

COMMUNITY COLLEGE COMPLETION: THE PREDICTIVE RELATIONSHIP BETWEEN  
PLACEMENT SCORES AND GRADUATION

by

Lisa Caroline Martin

Liberty University

A Dissertation Presented in Partial Fulfillment

Of the Requirements for the Degree

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## ABSTRACT

This predictive correlative study was designed to investigate the relationship between the entry placement-test scores of community college students as measured by the ACT<sup>®</sup> COMPASS<sup>®</sup> placement exams and the students' successful completion of a degree or certificate program at a technical (community) college [REDACTED]. The study was of importance, for it was designed to determine if ACT<sup>®</sup> COMPASS<sup>®</sup> placement test scores can predict graduation from a degree or certificate program in the subject college's programs of study. The study will utilize archival data available in the college's retention-management system. The selected college is a mid-sized institution that enrolls approximately 5,000 students each fall. A diverse population of approximately 600 students participated in the study. The major theory guiding this study was Tinto's persistence theory with its emphasis on the importance of understanding what causes students to not persist academically. The statistic used to determine the relationship between the criterion variable (graduation) and the combination of predictor variables (math, reading, and writing placement-test scores) for community college students who initially enrolled in the college in one of two fall semesters (2013-2014) was binary logistic regression.

*Keywords:* community colleges, technical colleges, graduation rates, college completion, placement tests, persistence theory.

### **Dedication**

This dissertation is dedicated to my most loving and supportive husband (Rick Martin) and sons (Noah Martin, Bennett Martin, and Garrett Martin) who have selflessly encouraged me to pursue the completion of this work, one of my greatest life goals. They have sacrificed much to see me through this process, and I appreciate and love them all the more for it. I also know that I could not have attempted or completed such an undertaking without the grace, mercy, and strength of my Lord and Savior Jesus Christ. It is with His continuing love and support that I have been able to complete this endeavor, and He continues to help me see the truth contained in what I claim as my life's verse, Romans 8:28: "For we know, all things work together for good for those who love the Lord and those who are the called according to his purpose."

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**List of Abbreviations**

COMPASS<sup>®</sup> English Score (COME)

COMPASS<sup>®</sup> Math Score (COMM)

COMPASS<sup>®</sup> Reading Score (COMR)

Free Application for Student Aid (FAFSA)

Grade Point Average (GPA)

Institutional Review Board (IRB)

National Association for Developmental Education (NADE)

Variance Inflation Factor (VIF)

## CHAPTER ONE: INTRODUCTION

### Overview

Community colleges (in some states referred to as technical colleges) have a rich and purposeful history in the nation's educational system. Originally established to provide an alternative to traditional universities and a systemized way to help train a workforce, community colleges have grown in enrollment to a high of more than eight million students (Collett, 2013, p. 45).

Students entering community colleges are often non-traditional, working students with families. They may stop in and out of the community-college system numerous times before they ultimately reach a stated goal (like degree or certificate completion). They may take years to reach their goal, or they may never reach their goal at all. Thus, a disparity is created between the number of students who enroll in a degree or certificate program and those who graduate in the intended timeframes (one year for a certificate, two years for an associate's degree). This disparity is prompting federal and state agencies to look closely at community-college completion rates and to pressure community colleges to narrow the gap that currently exists between enrollment and completion (Linderman & Kolenovic, 2013; Wolff, Wood-Kustanowitz, & Ashkenazi, 2014; and, Shea & Bidherano, 2014).

Additionally, community colleges are seeking ways to better understand, engage, and graduate their diverse student populations (Dorsey, 2012). Placement test results, which provide colleges with a current assessment of students' academic readiness, may become a valuable tool in this endeavor. If placement test results can be used as predictors of success for various academic programs of study, advisors will be better able to steer students toward appropriate career paths. Administrators could likely better plan for scheduling needs. Community colleges

could ultimately see completion rates improve.

This chapter offers an historical overview of the purpose and focus of America's community colleges. The conceptual framework of the study is outlined, and the problem statement is discussed along with an emphasis on the national college-completion agenda. The purpose and significance of this study is introduced as is the research question. Finally, definitions relevant to this study are provided.

### **Background**

Student retention, completion, and success, especially at the community-college level, are at the forefront of current literature. Scholars are clamoring to determine what impacts these intertwined topics in positive, measurable ways and are equally interested in determining what negatively impacts them. Disparity in completion rates is apparent among certain groups such as urban versus rural (Linderman & Kolenovic, 2013, p. 43), academically challenged versus academically prepared (Wolff, Wood-Kustanowitz, & Ashkenazi, 2014), online versus live instruction (Shea & Bidherano, 2014, p. 104), first-generation versus continuing-generation (Gibbons & Woodside, 2014), traditional versus non-traditional (Atherton, 2014) and part-time versus full-time (Crosta, 2014). Community colleges, which are widely defined as two-year colleges, currently enroll more than seven million students annually, but three years after initial enrollment, only “about 22% . . . have completed an associate degree” (Linderman & Kolenovic, 2013, p. 43).

### **Historical Overview**

Community colleges have a rich, purposeful history and have served their communities for many decades. For example, more than 100 years old, Gateway Technical College in Wisconsin is the oldest public community college in the nation (Brown, 2012, p. 1). These

colleges are now in all fifty states, and they serve two primary roles in the nation's education system. First, they usually offer technical education pathways such as those in healthcare, human services, and hospitality as well as applied fields like welding and industrial technology. These pathways help build a trained workforce and help communities compete in a global marketplace. Additionally, they serve as a starting point for students who are interested in pursuing baccalaureate degrees by offering the general education courses at the associate-degree level that can be transferred in as core courses in any one of several bachelor-level institutions. Thus, community and technical colleges can be viewed as transitional institutions between high schools and four-year colleges and universities.

Community colleges have a rich history, and, like many organizations, they have a "life cycle that is constantly morphing and evolving. Their history and evolution have made them, arguably, "one of the most successful and enduring big ideas of the past 111 years" (Brown, 2012, p. x). In 2000, nearly 5.5 million degree-seeking students attended two-year colleges. In the 2010-2011 school year, that figure jumped to more than eight million, due in part to the economic downturn and steadily rising tuition at four-year colleges and universities. Also, new skill requirements in the job market forced many professionals to seek recertification (Brown, 2012).

Community colleges have experienced tremendous growth during the last decade; this was especially true during the recent recession. This growth ranged from an estimated 5.5 million in attendance in 2000 to more than eight million in 2010-2011 (Collett, 2013, p. 45). Recent growth in the job market is contributing to enrollment decline, and now colleges are currently working to determine what their normed, operational annual enrollment will be. Striving to increase graduation rates is of primary importance. The sense of importance is being

enhanced by goals set by the Obama administration, which for “2020 . . . include an additional 10 million graduates from community colleges and four-year colleges and universities and every American completing one year or more of higher education or advanced training in his/her lifetime” (Friedel, D’Amico, Katsinas & Grant, 2013, p. 69).

### **Society at Large**

Community and technical colleges play important roles in the communities in which they serve. They are generally more affordable than four-year colleges and universities, offer smaller class sizes, and potentially enable students to progress to the workforce more quickly. They are typically open-access institutions, offering admission to students of varying levels of educational and technical readiness (Williams & Pennington, 2009). However, not all entering students are ready to enter desired programs of study. Recent high school graduates who may not have received needed academic skill development or displaced workers who are trying to learn a new skill to be employable are two types of students who need and are often granted access to the community-college system.

Correspondingly, when students lack the needed skills to directly enter curriculum-level courses, most community and technical colleges will offer some form of remediation to help ensure all enrolled students are eventually college-ready. The remediation is offered through a variety of programs – most of which are characterized under the umbrella term *developmental education*. Of concern to community, state, and national stakeholders, many students across the country entering four-year and community colleges are deemed underprepared academically to be successful. The number of academically underprepared students is startling, with current estimates that show as many as “ninety-three million adults . . . lack the basic literacy and math skills needed to enter and successfully complete credit-bearing college courses” (McDonnell,

2015, p. 12).

At most two-year institutions (especially open-access community colleges), determination of academic preparedness is ascertained by student performance on college-administered placement tests. The number of students scoring below college-readiness cut scores are of interest, particularly considering associated completion rates and costs involved with developmental coursework added to a student's degree-completion path. As Bettinger, Boatman, and Long (2013) noted, "Only 32 percent of students leave high school at least minimally prepared for college academically" (p. 1). These students, to be successful in college, must be remediated, but many of these students never reach graduation. Some never persist to curriculum-level courses; instead, they may find themselves languishing in developmental coursework or completely dropping out of college.

Though the reasons vary, today "there are a lot more people in college . . . who can't do college work" (Stuart, 2009, par. 10). Completion rates at community colleges are low, especially for the colleges that "enroll large numbers of students who need developmental education courses" (Bragg & Durham, 2012, p. 114). There is no one-size-fits-all explanation for the lack of persistence. Although every state has some form of remediation in place for academically underprepared college students, approaches to and results of remediation are different. Again, as Bettinger et al. (2013) attested, developmental "courses appear to help or hinder students differently by state, institution, background, and academic preparedness" (p. 93). Many students leave college after learning, through placement-test scores, that they are not academically prepared to begin college-level classes. Other students find they benefit greatly from remediation.



Understanding how placement scores determine college readiness is important because these scores can help academic advisors and career counselors direct students to appropriate fields of study. Furthermore, if placement tests generate scores that can be used to predict success in some entry-level courses, they may also predict success in various programs of study. Proper student placement can impact time spent working toward degree completion. Additionally, accelerated completion paths save students valuable time and money and benefit already heavily burdened local, state, and federal financial-aid programs. Additionally, appropriate placement will assist administrators and instructors to better understand how to structure their needed developmental-education programs.

