to continue its efforts to provide a rigorous and relevant curriculum for students. The district also implemented the ACT standards into the curriculum to ensure students are acquiring the necessary knowledge to perform well on the ACT.

District B needs to create a process of encouraging all students to enroll in rigorous courses throughout high school. The courses range from honors to college preparatory courses. By creating an open process for encouraging students to take rigorous courses, a variety of students can experience the many learning experiences those courses encompass in the curriculum. Currently, teachers and school counselors are relied upon to encourage students who meet certain criteria to enroll in various rigorous courses. These same school personnel are relied upon to encourage students to take the ACT Prep course which is often determined by whether a student is believed to pursue college for post-secondary education at a fixed time in a student's high school education. Districts, large or small, must have a curriculum that is rigorous and relevant to prepare students for a career or college upon graduation.

In conclusion, the study is evidence that the rigorous courses a student enrolls in, will help the student perform better on standardized tests such as the ACT. In contrast, the study alleviates the assumption that gender and SES have a significant impact on these same tests. Although the ACT scores in the study may not have been shown to be statistically significant in its relationship to certain variables, any positive gain, no matter how small, is an accomplishment. A one-point gain can make a difference in a student being accepted into the college of the student's choice. The gain might also lead to financial support for a student's post-secondary education through scholarships. Therefore, continuing to incorporate rigorous courses in the district curriculum, enhancing curriculum for more rigor, and improving an ACT prep course will be beneficial to students because it will prepare them to be college and career ready upon graduation.

References

ACT. (2006). T*he benefits of statewide use of the ACT® test.* Retrieved from ERIC database. (ED510717)

ACT. (2007). *Rigor at Risk: Reaffirming Quality in the High School Core Curriculum.* Retrieved from ERIC database. (ED496670)

ACT. (2009). *ACT: The first fifty years, 1959-2009.* Retrieved from http://www.act.org/aboutact/pdf/ACT_History.pdf

ACT. (2012). *Raising the bar: A baseline for college and career readiness in our nation's high school core courses*.

ACT. (2013a). *Challenges in readiness persist among US high school grads*. Retrieved from http://www.act.org/content/act/en/newsroom/ challenges-in-readiness-persist-among-us-high-school-grads.html

ACT. (2013b). *What are the ACT college readiness benchmarks*? Retrieved from ERIC database. (ED510475)

ACT. (2017a). *ACT technical manual*. Retrieved from https://www.act.org/content/act/en/research/technical-manuals-and-fairness-reports.html

ACT. (2017b). *The condition of college and career readiness, 2017: Missouri*. Retrieved from https://www.act.org/content/dam/act/unsecured/documents/cccr2017/Missouri-CCCR-2017-Final.pdf

ACT. (2018a). *ACT college and career readiness benchmarks: Setting the bar for excellence.* Retrieved from http://www.act.org/content/act/en/college-and-career-readiness/benchmarks.html

ACT. (2018b). *Request a copy of your test questions and answers.* Retrieved from http://www.act.org/content/act/en/products-and-services/the-act/scores/request-a-copy-of-qa.html

Adelman, C. (2006). *The toolbox revisited: Paths to degree completion from high school through college.* Retrieved from http://www.ed.gov/rschstat/research/pubs/toolboxrevisit/toolbox.pdf

Atkinson, R., & Geiser, S. (2009). Reflections on a century of college admissions tests. *Educational Researcher, 38*, 665–676. doi:10.3102/0013189X09351981

Briggs, D. (2001). The effect of admissions test preparation: Evidence from NELS: 88, *Chance, 14*(1), 10-18. doi:10.1080/09332480.2001.10542245

Brown, F., & Conley, D. (2007). Comparing state high school assessment to standards for success in entry-level university courses. *Educational Assessment, 12*(2), 137-160. doi:10.1080/10627190701232811

Center on Education Policy. (2011). *State high school tests: Changes in state policies and the impact of the college and career readiness movement*. Retrieved from ERIC database. (ED530163)

Center on Education Policy. (2012). *State high school exit examinations: A policy in transition*. Retrieved from ERIC database. (ED535957)

College Board. (2018). *AP Program.* Retrieved from https://ap.collegeboard.org/?navId=aps-ap

Conley, D. (2005). *College knowledge: What it really takes for students to succeed and what we can do to get them ready*. San Francisco, CA: Jossey-Bass.

Conley, D. (2007). *Redefining college readiness*. (Prepared for the Bill and Melinda Gates Foundation). Eugene, OR: Educational Policy Improvement Center.

Conley, D. (2012). *A complete definition of college and career readiness.* Eugene, OR: Educational Policy Improvement Center.