Therefore, a developmental-education program that addresses and meets the needs of entering students can be a true support to students and enable them to reach graduation, but caution is warranted for those responsible for “implementing remedial placements, and in evaluating their impacts” (Jackson & Kurlaender, 2014, p. 954). Colleges are recognizing the need for quality developmental programs, and “foundations are beginning to pour money into innovative . . . developmental education programs” (Stuart, 2009, par. 8). Seeing more students persist to graduation will inevitably benefit communities as well (Dorsey, 2012, par. 7). Appropriate placement, then, is critical. Additionally, knowledge of the predictive value of placement scores in relationship to the successful completion of various programs of study could prove valuable to all stakeholders.

### **Conceptual Framework**

Tinto (1982) argued for an investigation of causes for student-initiated withdrawals. Data, at the time, and arguably now, was insufficient to determine what caused students to fail to persist academically. Tinto realized a need to discover and analyze what caused students to not

persist, arguing “students have to want to persist and expend the effort to do so even when faced with the challenges they sometimes encounter. Without motivation and the effort it engenders, persistence is unlikely” (Tinto, 2015, p. 2). In his persistence theory, Tinto (1982) noted there is value in “distinguish[ing] between those with the competence or interest, motivation, and drive to finish given courses of study and those who, for a variety of reasons, do not or simply will not seek to complete their programs” (p. 692).

Further, it is “competence” (academic preparedness, an aspect of “college readiness”) that is frequently used as a key indicator of a student’s ability to be successful in college, and admissions staff and faculty need a relatively quick, systematic way to judge the college readiness of incoming students. The use of a standardized placement test as part of the community and technical college admissions processes is common practice across the country; these tests are used to “place incoming student[s] in an appropriate learning stream to promote student success” (Peng, Le, & Milburn, 2011, p. 42).

Further, colleges rely on these test results to accurately place students into classes that fit their skill level. Interest is growing in how accurately these tests can be used to predict course and/or program completion. For example, using historical data of students who graduated from a “business or a technical program” at a Canadian college, Peng and Milburn (2011) found a direct correlation between math placement scores and the final program GPAs (p. 45-46). Using a “discrete time hazard model,” one study delves into the success students initially placed in developmental math reached with “shorter-term completion outcomes,” such as completing thirty credit hours of college-level coursework, noting that overall students who placed into “lowest levels reached meaningful milestones in math within the first four years of their college careers” (Melguizo, Bos, Ngo, Mills, & Prather, 2016, p. 143) yet ultimately had “worse

educational outcomes than students who were placed directly in higher-level courses” (p. 147).

Furthermore, a 2013 study sponsored by the National Council on Measurement in Education used logistic regression to determine if KSA (Kansas State Assessments) math and reading scores could be used to predict success (a grade of B or higher) in dual-enrollment college algebra and English courses. The outcomes determined that “KSA scores are as predictive as currently used commercial assessments” (Kingston & Anderson, 2013). The results of their study showed that “KSA reading scores are moderately predictive of grades in College English I,” and the KSA math scores were “found to be a significant predictor of algebra class performance” (p. 8).

In a comprehensive study involving data from 7,898 community-college students, researchers (Bremer et al., 2013) explored how “outcomes such as retention, completion, and cumulative grade point average (GPA) vary among students taking developmental and non-developmental courses [and considered if] these effects remain after accounting for placement scores” and student participation in support services (p. 155). Results of the study showed initial math ability (based on placement scores) to be a strong predictor of retention, completion, and higher overall GPA and noted a higher graduation rate for occupational students as compared to transfer students. No clear connection between participation in developmental education coursework and program completion was established, but persistence to the next year was evident (p. 165, 171).

Taking a closer look at differences in rural college students’ background characteristics, researchers Byun, Irvin, and Meece (2012) found first-year cumulative GPA, family income, timing of college enrollment, and participation in formalized social clubs were all predictive of degree attainment at four-year colleges.

Finally, researchers completed a study to answer this research question: Is the location of where students take developmental math and English (community college or four-year university) predictive of the students' successful completion of college-level coursework (Williams & Siwatu, 2017, p. 26)? Using logistic regression, the researchers determined that location, particularly when coupled with GPA, was predictive of success in college-algebra courses; location of the developmental English classes, according to their study, was not predictive of success in college-level English courses (p. 35-36).

In summary, in current literature, much attention is focused on student retention, completion, and success, especially at the community/technical college level. These types of colleges have a significant annual enrollment that exceeds seven million and publicize that students can earn an associate's degree in just two years. However, three years after initial enrollment, less than 25% are awarded a two-year degree (Linderman & Kolenovic, 2013, p. 43). Placement tests, designed to assess students' preparedness to enter college-level coursework, are being used in most colleges, and results of these tests often require students to spend a year or two (sometimes even longer) in remediation before ever entering the actual coursework that can lead to a two-year degree or certificate.

Appropriate placement, then, is critical, and knowledge of the predictive value of placement scores in relationship to the successful completion of various programs of study could prove valuable to all stakeholders. Current literature, however, lacks discussion and research on the predictive value of these assessments to predict short-term success. For instance, course completion or retention through the first year of enrollment is not available on the predictive value of test scores for assessing the likeliness of program or certificate completion at the community and technical college level.

With more than a hundred years of history, community colleges have become an important part of the American educational system and are key to providing a skilled workforce for most of America's industries. These colleges, with their very diverse and seemingly unpredictable student populations, have drawn the attention of local, state, and national leaders who question funding institutions that do not graduate entering students in the two years most frequently advertised as the time required to earn an associate's degree. In fact, more than three years after entry, most community college students have either withdrawn from their declared programs of study or are still in the system working toward a degree or certificate. Determining what impacts student retention, completion, and success at the community-college level is predominant in the research reported in current literature. However, current literature does not offer a definitive answer regarding what could best narrow the gap between enrollment and completion.

### **Problem Statement**

Community and technical colleges have experienced enrollment growth during the last few years; however, the percentage of students who complete a selected program of study or who transfer to a four-year college or university has not increased incrementally (Bahr, Gross, & Christensen, 2015). Of national concern is the fact that a large percentage of students, more than two-thirds, per Bettinger et al., 2013, are entering college underprepared to be academically successful, and academically-prepared students who enroll in degree and/or certificate programs graduate at a much lower rate than students who complete full programs of study at four-year colleges and universities (Bragg & Durham, 2012). There is a push to understand why many students are enrolling in community and technical colleges underprepared for college entry.

Furthermore, many students who enroll in community and technical colleges fail to finish

their chosen programs of study. This fact is undergirded by the Obama Administration's goal to significantly increase the number of America's college graduates by at least ten million within the next four years (Friedel et al., 2013, p. 69). Single placement instruments (typically either ACCULACER or COMPASS®) have been, until just recently, the most prominent method used to judge student readiness to enter college-level coursework. The study contributes to the body of scholarship that is devoted to the national college-completion agenda by offering insight into the usefulness of placement-test scores as predictors of community/technical college completion on a comprehensive scale, for it will determine if there is a correlation between ACT® COMPASS® placement test scores in English, math, and reading and the graduation of community college students seeking various types of diplomas or certificates. The problem is that current literature is lacking on the predictive value of placement assessments to predict short-term success like course completion or retention through the first year of enrollment and is not available on the predictive value of test scores for assessing the likeliness of program or certificate completion at the community and/or technical college level.

### **Purpose Statement**

The purpose of this study is to determine if ACT® COMPASS® placement test scores can predict graduation from a degree or certificate program in one or more of Regional Technical College's programs of study. Using a predictive correlative design, this quantitative study will explore the relationship between the criterion variable (graduation, defined as being awarded a degree or a certificate) and the combination of predictor variables (English, math, and reading COMPASS® placement-test scores – defined as a single numeric score in the range of 1-99 for each subject) for community-college students at one of sixteen technical colleges in the South Carolina Technical College System.

### **Significance of the Study**

Limited research is available on how student performance in entry-level college math, reading, and writing courses is connected to placement scores determined by either of the two most common placement instruments: ACCUPLACER® and ACT® COMPASS®. However, research is lacking on the value these placement instruments have in predicting success in various program areas of study in community/technical colleges. Low graduation rates continue to plague community colleges across the country, so a better understanding of what contributes to the success of students who are completing their chosen program areas of study is of great value to the colleges as well as their stakeholders.

Placement is an essential component of the admissions process at most open-enrollment community and technical colleges. Because general-education courses, reliant on a proficient, usually college-determined level of reading, writing, and math skills, are required for degree programs as well as some certificate programs, correctly assessing students' level of skill/knowledge in these areas is needed.

Most community colleges use one of two commercially available, computer-adaptive programs: ACCUPLACER® or COMPASS®. Designed to provide enrollment staff and faculty advisors a reliable indication of students' skills and abilities--primarily in the areas of reading, writing, and math skills--the assessment results become a key component in student placement. At most community/technical colleges, students are placed either in curriculum-level, credit-bearing coursework or are recommended to begin in developmental coursework to "brush up" on basic skills before being enrolled in the curriculum-level courses. The placement level where students begin their programs of study can impact their perception, and a negative perception of where they are "placed" could negatively impact students' motivation toward degree completion.

Perception, per Tinto (2015), must be recognized as a key factor in student persistence. Tinto argues “an understanding of student perceptions . . . and their impact upon student decisions to stay or leave is a prerequisite for the development of a more comprehensive strategy to further enhance the persistence and completion of all . . . students” (p. 11).

Whether entering students placed into developmental or not, understanding what factors indicate a stronger propensity toward success would be beneficial to community colleges that are now often operating within tight budget constraints. Understanding where budget dollars would be best utilized to see more students graduate from their offered programs of study would be most valuable to community college administrators.

This predictive correlative study was purposely designed to investigate the relationship between the entry placement-test scores of community college students as measured by the ACT<sup>®</sup> COMPASS<sup>®</sup> placement exams and the students’ successful completion of a degree or certificate program at a technical (community) college in South Carolina. The study was of importance, for it helped determine, through an analysis of archival data readily available in the college’s retention-management system, if ACT<sup>®</sup> COMPASS<sup>®</sup> placement test scores can predict graduation from a degree or certificate program in the college’s programs of study.

### **Research Question**

**RQ1:** How accurately can the ACT<sup>®</sup> COMPASS<sup>®</sup> placement test scores in English, math, and reading predict the graduation of community college students seeking various types of diplomas or certificates?

### **Definitions**

1. *College Readiness* - College readiness is an assessment of a student’s ability to be successful in a college-level program of study. Per Conley (2008), it is “the degree to



which previous educational and personal experiences have equipped them for the expectations and demands they will encounter in college” (p. 3).

2. *Completion* - For the purpose of this study, completion is defined as a synonym for graduation rate: “The percentage of a school’s first-time, first-year undergraduate students who complete their program [of study] within 150% of the published time for the program” (Federal Student Aid, 2016).
3. *Developmental Education* - The National Association for Developmental Education’s (NADE’s) website (About developmental, n.d.) offers the following definition of developmental education:

Developmental education is a field of practice and research within higher education with a theoretical foundation in developmental psychology and learning theory. It promotes the cognitive and affective growth of all postsecondary learners, at all levels of the learning continuum. Developmental education is sensitive and responsive to individual differences and special needs among learners. Developmental education programs and services commonly address academic preparedness, diagnostic assessment and placement, development of general and discipline-specific learning strategies, and affective barriers to learning.
4. *Open Access* - Community and technical colleges are “open access” institutions, for they do not limit, through their liberal admissions policies, student access to education. Students of varying levels of academic and financial preparedness are accepted. Bahr (2013) contends the “community college is the primary door through which nontraditional, underrepresented, low-income, and first-generation students enter

postsecondary education” (p. 139) Thus, as “centers of educational opportunity,” community and technical colleges across the country are “inclusive institutions that welcome all who desire to learn, regardless of wealth, heritage, or previous academic experience” (“About community colleges,” 2017).

5. *Placement Test* - For this study, a placement test is defined as an assessment instrument used to determine a student’s readiness to enter a college-level (credit-bearing) course at a community or technical college. Not all colleges use the same instrument, but COMPASS<sup>®</sup> and ACCUPLACER<sup>®</sup> are the two most currently used across the country in the last few years. They are both “computer-adaptive placement tests that employ an internal algorithm—or branching mechanism—to estimate the student’s placement score. Both tests are composed of subsets that vary in academic content and rigor” (Melguizo, Kosiewicz, Prather, & Bos, 2014, p. 702). This study focuses on the value of COMPASS<sup>®</sup> placement scores in predicting graduation from a community college degree or certificate program of study.
6. *Retention* - Though definitions of retention may vary by institution, for this study, retention, as defined by the subject college, is the continuous enrollment of a community and technical-college student from one fall term until the next fall term.
7. *Success* - Success, though typically defined as earning a grade of A, B, or C in community and technical college course work, is, for this study, synonymous with completion. Success, then, is completion of a selected program of study. Conley (2008) notes, “To be successful in college, students must be prepared to use an array of learning strategies and coping skills that are quite different from those they developed and honed in high school” (p. 6).

## **CHAPTER TWO: LITERATURE REVIEW**

### **Overview**

Community colleges are open-access, two-year, degree- and certificate-granting institutions of higher education. Located in every state in the United States, these colleges serve to train much of the nation's workforce and to provide a lower-cost gateway to four-year colleges and universities. Direct access to four-year institutions would be unattainable for many students with limited financial resources or poor academic skills, so many look to community colleges to begin their college careers. Nationally, however, completion rates and transfer rates are very low. Thus, much of the current literature offers analyses of strategies recently implemented in community colleges, primarily in year one, to encourage, engage, and enable student retention, persistence, and completion. Similarly, another major branch of current literature is focused on helping readers better understand what student characteristics, like initial placement-test results, can be viewed as predictors of student success. Though placement-test scores have been used to determine the likelihood of success in entry-level coursework, no research is yet available to prove or disprove the usefulness of combined placement-test scores (English, math, and reading) as predictors of success in various degree and certificate programs of study in community colleges.

### **Theoretical Framework**

For many families, seeing their children earn a college degree is still a major part of the American dream. It brings with it the idea of success and an ability to reach any goal, but educators, especially community college educators, often realize all too well that for many students a college education will remain an elusive dream. Although many students begin on the path to college completion, there are relatively few community college students who persist to

graduation, and without an earned college degree the students will, as Tinto (2012) acknowledged, lack this “important certificate of occupational entry without which access to prestigious positions in society becomes measurably more difficult” (p. 1-2).

Tinto’s (1975) persistence theory is first voiced in the seminal work “Dropout from higher education: A theoretical synthesis of recent research” where he synthesized the work of retention theorists to better understand what caused some students to fail to persist to degree completion. Building on Durkheim’s suicide theory (1961), Tinto argued there is a connection between factors contributing to suicide and factors contributing to prematurely exiting college. This theory is an attempt to explain interactions students have with institutions of higher learning that cause some students to drop out and “that also distinguishes between those processed that result in definably different forms of dropout behavior” (1975, p. 90). Tinto recognized Durkheim’s suicide theory has some inadequacies when one tries to look more granularly at tendencies that may be indicative of suicide. He parallels this to trying to determine the various exchanges and encounters that lead people to exhibit different types of persistence or “drop-out behavior” (1975, p. 93). He argues that the model also needs to address the characteristics and natures of people relevant to educational persistence (1975, p. 93).

In the introduction to his original persistence model, Tinto (1975) captured a truth that is still relevant today: “Despite the very extensive literature on dropout from higher education, much remains unknown about the dropout process” (p. 89). Tinto has since updated his initial work on persistence several times in the past decades, detailing the importance of the classroom and showing interconnection between the social systems and academic systems of colleges by describing them as “two nested spheres, where the academic occurs *within* the broader social system that pervades the campus” (Tinto, 1997, p. 619). Tinto (2013) stressed the importance of

students attaining and keeping momentum if they are to achieve academic success (p. 1).

Tinto (1982) argued for an investigation of causes for student-initiated withdrawals. Data at the time and arguably now was insufficient to determine what caused students to fail to persist academically. Tinto saw a need to discover and analyze what caused students to not persist. In his persistence theory, he recognized value in “distinguish[ing] between those with the competence or interest, motivation, and drive to finish given courses of study and those who, for a variety of reasons, do not or simply will not seek to complete their programs” (p. 692).

Too many students, faculty, staff, community stakeholders, and government officials are involved in the national question of community college completion for it to go ignored, so current research leans heavily on Tinto’s (1975) persistence theory and enhanced versions of the theory. Much of the more recent--as well as current literature--focuses on ensuring students earn a degree or certificate in their chosen programs of study at community colleges in a timely manner. If the students do not reach this goal, Brown (2012) argued the stakeholders have failed: More people in America need to reach success, and people with relevant knowledge and skills are “necessary to continuously stoke the nation’s economic engines” (p. 82).

It is evident that students benefit from earning a college degree, and educational institutions, due to historically low enrollment trends across the country, are now more than ever before seeing the importance of students persisting through graduation (Pierce 2015; Harbour and Smith 2016; Bailey 2016). Retaining students for a growing number of colleges is “the only reasonable course of action left to insure their survival” (Tinto, 2012, p. 2).

Determining what causes students to leave college before completing a degree can be very difficult to assess, for the reasons and circumstances are so varied. This difficulty is enhanced when additional entry points to college are added to the mix. In community and

technical college systems, it is not unusual for students to begin their college careers as part-time students, and many do not even select a major – at least not initially. Their departure date is often not recognized in a timely manner, and data about these students are likely “not provided in a form amenable to standardization across different institutions” (Tinto, 2012, p. 9). Full-time college students who initially enroll in a community or technical college, though somewhat less difficult to track, are often not even persisting through the first year of college (p. 14), and first-year retention continues to be a major focus at many colleges. Because first-generation college students have limited “social and cultural capital,” they may become more frustrated and even isolated as they try to navigate the college experience (Shumaker & Wood, 2016, p. 9).

Tinto’s persistence theory, then, serves as an appropriate backdrop and framing structure for this study, for the premise of his theory and the goals of this study marry well in an overarching framework – to better understand what it is that helps students persist in college and to ascertain if there are certain student characteristics (like the results of initial college placement tests) that can be viewed as legitimate predictors of student success. This study directly addresses the argument Tinto (1975) presented, for it seeks to closely look at placement score sets to determine if they are predictors of successful community-college program completion and ultimately “sets of individual characteristics . . . relevant to educational persistence” (p. 93).

### **Related Literature**

Community colleges serve an important function in our nation’s educational system, often providing a gateway to an education that may have been unattainable to many without the access community colleges provide.

#### **First-generation College Students**

It is the community/technical college system where most returning adult students choose

to begin their postsecondary education. Certainly, first-generation students are more readily served in our nation's community and technical colleges (Friedel et al., 2013, p. 69). These colleges are the "institutions of choice" for these first-generation college students (Everett, 2015, p. 55). With the costs of a quality college education continuing to rise, many students ready to take a more traditional, four-year route are finding community colleges to be a more financially appealing starting point for their college careers. Additionally, professionals seeking recertification often seek to gain needed skills at their local community college (Collett, 2013).

### **Importance to Local Communities**

Community colleges are, as their name implies, an integral part of the communities in which they are located. In South Carolina, for example, each county in the state has one community or technical college, so the institutions are convenient, within driving distance, for most of the state's residents. These community-centered institutions are governed by boards of trustees comprised of citizens from the communities they serve (Brown, 2012, p. 2). These board members are often very dedicated individuals who "are so passionate about their enterprise that despite whatever personal cost they continue to serve" (Hinton, 2012, p. 23). Like many other boards of trustees for not-for-profit, two-year institutions of higher learning across the country, members serve to assist with finalizing the mission of the college, approving the budget, and "selecting and monitoring" the college president (Garrity, 2014, p. 46).