Common Core State Standards Initiative. (2018a). *Standards in your state.* Retrieved from http://www.corestandards.org/in-the-states

Common Core State Standards Initiative. (2018b). *Standards in your state.* Retrieved from http://www.corestandards.org/read-the-standards/

Creech, J. (1997). *Better preparation, less remediation. Challenging courses make a difference. Goals for education: Educational benchmarks, 1997.* Atlanta, GA: Southern Regional Education Board.

District B High School. (2017). *Career and educational planning guide.* Retrieved from http://hs.[redacted].com/counseling_center/counseling_center_webpage/career__educational_planning_guide_

Donen, T. (2012). *Formal individualized teaching, a differentiated instructional model, effects on student learning in a high school ACT preparation course* (Doctoral dissertation). Retrieved from ProQuest Dissertations and Theses database. (UMI No. 3519038)

Dougherty, C., & Fleming, S. (2012). *Getting students on track to college and career readiness: How many catch up from far behind?* (ACT Research Report No. 2012-9). Retrieved from ERIC database. (ED542022)

Dougherty, C., & Mellor, L. (2009). *Preparation matters.* Retrieved from ERIC database. (ED516789)

Green, K. V. S. (2012). *The critical middle years and the relationship of early access to algebra on high school math course completion and college readiness* (Doctoral dissertation). Retrieved from ProQuest Dissertations and Theses database. (UMI No. 3530423)

Grinstead, M. L. (2013). *Which advanced mathematics courses influence ACT scores? A state level analysis of the Iowa class of 2012.* Retrieved from ERIC database. (ED566094)

Hoyt, J. E., & Sorensen, C. T. (2001). High school preparation, placement testing, and college remediation. *Journal of Developmental Education, 25*(2), 26. Retrieved from ERIC database. (EJ641633)

Jones, A. (2008). *High school factors that influence ACT test scores* (Doctoral dissertation). Retrieved from ProQuest Dissertations and Theses database. (UMI No. 13853)

Jones, K. (2016). *Students' curricular paths and GPAs: The relationship with ACT scores* (Doctoral dissertation). Retrieved from www.bakeru.edu/images/pdf/SOE/EdD_Theses/JonesKeith.pdf

Justus, L. C. (2010). *Impact of a school-based test preparation course on ACT scores with consideration of cultural associations* (Doctoral dissertation). Retrieved from ProQuest Dissertations and Theses database. (UMI No. 3443004)

Klein A. M., Zevenbergen, A. M., & Brown, N. (2006). Managing standardized testing in today's schools. *Journal of Educational Thought, 40*(2), 145-157. Retrieved from http://www.jstor.org/stable/23767165

Lunenburg, F. C., & Irby, B. J. (2008). *Writing a successful thesis or dissertation: Tips and strategies for students in the social and behavioral sciences.* Thousand Oaks, CA: Corwin Press.

Marsh, C. M., Vandehey, M. A., & Diekhoff, G. M. (2008). A comparison of an introductory course to SAT/ACT scores in predicting student performance. *The Journal of General Education, 57*(4), 244-255. doi:10.1353/jge.0.0024

Merisotis, J., & Phipps, R. (2000). Remedial education in colleges and universities: What's really going on? *The Review of Higher Education, 24*, 67-85. doi:10.1353/rhe.2000.0023

Missouri Department of Elementary and Secondary Education. (2016). *Comprehensive guide to the Missouri school improvement program*. Retrieved from https://dese.mo.gov/sites/default/files/MSIP_5_2016_Comprehensive_Guide.pdf

Missouri Department of Elementary and Secondary Education. (2017). [redacted] *school district report card.* Retrieved from https://mcds.dese.mo.gov/guidedinquiry/Pages/Accountability

Missouri Department of Elementary and Secondary Education. (2018a). *Missouri comprehensive data system*. Retrieved from https://mcds.dese.mo.gov/guidedinquiry/MSIP%205%20%20State%20Accountability/School%20Summary%20for%20Annual%20Performance%20Report%20-%20Public.aspx?rp:District=[redacted]

Missouri Department of Elementary and Secondary Education. (2018b). *Show me success strategic plan.* Retrieved from https://dese.mo.gov/show-me-success

Missouri Department of Elementary and Secondary Education. (2018c). *2017-18 Missouri Department of Elementary and Secondary Education public education snapshot.* Retrieved from https://dese.mo.gov/sites/default/files/2017-18-public-education-snapshot.pdf

Missouri Department of Higher Education. (2018). *Admissions selectivity categories.* Retrieved from https://dhe.mo.gov/policies/admissions-selectivity.php

Missouri Western State University. (2018). *Course catalog*. Retrieved from http://catalog.missouriwestern.edu/undergraduate/course-descriptions/mat/

Moss, G. (1995). *The effects of coaching on the ACT scores of African-American students.* Paper presented at the Annual Meeting of the American Educational Research Association, San Francisco, CA. Retrieved from ERIC database. (ED399265)