Convenience of location along with affordable tuition prices are two factors that are encouraging enrollment. These colleges are designed to offer all who desire to attend a chance to earn an education. They provide access to a higher education that would likely be denied for many if they chose to start at a four-year college. Because they typically have open admission policies, provide financial assistance, and seek to reach the populous at large, they are, indeed,

“equalizing institution[s]” (Leeder, 2013, p. 189).

### **Workforce Development**

An important part of the community-college mission is workforce development. Community colleges partner with local (sometimes even national and international) businesses and industries and seek guidance regarding what skills students need to be ready for various jobs in their companies. Community colleges are used to train much of the nation’s workforce. Daily, they validate the “link between education and economic validity” (Blanco, 2015, p. 906).

The Southern Region Education Board (SREB) was established for and continues to serve as a promoter of the needed bond between education and workforce development. Community colleges are key to the country’s ability to provide a competitive, strong workforce; they serve as “essential pivot points for students coming from high school as well as for returning adults (Blanco, 2015, p. 208).

For most community colleges, “civic and workforce goals . . . seamlessly coexist within [their] vision and mission statements” (Jones, 2016, p. 121). There can be, however, a disconnect between this mission and some faculty (like those who teach general education courses), for they may view the building of the student-workforce connection as a task best covered through occupational training programs (Jones, 2016, p. 126). In contrast, in a study focusing on the messages given to rural students regarding the worth of a college education, participants agreed “higher education [is] the pathway to a career (Shumaker & Wood, 2016, p. 210).

However, regardless of students’ fields of study, field-based experiences are relevant and lead to great student success, improved job placements, and increased wages upon graduation. Workforce-development programs are needed to provide all citizens an opportunity to ultimately make a living to support themselves and to be able to support (or help support) a family. The



trend during the last 20 years shows a growing decline in the need for “unskilled and low-skilled workers” (Fox, 2015, p. 727). It is even more rare for unskilled and low-income workers to find a job that will provide them with a “living wage” (Fox, 2015, p. 727).

Additionally, community colleges can be influential in attracting needed industry to certain areas, for they are often used “as vehicles for workforce development, moving people from welfare to work” (Smith & Vellani, 1999, p. 8). Bowles (2014) argued that development of the nation’s workforce is the “most socially impactful work” (p. 5) of community colleges. The need to supply a well-trained workforce is growing as the technology-infused job market gets hungrier to fill the jobs available in a rapidly changing “employment landscape” (Bailey & Darling, 2017, p. 6). There is a 48% gap between available jobs and the skilled workers needed to fill those jobs. This discrepancy remains of interest to educators who need to ensure the programs and training opportunities being offered are applicable to current job demands (Bailey & Darling, 2017, p. 6).

### **Community College Access**

Though not necessarily the end goal of students who enter community colleges, admission into these open-access environments is a one popular entry point into the higher-education system “for millions of academically-talented minority and low income students” (Friedel et al., 2013, p. 69). Community colleges are also described as “broad-access,” because students from various social classes and economic backgrounds are admitted (Jenkins & Rodriguez, 2013, p. 188). Some students find that entering a community or technical college is the only real choice available to them (Bragg & Durham, 2012). There are “millions of academically-talented minority and low-income students” (Friedel et al., 2013, p. 69) who gain access to America’s higher-education system through community and technical colleges across

the country. Additionally, Hillman and Orians (2013) noted the number of students enrolled annually in community colleges is approximately “35% of all undergraduate students” (p. 767). In these types of higher education environments, students can pursue degrees and certificates in a variety of academic, service, and trade fields such as healthcare, hospitality, industrial, and transfer-track (track that leads to enrollment in a baccalaureate degree program, usually offered at a four-year college). No doubt the number of students who begin college at community colleges is impressive, especially when compared to many other public and private institutions across the country. However, the percentage of these students who graduate is often staggeringly low. Certainly, “access without success, however, constitutes a broken promise” (Brown, 2012, p. 72).

The community-college mission of open access is noble and designed to positively change the lives of the students who attend. However, open access does also entail some significant complications. Now community colleges often face the growing criticism that they have become “revolving door institutions” that fail to graduate the majority of their students (Handel, 2017). They have, from their inception, had to seek out, plan, and determine ways to best work with students who enter their programs of study academically underprepared (Hughes & Scott-Clayton, 2011).

### **Community College Completion**

Trying to identify what prompts or prevents students from completing a program of study and earning a degree remains a focus of current literature as well as a topic of national concern. Much attention has been focused on completion. Stakeholders – parents; students; community members; industry representatives; and local, state, and national government – are seeking assurance that tuition dollars and student aid are being spent appropriately and that community

colleges are producing qualified graduates in a timely manner (Davidson & Bush 2016; Pierce 2015; McDonnell 2015; Davidson, 2015). In response to this issue, the Obama Administration also set goals to see improvement in completion. To see our country as competitive in the global workforce, his administration's goals for 2020 called for 10 million more graduates from institutions of higher education and all Americans completing at least a year of college or some type of advanced training (Friedel et al., 2013, p. 69). Estimates in current literature indicate that "more than half of the U.S. workforce" do not have the basic academic skills needed to be successful in college coursework (McDonnell, 2015, p. 12).

Reasons for lack of completion vary, and much research has been and is being conducted to determine the cause of the lack of persistence to graduation (Yu, 2017; Hayward & Williams 2015). Understanding the reasons why students fail to persist to completion is becoming increasingly important. Some studies focus on motivation (Morrow & Ackermann, 2012), momentum (Attwell, Heil, & Reisel, 2012; Wang, Chan, Phelps, & Washbon, 2015), financial ability (McKinney & Novak, 2013, 2015; McKinney and Burrige, 2015), high school academic rigor (Niu & Tienda, 2013), high school GPA (Scott-Clayton, Costa, & Belfield, 2014; Yu 2017), student-support initiatives (Koch, Slate & Moore, 2012; Tinto, 2012, 2015), the location of the college (Yu, Campbell, & Mendoza, 2015), non-traditional status (Calcagno, Crosta, Naley, & Jenkins, 2007), an overemphasis on the use of adjunct faculty (Jacoby, 2006) as factors most associated with the likelihood of college completion.

Likewise, Jenkins & Cho (2013) noted another reason that community college completion rates are low is that few students enter a program of study (p. 2). Others may flounder or lose completion momentum while taking additional courses that are not related to their intended program of study (Romano, Losinger, & Millard, 2011; Zeidenberg, 2015). Some

fail to regularly attend classes, and this correlates to a lack of degree completion (Yu, 2017). Unlike most students at four-year colleges and universities, some students at community colleges may not aspire to earn a certificate or degree (Yu, 2015, p. 225). Further, some students are not familiar with how colleges operate and can get lost in the minutia. Rosenbaum, Becker, Cepa, and Zapata-gietl (2016) found even deciding what courses to take when there are so many from which to choose can be a great source of frustration for students and may prompt them to withdraw from college rather than persist to graduation.

Because most community and technical colleges use placement instruments like COMPASS<sup>®</sup> or ACCUPLACER<sup>®</sup>, identifying and verifying their predictive ability is also of interest to researchers (Hughes & Scott-Clayton, 2011) and policy makers alike. Because it is placement-test results that most typically assign community college freshmen to developmental coursework, it is not surprising that the abundant literature that addresses placement testing often also focuses on developmental education—its cost, its lack of evidence of results, and the barriers it presents to success (Hughes & Scott-Clayton, 2011; Brothen & Wambach, 2012; and, Goudas & Boylan, 2012).

Indeed, many students across the country are entering four-year and community colleges underprepared academically to be successful. As Bettinger et al. (2013) noted, most students, nearly two-thirds of the graduating high school seniors, are academically underprepared for college (p. 1). These students, to be successful in college, must be remediated, but many of these students never reach graduation. Some fail to reach a level where they are able to enroll in or successfully complete curriculum-level courses that would actually apply toward a program of study (Bailey, 2016). Though completion rates are noticeably low at colleges where a high percentage of students who place into developmental coursework are enrolled (Bragg & Durham,

2012, p. 114); there is still no one-size-fits-all explanation for the lack of persistence.

Ultimately, developmental education remains a primary need for many students entering open-access community colleges. Further, it is a key, integrated part of the community-college landscape (Williams & Siwatu, 2017, p. 23). Some colleges use remediation as a prominent retention tool; other than financial assistance, “remedial education is perhaps the most widespread and costly single intervention aimed at improving college completion rates” (Scott-Clayton, Crosta, & Belfield, 2014, p. 371). Whether entering students are developmental or not, understanding what factors indicate a stronger propensity toward success would be beneficial to community colleges that are now often operating within tight budget constraints. Determining where budget dollars would be best utilized to see more students graduate from their offered programs of study would be most valuable to community college administrators.

Limited data are available on the completion rates of students who begin their community/technical college education in developmental programs. However, some studies show students who placement test into developmental education and complete the coursework do have a greater chance of persisting from year to year and usually complete a larger number of credit hours than students who do not (Bremer et al., 2013 and Moss, Kelcey, & Showers, 2014). Some students complete developmental coursework and fail to enter curriculum-level courses or enter curriculum-level courses but do not successfully complete them (Bailey, Jeong, & Cho, 2010). One statewide study found that students who were required to take developmental courses graduated at “disappointingly lower rates” than did students who placed into developmental education but were not required to take developmental courses (Priesmeyer & Slate, 2014, p. 242).

Using placement-test scores as one independent variable of interest specifically related to student retention, Bremer et al., 2013 found that students' success could be predicted by their math abilities at the time of enrollment, and scores earned on math placement tests could be used to predict retention, higher GPAs, and likelihood of graduation (p. 171). These researchers also did find reading placement scores to be predictive of persistence to year two but not predictive of community college completion (p. 172).

Similarly, to better understand the factors that most contribute to the success of students in community colleges, Tovar (2015) researched the impact of instructors, counselors, and student support programs on student GPA and degree completion and found support from friends and family while in college and participation in specific support programs did predict students' proposing to reach degree completion.

Researchers seeking to determine if students who would successfully complete college-level coursework could be determined by the location (community college or baccalaureate institution) of where their developmental coursework in math and English is completed (Williams & Siwatu, 2017, p. 24). They report that students who complete developmental math courses at a four-year college are "20% less likely to successfully complete college algebra than students who complete developmental mathematics at a community college" (p. 35). The location of developmental math coursework was determined to have predictive validity; English could not be used as a predictor of student success. Additionally, they found that students who have high school GA lower than 2.5 are more likely to pass college algebra if they take developmental math at a community college than at a four-year college (p. 35-36).

Much of the current literature regarding developmental education focuses on retention and success of developmental students. Boylan and Bonham (2011) argued that developmental

students can be as successful as, in some cases more successful than, their initially college-ready peers (p. 31) and that “participation in developmental programs . . . contributes to improved retention” (p. 32). True correlation, however, between placement into and completion of prescribed developmental coursework with successful completion of students’ chosen programs is missing from the literature, and no studies focus on the predictive value of a combination of placement scores on student completion of a degree or certificate program.

For example, in studying a cohort of community college students in Virginia, Wolfe (2012) found no correlation between “developmental status [and subsequent] success in the first college-level mathematics course or fall-to-fall persistence” (p. 49). Barnett (2011) found that a positive relationship existed between students’ planning to persist and actual persistence (p. 197), while (Fike & Fike, 2008) argue “the strongest predictor for retention is passing a developmental reading course (p. 80). Analyzing data collected from 156 first-year college students, authors Morrow & Ackermann (2012) sought to determine if students’ persistence rates were attributable to how motivated the students were. They concluded motivation was significantly related to student intent to remain in college. Similarly, Barnett surmised that faculty, especially in community colleges, can positively impact students’ decisions to persist. Her research showed that “students experiencing faculty validation were more likely to feel academically integrated and to express their intent to continue their education” (2011, p. 215).

Acknowledging and building on Tinto’s (1973) argument that adaptation of the student to the college or the college to the student is necessary for student persistence, Bers and Schuetz (2014) conducted an exploratory and descriptive study on community college students (“nearbies”) who had earned at least 45 credits with a GPA of at least a C. Their study involved students who had not yet returned to the college in at least a year, had not earned a degree or

certificate, and had not transferred. Though they acknowledge additional research and validation is needed at the institution they studied, their findings show course completion is not at issue; completing needed courses to earn a degree or certificate is (p. 173). The researchers argued, based on their findings, that first-year initiatives aimed at persistence must be expanded and implemented throughout a student's enrollment at the community college.

Similarly, second-year persistence rates as well as initial college-credit attainment are directly associated with enrollment in a first-year student success course according to results of research conducted by Cho and Karp (2013). Even when students were enrolled in the lowest-level developmental math course, Cho and Karp found the students were more likely to earn college credits if they also took a first-semester student success course. The researchers used data supplied by the Virginia Community College System.

It is financial difficulties, according to McKinney and Novak (2013), that may keep developmental students from persisting: They concluded from their study that "failure to file a FAFSA [Free Application for Federal Student Aid] negatively affects the ability of community college students, especially those attending part-time, to persist from fall to the spring semester during their first year of enrollment" (p. 77). In contrast, when testing for a relationship between persistence and taking developmental courses in math, reading, or English, there was no significant relationship evidenced (Crisp & Delgado, 2014, p. 109).

In their qualitative study focusing on perceptions of three developmental students who participated in the developmental education program at a community college in Texas, researchers Koch, Slate, and Moore concluded the students they interviewed "became more confident as they experienced success with the assistance of supportive professors and college resources" (2012, p. 76). Tinto (2013) also supported this idea, noting that it is the successes



students have within the classrooms that lead to success in college and that college completion will naturally stem from “success in a sequence of classes one after another over time” (p. 5).

Understanding why students come to college, particularly community colleges, underprepared and why many never graduate with either a certificate or a diploma is important because it can help administrators and instructors better understand how to structure their developmental-education programs. A developmental education program that addresses and meets the needs of entering students can be a true support to students and enable them to reach graduation. Colleges are recognizing the need for quality developmental programs, and “innovative” developmental education programs are started to be well funded (Studart, 2009, par. 8). Seeing more students persist to graduation will inevitably benefit our communities and society in general (Dorsey, 2012, par. 7).

In their study for the Florida Community College System, researchers found that older students, after brushing up on “rusty” math skills, show promise for completion. These students often “have a clearer sense of their objectives for going to college, they know how to navigate the educational bureaucracy, and they are generally not as shy about asking for help or demanding service” (Calcagno et al., 2007, p. 231).

In summary, the low percentage of students who complete community college is of interest to stakeholders at all levels from students’ family members to national oversight committees. Researchers continue to focus on plausible causes of lack of completion as well as possible solutions for positively impacting completion numbers at community colleges. Students placing in developmental education and how they progress or fail to progress also remain important components of studies available in current literature.

## Placement Decisions

Public and private colleges and universities across the country often have complex and competitive admissions' guidelines. Students are judged as qualified or not qualified for admittance, and this type of "sorting" is widely accepted. Students may willingly compete for limited seats and may even choose to have their names placed on a waiting list until a seat opens in their coveted programs of study in the academic institutions of their choice. However, in most areas of the United States, another type of educational institution is more widely accessible to all – the community/technical college. Community and technical colleges typically have open admission policies and will likely admit any student who has a valid high school diploma. Students without a high school diploma may still gain admittance and even federal financial aid if they are able to demonstrate an ability to benefit. The "ability to benefit" provision, part of the revised Higher Education ACT of 1965, will "allow a student who did not receive a high school diploma (or its recognized equivalent), or who did not complete a secondary school education in a home-school setting, to be eligible for Title IV financial aid" ("New Guidance," 2016, par. 1).

Interestingly, sorting is not reserved for the elite schools in the nation. Not all students who are deemed eligible to enter a community or technical college have the same academic and social skills. Thus, it becomes evident that "all higher education involves sorting . . . Less-advantaged students are sorted after they arrive at open-access institutions," with placement-test results being used to sort them into categories of curriculum-ready or remediation-needed (Hughes & Scott-Clayton, 2011, p. 329).

To judge readiness for college entrance, most students planning to enter a community or technical college are required to take a placement test; this test is used to "place incoming student[s] in an appropriate learning stream to promote student success" (Peng & Milburn, 2011,

p. 42). Further, these tests are most often viewed as necessary to see students be as successful as they can possibly be, and their use “is nearly universal in community colleges” (Hughes & Scott-Clayton, 2011, p. 333). However, “As with any single measure, placement exams have measurement error” (Jaggars, Hodara, Cho, & Xu, 2015, p. 5). The inherent error is of more interest when stakeholders consider that the tests are often used “as a high-stakes determinant of students' access to college-level courses” (Hughes & Scott-Clayton, 2011, p.328).

### **Predictive Validity of Placement**

ACT's COMPASS<sup>®</sup> and the College Board's ACCUPLACER<sup>®</sup> remain the two most commonly used testing instruments at community colleges and in community/technical college systems across the country (Hughes & Scott-Clayton, 2011). The appeal to college administrators nationwide is ease of use, for “matriculation coordinators and directors of institutional [research], in particular, cite the seamlessness between testing and placement as a major reason for switching to a computer-adaptive placement instrument” (Melguizo et al., 2014, p. 703). COMPASS<sup>®</sup> and ACCUPLACER<sup>®</sup> are not, however, the only placement instruments used. For example, both Florida and Texas have devised their own instruments to make placement decisions for entering freshmen (Melguizo et al., 2014, p. 695). Additionally, the reliability of the tests has come into question. Melguizo et al. (2014) found that “students of similar ability levels place into different level courses at different colleges [and this] should be considered a cause for concern for researchers, policymakers, and practitioners” (p. 716). Furthermore, the predictive validity of the two most common placement instruments have been questioned in recent studies.

Using a case-study approach to focus on the determination of math placement in the Los Angeles Community College District (LACCD), Melguizo, et al. (2014) used qualitative and

quantitative data (p. 700) and found disparities in the cut scores (p. 708); most entering students were being placed in “the two lowest levels of the developmental math course sequence” (p. 707); low-level math placement negatively impacted enrollment (p. 713-14); and that often “colleges lack the resources and information necessary to decipher how each component constituting A & P policies works to facilitate or impede students from progressing in the developmental education sequence” (p. 714).

Using placement-test scores as a predictor of college success is an interesting yet controversial topic. Placement tests are “designed to measure whether students possess the core competencies to achieve at a college level” (Brown, 2012, p. 74). ACT<sup>®</sup>, one of the two major suppliers of placement test units in the country, is phasing out its production of COMPASS<sup>®</sup> testing units, noting the following:

Thorough analysis of customer feedback, empirical evidence, and postsecondary trends led us to conclude that ACT<sup>®</sup> COMPASS<sup>®</sup> is not contributing as effectively to student placement and success as it had in the past [thus they] . . . made the difficult decision to phase out all ACT<sup>®</sup> COMPASS<sup>®</sup> products (ACT<sup>®</sup> Asset, Windows COMPASS<sup>®</sup>, and eCOMPASS<sup>®</sup>) by December 31, 2016. (ACT<sup>®</sup> COMPASS<sup>®</sup>, 2016, para. 4)

The predictive value of placement scores when used even for individual course success sometimes shows limited promise, for “some students placed directly into college-level courses do not have the necessary skills to complete them, [and] many students placed into math remediation could have earned at least a C or B in a college-level math course” (Kurlaender, 2014, p. 39).

Additionally, because consistency in student success is missing for students who place very close to the assigned cut-off scores (whether they are slightly above or slightly below) may

indicate college readiness may not be sufficiently measured by an assessment instrument, at least not by current assessment measures (Scott-Clayton, 2012, p. 39). Indeed, cut scores may need to be revisited, reevaluated, and perhaps realigned so that they more accurately express predictive value (Secolsky, Krishnan & Judd, 2013, p. 6). Predictive validity of placement scores on overall student success and completion can be further hindered when students initially place into developmental coursework. Though it seems theoretically possible to look at initial placement scores and students' grades for all community college students, there could be a problem with statistical analysis when students are initially placed into developmental coursework. For example, if a study warrants focusing only on students who place into college-level courses, the "restricted range of variation can bias goodness-of-fit statistics downward" (Scott-Clayton, Crosta, & Belfield, 2014, p. 374).