Moss, G. L., Chippendale, E. K., Mershon, C. W., & Carney, T. (2012). Effects of a coaching class on the ACT scores of students at a large Midwest high school. *Journal of College Admission*, *217*, 16-23. Retrieved from ERIC database. (EJ992994)

Noble, J., Davenport, M., Schiel, J., & Pommerich, M. (1999). *Relationships between noncognitive characteristics, high school coursework and grades, and test scores of ACT-tested students (*ACT Research Report Series, 99-4). Retrieved from ERIC database. (ED434917)

Noble, J. P., & McNabb, T. (1989). *Differential coursework and grades in high school: Implications for performance on the ACT assessment* (Research Report 89-5). Retrieved from ERIC database. (ED322159)

Noble, J. P., & Powell, D. (1995). *Factors influencing differential achievement of higher order thinking skills, as measured by PLAN* (Research Report 2007-2). Retrieved from ERIC database. (ED510476)

Noble, J., & Schnelker, D. (2007). *Using hierarchical modeling to examine course work and ACT score relationships across high schools* (Research Report 2007-2). Retrieved from ERIC database. (ED510476)

Parrott, T. N. (2012). *ACT test preparation course and its impact on students' college- and career-readiness* (Doctoral dissertation). Retrieved from ProQuest Dissertations and Theses. (UMI No. 3552840)

Phelps, R. P. (2011). Teach to the test? *Wilson Quarterly, 35*(4), 38-42. Retrieved from https://wilsonquarterly.com/quarterly/fall-2013-americas-schools-4-big-questions/teach-to-the-test/

Popham, J. (2006). Branded by a test. *Educational Leadership, 63*(7), 86-87. Retrieved from ERIC database. (EJ745593)

Roberts, W. L., & Noble, J. P. (2004). *Academic and noncognitive variables related to PLAN scores* (ACT Research Report Series 2004-1). Retrieved from http://www.act.org/reasearch/reports/index.html

Roth, J., Crans, G. G., Carter, R. L., Ariet, M., & Resnick, M. B. (1999). *Effect of high school course-taking and grades on passing a college placement test*. Paper presented at the meeting of the American Educational Research Association, Montreal, Quebec. Retrieved from ERIC database. (ED428817)

Saluri, K. (2012). *Effectiveness of the Missouri college preparatory studies certificate and the Liberty Public School's afterhours ACT preparation course in improving ACT composite scores* (Doctoral dissertation) Retrieved from https://www.bakeru.edu/images/pdf/SOE/EdD_Theses/Saluri_Kelly.pdf.

Savitz-Romer, M., Jager-Hyman, J., & Coles, A. (2009). *Removing roadblocks to rigor: Linking academic and social supports to ensure college readiness and success.* Retrieved from ERIC database. (ED509545)

Scholes, R. J., & Lain, M. M. (1997). *The effects of test preparation activities on ACT assessment scores*. Retrieved from ERIC database. (ED409341)

Strong American Schools. (2008). *Diploma to nowhere.* Retrieved from http://broadeducation.org/asset/1128-diploma%20to%20nowhere.pdf

Syverson, S. (2007). The role of standardized tests in college admissions: Test-optional admissions. *New Directions for Student Services*, (118), 55-70. doi:10.1002/ss.241

Task Force on Standardized College Admission Testing. (2002). *A review of the use of standardized test scores in the undergraduate admissions process at the University of Texas at Austin*. Austin, TX: University of Texas, Austin.

University of Missouri-Kansas City. (2018). *Financial aid and scholarships*. Retrieved from http://finaid.umkc.edu/aid/?slg=financial_aid&mdf_cat=21 &page_mdf=f9b5dc429380b8a811f8331fd313655f

Warne, R. T., Larsen, R., Anderson, B., & Odasso, A. J. (2015). The impact of participation in the Advanced Placement program on students' college admissions test scores. *The Journal of Educational Research, 108*, 400-416. doi:10.1080/00220671.2014.917253.

Appendices

Appendix A: Baker IRB Application Proposal

BAKER UNIVERSITY

IRB Request

Date July 8, 2018

IRB Protocol Number _____ (IRB use only)

I. Research Investigator(s) (students must list faculty sponsor)

Department(s) Graduate School of Education

	Name	Signature	
1.	Rachel Peek	Rachel Peek	Principal Investigator
2.	Susan Rogers	Susan K Rogers Digitally signed by Susan K Rogers Date: 2018.07.02 17:05:03 -05'00'	✔ Check if faculty sponsor
3.	Margaret Waterman	Margaret Waterman	__ Check if faculty sponsor
4.			__ Check if faculty sponsor

Principal investigator contact information

Phone 816-294-7525

Email rachel_peek@yahoo.com

Address 3520 Ajax Road
Saint Joseph, MO 64503

Note: When submitting your finalized, signed form to the IRB, please ensure that you cc all investigators and faculty sponsors using their official Baker University (or respective organization's) email addresses.