Recognizing too many students graduate from high school underprepared to be successful in a college-level math class, researchers examined the effectiveness of the North Carolina Early Mathematics Placement Testing Program as a predictor of future college success in math. Though they did not find correlation between test scores and college graduation, they determined the test results were useful to determine what students needed additional reinforcements in math skills while they were still in high school (Hilgoe, Brinkley, Hattingh, & Bernhardt, 2016).

Results of several studies show that placement scores alone may not be the best predictors of student success. One study shows as many as a third of college students may be incorrectly placed and finds that "test scores poorly correlate with students' ultimate success in college" (Hassel & Giordano, 2015, p. 57-58). Researchers are starting to argue the use of multiple-placement measures as better predictors of student success (Scott-Clayton et al., 2014; Hassel & Giordano, 2015; Ngo & Kwon, 2015). Alternately, other studies are showing that

assessing students' college readiness, while they are still in high school, may be more predictively powerful (Kurlaender, 2014, p. 55).

Focusing on degree attainment for students seeking two- or four-year degrees, Attwell, Heil, and Reisel (2012) found correlation between students taking a college course in the summer, immediately after high school graduation, and movement toward degree attainment. This continued coursework contributed to student momentum and was especially beneficial to academically weak students (p. 41). Further, their study revealed an "increased likelihood of graduation" for students who took at least one course in the summer session between year one and year two of their college enrollment (p. 41).

Working in part on a premise promoted in Tinto's persistence theory (1973), researchers suggest that a heavier course load may be what is needed for community college students to reach degree or certificate completion. Taking 15 or more credit hours rather than 12 or fewer can benefit community college students by helping them acclimate to a college setting more quickly (Attwell & Monaghan, 2016, p. 684).

Because Tinto's persistence theory (1975, 1987, & 1993) identified a need for student acclimation to college, offering or requiring community college students to enroll in a student success course may ultimately improve retention. It is no wonder college success courses are popular in many community colleges across the nation, and some colleges require students to take them. However, Claybrooks and Taylor (2016) found no statistically significant difference in persistence rates between students required to take the course and those who exempted taking the course (p. 207). This study does reinforce the idea that community-college persistence and graduation rates of its students are difficult to understand and to positively impact.

Tinto's (1975) persistence theory has been a driving force behind advancing and informing considerable research in the area of community college persistence and completion. Researchers in a 2014 study, for example, expanded on Tinto's work by looking at job opportunities as a determining factor in community college students' decision to remain enrolled and ultimately graduate. They argued that community colleges must include job-related data like employment numbers, job satisfaction, and average earnings when measuring student success (Stuart, Rios-Aguilar, & Deil-Amen, 2014).

Finally, finding usable data on the predictive validity of placement cut scores on student retention and success may be most hindered because of the wide range of scores used. Even though there is primarily only one major placement-test provider being used nationwide, the scores used to place students in college-level courses vary widely. There is no "clear boundary [being] universally shared" that is used to decide "where 'remediation' starts and 'degree-credit' begins" (Hassel & Giordano, 2015, p. 57-58). The technical college system in this present study is just beginning to determine cut scores or cut score ranges to be used for placement purposes in all its member colleges. Further, subject-area success markers are also often lacking. English curricula, for example, "is also affected negatively by not clearly and accurately identifying what markers of knowledge and skills are required for precollege, first-semester, second-semester, and more advanced writing courses in a consistent way that we can adequately measure" (Hassel & Giordano, 2015, p. 76)

### **Multiple Placement Measures**

With more of an emphasis being placed on the placement decisions made by community colleges, many colleges are opting to move from using placement-test scores as their sole placement mechanism, opting instead to utilize multiple placement measures. California has

been at the forefront of the move, as multiple placement measures have been mandated in their community colleges for more than two decades (Ngo & Kwon, 2015, p. 445). Though the original intent of using placement test scores as the mechanism for placing students in the correct level courses was focused on student success, colleges are realizing there is no true correlation between the subject placement score and success in the subject area. Current literature contains only very limited evidence of the correlation between entry placement scores and degree completion; some studies even show no correlation. Thus, using the placement test as the sole placement indicator has become “problematic” for the colleges that follow this practice (Hassel & Giordano, 2015, p. 64).

Term-to-term persistence or likelihood of course success based on entry placement test scores is much more prevalent in the literature than is the use of placement-score data as a predictor of degree attainment. For students who are marginally inside the developmental cut scores for developmental reading, for example, the completion of a developmental reading class may be used as a predictor of persistence. Through a study that focused on a select group of students who placed slightly above and slightly below the COMPASS<sup>®</sup> cut score for developmental reading in a large community college, Pinkerton (2010, p. 24-25) showed “likelihood of persistence,” with persistence defined as earning thirty or more credit hours or attaining an associate’s degree, could be predicted. Through the use of logistic regression, the researcher determined that the students just inside the cut score who successfully completed the prescribed developmental reading coursework were more persistent than the students who fell just outside the cut score for the developmental reading coursework. This study provides an additional argument for further evaluation of student readiness above just a review of placement scores (Pinkerton, 2010, p. 27).



Using a multiple-measures approach rather than relying solely on a single placement score is, per Hasel & Gioradano (2015), a better way to determine which students would benefit from developmental writing courses. However, though better, a consistent prediction of which students will or will not be successful is not evidenced, even when students' academic histories are similar. The researchers noted that similar academic backgrounds did not mean similar outcomes for the students in their study. They argue that the "most vulnerable student populations" should be given access to college programs and be provided needed support (p. 77). If these programs are removed, less students may be enrolled in developmental and transitional courses, but the rate at which underprepared students reach degree attainment would not be increased (p. 77).

Though placement into developmental coursework (even with the multiple-measures placement approach) will continue to be needed, Sullivan (2013) argued for multiple "exit point[s]" (p. 118) out of developmental courses so that students, once they show they have the needed skills, can advance into their next-level coursework rather than being bound by full-semester timeframes.

Looking at how students performed academically in high school is among the most encouraged multiple-measure source being emphasized in current literature. Scott-Clayton et al. (2014) found "that if institutions took account of students' high school performance, they could remediate substantially fewer students without lowering success rates in college-level courses" (p. 373). This is an area that needs to be explored and encouraged, for, per the researchers, cumulative high school grade point averages and academic achievement in high school are not yet being widely used to place students in or out of remedial education in community colleges. This is not the best news for students, faculty, administrators, and other stakeholders in

community-college education, for high school GPA is proving to be a better tool for accurate placement (Scott-Clayton et al., 2014, p. 382-383).

It follows that open-access institutions, like community colleges, may be doing their students (and potential students) a disservice if they rely solely on a “stand-alone, multiple choice usage and reading comprehension test” (Hassel & Giordano, 2015, p. 64), for a complete picture of academic readiness may be lacking. For placement and remediation to be most effective, “markers of knowledge” (academic skill level needed) for all points in students’ college careers (pre-college through graduation) need to be defined so student preparedness is demystified, and expectations can be in line with initial placement decisions (Hassel & Giordano, 2015, p. 76). This research suggests that the initial snapshot of student college readiness, as captured in pre-college placement tests, is not an all-encompassing measure of how well a student will do throughout his or her college career. A look at what academic skill level will be needed at various points along the students’ degree path could be more effective, and measuring where students’ academic standing and skill sets are along the way, in correlation with the established markers could prove to be more effective in determining students’ needs and readiness for college completion.

### **Developmental Education**

One reality the US is now facing is the fact that a number of students, though they are high school graduates, lack the basic academic skills needed to be successful in college. This is among “primary explanation for college non-completion” (Scott-Clayton et al., 2014, p. 371). The results of placement tests, for many students who have made the decision to apply to college, may reveal remediation is needed prior to beginning curriculum (college-level) coursework. This knowledge and the associated time and costs involved “can be enough to

discourage students from pursuing higher education” (Brown, 2012, p. 74). Ambitious completion goals set by the Obama Administration do hinge upon students’ preparedness for college entry (Bragg & Taylor, 2014, p. 994-995). Through his work in designing accelerated paths to curriculum enrollment, Sullivan surmised, “For some students, traditional developmental curriculum appears to hinder their progress and achievement unnecessarily” (2013, p. 119) while evidence shows “accelerated developmental education provides students with a strong positive boost terms of their probability of enrolling in and completing college-level math and English” (Jaggars et al., 2015, p. 20). This boost likely comes from sustained momentum and opportunities for earlier exposure to success which can build student confidence.

Though some states like Florida and Connecticut have chosen to drastically limit the number of students who will have access to developmental education, many states are piloting and ultimately institutionalizing innovative, accelerated curriculum models that are designed to get students to the curriculum level and ultimately to completion at a much more accelerated rate. Providing multiple exit opportunities in developmental courses is one way colleges are ensuring that students progress quickly through developmental coursework and enter curriculum coursework. It is multiple exit points that Sullivan (2013) argued “create a more welcoming and encouraging educational environment for developmental students than the current system of monolithic full semester courses” (p. 29).

Increased state and national attention on purpose, success, and costs associated with developmental education programs in community colleges contribute to the need for administrators to closely analyze what is being offered at their institutions. To become and remain competitive in a global economy, the number of students graduating from college annually must increase. Additionally, community colleges are being pressured to progress

students through developmental programs more quickly. Brown (2012) argued for developmental courses “to be more intensive and better targeted to students through pinpoint assessment of skills and academic goals and aspirations” (p. 75). Institutions with the best redesign models may just be the ones who get buy-in and assistance from the developmental faculty, who have, in many cases, made a career of working with and toward empowering underprepared students to be successful. Results of Cafarella’s (2016) study showed “that bypassing faculty input is not beneficial to student success” (p. 24). Instructors are, as Cafarella noted, the ones who have the most interaction with students and are experts in their respective fields (p. 24).