Faculty sponsor contact information

Phone 785-230-2801

Email srogers@bakeru.edu

Expected Category of Review: ✔ Exempt __ Expedited __ Full __ Renewal

II. Protocol Title

The Relationship Between Student Course Selection and Student Performance on the ACT

III. Summary:

The following questions must be answered. Be specific about exactly what participants will experience and about the protections that have been included to safeguard participants from harm.

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

There will be no conditions or manipulations included within the study; however, archival data will be included related to students ACT scores, courses found on student transcripts, student gender, and student SES. This study will be conducted at a high school in a rural, northwest Missouri school district. The high school has a student population of 785 students. There are four purposes of this study. The first purpose will be to determine whether there are correlations between ACT subtest scores (math, English, reading, and science) and core course rigor level scores (math, English, social studies, and science). The second purpose of the study will be to

B. Briefly describe each condition, manipulation, or archival data set to be included within the study.

There will be no conditions or manipulations included within the study; however, archival data will be included related to students ACT scores, courses found on student transcripts, student gender, and student SES.

IV. Protocol Details

A. 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.

Data will be taken from student transcripts. The data will include ACT composite and subtest scores (English, math, reading, and English), courses taken, gender, and SES. The registrar will note SES on each transcript by writing "FR" for students on Free/Reduced Lunch. Students without the notation, "FR" are on Full Pay lunch.

B. 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.

The subjects will not encounter the risk of psychological, social, physical, or legal risk.

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

There will be no stress on the subjects due to the use of archival data.

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

Subjects will not be deceived or misled in any way due to the use of archival data.

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

Subjects will not be asked for information that they might consider to be personal or sensitive due to the use of archival data.

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

Subjects will not be presented with materials which might be considered to be offensive, threatening, or degrading due to the use of archival data.

G. Approximately how much time will be demanded of each subject?

No time will be demanded of each subject; however, the high school registrar will spend two hours preparing student transcripts. The district has approved the use of the registrar's time to complete the project.

H. 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 participants in the study will be high school students who took the ACT during the spring semester of their junior year, spring 2016 and 2017. The participants will be limited to students who attended the high school within District B their freshman, sophomore, and junior years. All students in the graduating classes of 2017 and 2018 are potential participants in the study. The criterion for selection of the sample population will be students who took the ACT as juniors.

I. 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?

Since archival data will be used the participants will not be solicited to participate in the study.

J. 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.

Since archival data will be used the participants will not be asked to provide consent.

K. 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.

№ aspect of the data will be made a part of any permanent record that can be identified with the subject.

L. 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.

The fact that the subject did or did not participate will not be made part of any permanent record because archival data with no identifiable information is being used.

M. 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 the data after the study is completed?

There are no risks involved in this study Student data will be collected from transcripts. The District B high school registrar will print transcripts from the student information system for the Class of 2017 and 2018 graduates. She will use district information to label each student transcript FR (free or reduced lunch) or FP (full pay) to designate each student's SES. The transcript data will include student gender, course enrollment throughout high school, year of graduation, and ACT subtest and composite scores from Spring 2016 and 2017. The transcript is evidence of how many classes were taken in each content area during each year (freshman, sophomore, and junior years)

N. 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 risks involved in this study.

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

Yes, archival data will be used. Student transcripts will be used to collect ACT composite and subtest scores (English, math, reading, and science), courses taken, gender, and SES status.

Appendix B: Baker IRB Approval Letter

BAKER UNIVERSITY
Own Confidence

Baker University Institutional Review Board

July 19th, 2018

Dear Rachel Peek and Susan Rogers,

The Baker University IRB has reviewed your project application and approved this project under Exempt 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 npoell@bakeru.edu or 785.594.4582.

Sincerely,

Nathan D. Poell

Nathan Poell, MA
Chair, Baker University IRB

Baker University IRB Committee
Scott Crenshaw
Erin Morris, PhD
Jamin Perry, PhD
Susan Rogers, PhD

Appendix C: District B Approval Letter

[redacted]

[redacted]

Baker University
Graduate School of Education
7301 College Blvd., Suite 120
Overland Park, KS 66210

Subject: Site Approval Letter

To whom it may concern:

This letter acknowledges that I have received and reviewed a request by [*researcher's name*] to conduct a research project entitled "The Relationship Between Student Course Selection and Rigor Level Scores and Student Performance on the ACT" at [redacted] I approve of this research to be conducted at our district.

When the researcher receives approval for her research project from Baker University's Institutional Review Board, I agree to provide access for the approved research project. If we have any concerns or need additional information, we will contact Dr. Susan Rogers at 913-344-1226 or Susan.Rogers@bakeru.edu.

Sincerely,

[redacted]