The increased scrutiny by many stakeholders in developmental education that is prompting professionals in the field to take action is not necessarily a negative. Because of the increased attention, many administrators and developmental educators are pondering initiatives that can infuse “positive momentum into the field” (Brothen & Wambach, 2012, p. 16). Arguably, faculty members, because of their direct contact and interaction with students in their classrooms, “are in a unique position to positively impact the persistence decisions” (Barnett, 2011, p. 194) and possibly graduation rates of community college students.

Reformed or redesigned developmental education programs should “expand the concept of learning to include affective outcomes such as leadership, self-understanding, and citizenship, as well as cognitive outcomes” (Barbatis, 2010, p. 20). Additionally, redesigned developmental programs can positively impact the colleges’ financial picture. When considering redesign, college administrators are realizing, “cost-effective innovations are imperative for both secondary institutions and their students during uncertain financial periods” (Bettinger et al., 2013, p. 108). Accelerated developmental instruction practices are proving to be effective in a

number of institutions across the country, and the implementation of these practices is beginning to be the go-to promise for program salvation for colleges that are still struggling with fluctuating enrollment, poor retention, and pass rates in their developmental-education programs. These are working well for some institutions and students but not all.

Utilizing purposive sampling, Caferella (2016) found “there is a significant subset of students whose needs may not fit these delivery models” (p. 25). The establishment of learning communities, another strategy that is increasingly employed by community colleges in an effort to see improved student success, is also one way developmental educators are tackling course redesign. Unlike the emporium model that focuses primarily on remediating the academic weaknesses of the individual student in a computerized learning lab that also provides on-demand feedback (Wong, 2013, p. 259), learning communities focus on creating a supportive atmosphere for a cohort of students who enroll in two or more common classes. Additionally, learning communities can afford students the “opportunity to form deeper ties with their peers and with faculty” (Bettinger et al., 2013, p. 102). This may be a benefit to adult learners who have a “growing presence in higher education, [so] it is important to consider ways in which all college-level learning in adulthood (e.g., informal and self-directed) might contribute to degree completion” (Hayward & Williams, 2015, p. 45). Whether students are classified as developmental or not, student participation in learning communities does positively contribute to “increased effort in their coursework [as well as] interactions with faculty members” (Rocconi, 2014, p. 189).

Advancing students through developmental coursework into curriculum-level coursework while still instilling and enhancing needed competencies has been a major component in the recent, national push for reform and redesign of developmental education programs.

Streamlining the curriculum so that students get through developmental and into curriculum courses more quickly is most desirable. However, limiting the needed number of developmental courses is challenging, for some “institutions offer up to three developmental mathematics courses below college-level mathematics” (Bettinger et al., 2013, p. 96). Depending on placement-test scores and other college placement instruments, some students may be required to take developmental coursework for “one to five semesters” (Crisp & Delgado, 2014, p. 100).

To progress students through the developmental sequence more quickly, some community colleges are institutionalizing accelerated learning paths for their students. Though a shift in structure and attention to the pace of content delivery are required, accelerated learning is a “strategy used by community colleges to reduce the amount of time in remediation and allow [students] to enroll more quickly—or immediately—in courses leading to certificates or degrees” (Venezia & Hughes, 2013, p. 39).

Mainstreaming is another way colleges are trying to more quickly advance students through the developmental sequence and into curriculum-level courses. This strategy involves placing students directly in college-level courses, often in conjunction with a partnered developmental course to help remediate any academic deficiencies. This practice is showing promise, and “evidence suggests that one step in improving developmental education could be reforming remedial placement policies” (Bettinger et al., 2013, p. 107). Learning communities may make this type of instruction more palatable and practical for students who have weak academic skills. For example, “linking a course like remedial English with a course of special interest to a student may make the material more engaging and motivate the student to work harder” (p. 102). Academically underprepared students may benefit from using a model where a remedial writing course, for example, might be paired with a course of more interest to them,

perhaps a psychology course (p. 102). One study, however, conducted in a large urban community college in New York, found that students who progressed through a compressed sequence of developmental English courses “were 2.5 percentage points less likely to pass college English than similar students from longer sequences” (Hodara & Jaggars, 2014, p. 266).

Because the students who enter developmental courses comprise a diverse population of learners, their learning styles and academic needs, according to recent literature, are also diverse. One way some colleges are working to reform their developmental programs is by addressing the needs of the individual learner. To do this, they are modularizing content and offering what each student needs to focus on individually – hence the term, *individualized instruction*.

For this to work, course content must be examined and restructured. What was once covered in a semester-long course where all student learning outcomes were assigned to every student is now being broken down into smaller modules that focus on a specific competency or skillset. The students do not have to focus on every unit or topic covered within a course or module – they only focus on the specific competencies or skillsets which is identified as a weakness for them individually (Venezia & Hughes, 2013, p. 40).

The individualized approach is a key tenet in a popular redesign, especially in development math, commonly known as the emporium model. This model of curriculum design and content delivery has been praised as a “silver bullet” that can address several problematic areas in higher education, particularly how poorly students perform in developmental classes (especially developmental math classes) in community colleges (Twigg, 2011, p. 25).

Implementing an emporium model typically requires completely redesigning the way courses are taught. Though the emporium method may be, and usually is, adapted or modified to fit the needs of the college and its students, emporium models do rely on a flipped classroom

approach where in-class lectures are removed and “interactive computer software” (Twigg, 2011, P. 25) is used to provide a personalized learning path on which students should focus. An academic assessment, provided through the chosen software is used to determine where students have weak mathematical skills, and it is those skills on which they work on strengthening and mastering (Twigg, 2011). Students are typically placed in the developmental course based on a college-wide placement test and then reassessed using a program that takes a granular look at their individual needs to see which specific competencies should be stressed in their constructed curriculum. Basically, the emporium model will “replace lectures with a resource center with computer software and on-demand personalized assistance” (Wong, 2013, p. 259). For the model to be effective, colleges must ensure students work enough time on the assigned competencies and take advantage of on-demand feedback and help when they need it (Twigg, 2011, p. 29).

At Virginia Technical College, the emporium model has reduced the need for numerous classrooms and a large number of teachers: The model enabled the college to rid itself of “all the strictures of the conventional university class. Instead of attending three lectures a week, students could come to the lab when they pleased. Instead of 100 instructors leading hundreds of class sections, a rotating staff of about 12 would roam the lab, dispensing help as needed” (de Vise, 2012, p. A1). Using an emporium model at Cleveland State Community College in Tennessee, faculty saw success rates (students earning a score of A, B, or C as a final grade in developmental math) rise from around 50% to 74% after implementation of the course redesign (Stern, 2012). A shorter amount of time spent in a developmental-English sequence proved to positively impact students’ decisions to later enroll in and ultimately complete college English. Further, the completion of the condensed writing sequence also seemed to contribute to the accumulation of college credit as well as a receipt of a college degree (Hodara & Jaggars, 2014,



p. 270).

The emporium model is proving to be a path to success and to entrance into curriculum-level math for many students. However, a recent phenomenological study revealed that students who are not successful in an emporium math courses prefer less time working in the computerized class or a change to a traditional setting (Cordes, 2014, p. 163). They find themselves being frustrated, reporting feelings of “isolation, self-doubt, and negative attitudes toward developmental math” (Cordes, 2014, p. 162).

To help students progress into curriculum-level courses more quickly, some developmental education programs are merging various levels of courses (accelerated programs); others are merging subjects (integrated courses). Integrated courses, a form of course redesign, provide a workable approach for expediting completion of needed developmental coursework and entrance into curriculum-level courses. Barbatis (2010) suggested that “acquiring the competencies of reading, English, and mathematics in an integrated curriculum may increase year-to-year retention and higher grades in subsequent classes” (p. 20). Currently, as many as 50% of first-year community-college students discontinue their enrollment prior to entering their second year (ACT 2012).

### **Summary**

Nationally, completion rates and transfer rates are very low for students enrolled in community colleges. Many students who enter community colleges, even though they may be very recent high school graduates, often need remediation (developmental coursework) before being ready to enter curriculum-level courses; this is causing stakeholders from the national to local levels to ask *why*? Thus, much of the current literature offers analyses of strategies recently implemented in community colleges, primarily in year one, to encourage, engage, and enable

student retention, persistence, and completion. A strong branch of the research also explores ways for students to be accelerated through or completely bypass developmental coursework. Student success is of primary importance when focusing on completion, so recent literature also involves studies that help educators better understand what student characteristics, like initial placement-test results, can be viewed as predictors of student success. Though placement-test scores have been and are being used to determine the likelihood of success in entry-level coursework, no research is yet available to prove or disprove the usefulness of combined placement-test scores (English, math, and reading) as predictors of success in various degree and certificate programs of study in community colleges. Since community colleges across the country still primarily use placement tests as an initial measure of student readiness to enter curriculum-level courses, researching the effectiveness of placement scores as predictors of students' abilities to successfully complete various programs of study in community colleges is key and remains a gap that needs to be filled in literature devoted to community college completion.

## CHAPTER THREE: METHODS

### Overview

Though community colleges across the country enroll a large percentage of the nation's college students, "almost half of all undergraduate students in the United States," still "[struggle] with . . . low degree-completion rates" (Linderman & Kolenovic, 2013, p. 43). This predictive correlative study was designed to investigate the relationship between the entry placement-test scores of community college students as measured by the ACT<sup>®</sup> COMPASS<sup>®</sup> placement exam and the students' successful completion of their chosen degree or certificate program at a community college in South Carolina. This study was designed to examine the relationship between the community college students' ACT<sup>®</sup> COMPASS<sup>®</sup> placement scores in English, math, and/or reading and the students' graduation rates from their individual programs of study. This chapter details the design, participants, and setting used for the study as well as the rationale for using logistic regression.

### Design

Using a predictive correlative design, this quantitative study explored the relationship between the criterion variable (graduation) and the combination of predictor variables (English, math, and reading placement test scores) for community-college students at one of 16 technical colleges in the South Carolina Technical College System. The study was designed to determine if initial ACT<sup>®</sup> COMPASS<sup>®</sup> placement test scores (scores resulting from the students' first attempt in each subject area of the placement test) can predict graduation from a degree or certificate program in one of the college's programs of study.

Further, a correlative design was appropriate, for it "reflects the dynamic quality of the relationship between variables" and allows analysts to better understand the movement of the

variables as they change (Salkind, 2014, p. 82). The results of this predictive correlative study could be used to ultimately help “guide the selection of students who will be successful” in the college’s programs (Gall, Gall, & Borg, 2007, p. 4). Students are typically considered likely to succeed if the estimated probability of success generated by logistic regression is at least 50% (Hughes & Scott-Clayton, 2011, p. 355-336). The criterion variable, graduation, is defined as being awarded any-level degree or a certificate and the predictor variables, English, math, and reading COMPASS<sup>®</sup> placement-test scores, are defined as a single numeric score in the range of 1-99 for each subject in reference to community-college students at one of 16 technical colleges in the South Carolina Technical College System.

### **Research Question**

One research question was formulated for this study:

**RQ1:** How accurately can the ACT<sup>®</sup> COMPASS<sup>®</sup> placement test scores in English, math, and reading predict the graduation of community college students seeking various types of diplomas or certificates?

### **Null Hypotheses**

**H<sub>0</sub>1:** There is no significant predictive relationship between the criterion variable (graduation) and the combination of predictor variables (English, math, and reading placement-test scores) for community college students in the Business, Information Technologies, and Public Service Division.

**H<sub>0</sub>2:** There is no significant predictive relationship between the criterion variable (graduation) and the combination of predictor variables (English, math, and reading placement-test scores) for community college students in the Engineering and Industrial Technologies Division.

**H<sub>03</sub>:** There is no significant predictive relationship between the criterion variable (graduation) and the combination of predictor variables (English, math, and reading placement-test scores) for community college students in the Health Science Division.

**H<sub>04</sub>:** There is no significant predictive relationship between the criterion variable (graduation) and the combination of predictor variables (English, math, and reading placement-test scores) for community college students in the Nursing Division.

### **Participants and Setting**

South Carolina has a technical-college system, the state's largest system of higher education, that spans the state (About us, 2018). The system attracts the majority, 57%, of the state's undergraduate students (Our colleges, 2018). Over 225,000 students enroll annually. Female students comprise 61% of the enrollment and males comprise 39%. A high percentage, 41%, of those enrolled in the technical college system are minority students (System impact, 2018). Sixteen sister colleges comprise the state system, and each is assigned a major service area. This study utilized a convenience sampling of students who enrolled in a community college in the Southeast who were enrolled in a program of study in one of the following divisions at that college: Business, Information Technologies, and Public Service; Engineering and Industrial Technologies; Health Science; or Nursing. The researcher works at the subject institution and has access to the data that is available in the college's retention-management system, ZogoTech. The selected college "contributes to the economic growth and development of the largest and most diverse region of the technical college system . . . [and annually] enrolls approximately 4,500 to 5,500 credit students" (FACT Book, 2012, p. 3).

The diverse participants in the study were selected from a group of community college students who were enrolled in any one of four divisions at the subject college (Business,

Information Technologies, and Public Service; Engineering and Industrial Technologies; Health Science; or Nursing). The sample was purposely selected because it represents the “population most pertinent to [this] study” (Gall, Gall, & Borg, 2007, p. 343). Participants included in this study are those enrolled in any one of four divisions at the college (Business, Information Technologies, and Public Service; Engineering and Industrial Technologies; Health Science; or Nursing). The sample was purposely selected because it represents the “population most pertinent to [this] study” (Gall, Gall, & Borg, 2007, p. 343). The diverse population in the convenience sample comprised of the following: 354 females, 297 males, 349 Caucasian students, 277 African American students, 12 multi-race students, and 13 students from other races.

Of the 651 total students in the sample, 534 (82%) did not graduate with a certificate, degree, or diploma; however, 117 (18%) of the students did graduate with a certificate, degree, or diploma. The sample size of students who began college in Fall 2014 is 280 and students who began college in Fall 2013 is 371 for a total sample of 651 unique students. This greatly exceeds the minimum required (66) for medium effect size with a .7 statistical power (Gall, Gall, & Borg, 2007, p. 145) at the .05 alpha level. The large sample size permits the inclusion of all variables in the logistic model being used (Sperandei, 2014, p. 17).

Archival, objective data of student test scores, degrees, and certificates received, as well as demographic data for students who enrolled for the first time in the subject community college in either Fall 2013 or Fall 2014, were retrieved from the college’s retention database (ZogoTech) by a data analyst; participant anonymity was preserved, for the names of the participants were not provided to the researcher. ZogoTech is a robust data storage and predictive analytics system that is used at the subject institution. It provides users, including this researcher, access to

student-level descriptive, persistence, success, and retention data as well as institutional “scorecards” that provide “real-time tracking of strategic goals and benchmarks” (Executive, par. 2). Descriptive statistics were used to expose the true makeup of the sample population studied.

### **Instrumentation**

Archival, objective data was used for this study. This quantitative study explored the relationship between the criterion variable (graduation) and the combination of predictor variables (English, math, and reading placement-test scores) for community-college students who initially enrolled in the college in one of two fall starts: Fall 2013 and Fall 2014. Data was requested from the participating institution once in Spring 2018. The placement-test scores available in the archival data were determined through the web-based ACT<sup>®</sup> COMPASS<sup>®</sup> test. This test “is a computer-adaptive college placement test that lets educators . . . evaluate incoming students' skill levels in Reading, Writing [and] Math” (ACT<sup>®</sup> COMPASS<sup>®</sup>, 2015, par. 1). ACT<sup>®</sup> COMPASS<sup>®</sup> in its 2008 *COMPASS Course Placement Service Interpretive Guide* recommends colleges use additional measures, such as high school GPA and previous course work, to make placement decisions rather than solely using the results of the COMPASS<sup>®</sup> tests (p. 17). The information provided in the *Service Report* is based on a “course placement model,” where placement decisions are typically made between two sequenced courses in the same subject area where the lower-level (developmental) course offers students additional academic assistance to be successful in the upper-level (curriculum-level) course (*Compass Course*, 2008, p. 4).

Using predictive validity to refer to the “statistical relationship” between course grades and the placement variable (COMPASS<sup>®</sup> test scores), ACT<sup>®</sup> reports curriculum-level English courses have a “median correlation of .24 with COMPASS<sup>®</sup> Writing Skills scores and a median correlation of .16 with COMPASS<sup>®</sup> Reading scores” (*Compass Course*, 2008, p. 8-9).

Additionally, the mathematics' grades have a "median correlation of .20 to .40 with COMPASS® Prealgebra, Algebra, or College Algebra scores (*Compass Course*, 2008, p. 9). Though nearly always positive, the "correlations between course grades and placement variables vary considerably among institutions and courses" (*Compass Course*, 2008, p. 8).

The ACT® COMPASS® test was designed to assess students' or potential students' skill level in one of three subject areas: math, reading, and writing. First offered in 1983 (Fain, 2015, p. 1), ACT® decided to no longer use COMPASS® as a placement-test solution and officially retired it in December 2016 (Pratt, 2017, p. 40). Several recent studies acknowledge that ACT's COMPASS® along with College Board's ACCUPLACER® have been the two most commonly used placement instruments being used across the country, and ACCUPLACER® has now shifted into the number-one slot (Melguizo, Kosiewicz, Prather, & Bos, 2014; Porter & Polikoff, 2012; Venezia & Jaeger, 2013).

The initial math placement test (Numerical Skills/Prealgebra Test) is the most basic of the math tests in ACT's COMPASS®. The test questions are generated from a pool of 332 questions, and the number of questions each student is asked on the math test can vary by student (Part two, 2012, p. 8). The reading placement test assesses students' reading comprehension; it "consists of a pool of 71 passages, each of which is accompanied by up to five reading comprehension items (Part two, 2012, p. 1). When students take the Writing Skills Placement Test, they are being assessed in how well they are able "to apply the appropriate standard written English conventions of grammar, usage, and mechanics to actual passages (Part two, 2012, p. 21). Two main sections (Usage/mechanics and Rhetorical skills) are covered in the writing section.



Though the number of questions students are asked varies by student, the questions are generated from a pool of 228 questions (Part two, 2012, p. 22). There is a range of scores (lowest 1; highest 99) in each of the three subject-area tests. The tests are not timed, and the time it takes for students to test varies greatly by student. At the subject college, students are advised the full battery (math, reading, and English) can take up to three hours to complete. Some students complete the tests much more quickly, and some need longer than three hours.

ACT<sup>®</sup> does not dictate to colleges which score or which combination of scores will show subject-area proficiency. Rather, the advice presented in the ACT<sup>®</sup> COMPASS<sup>®</sup> provides great flexibility for colleges and provides the college with the responsibility to “control how students are routed through content domains and diagnostic areas and specify score ranges that align with local needs” (ACT COMPASS, 2012, p. 73). The available score a student can earn on any of the subjects will fall within a range between one and 99. At the subject college, readiness to move into college-level English (English 165: Professional Communications) is measured by a minimum score of at least 65 in writing and at least an 84 in reading. English 165 is primarily used for students seeking certificates. To move into English 101: English Composition, the first in a sequence of English courses at the subject college that is primarily used for students seeking an associate’s degree or those who plan to transfer to a four-year institution, a minimum score of at least 75 in writing and 84 in reading is required. For students to be considered proficient in basic math and demonstrate readiness to move into Mathematics 155: Contemporary Mathematics, a minimum math score of 36 is needed. To move into MAT 170: Algebra, Geometry, & Trigonometry I, a minimum math score of 32 is required. An algebra score of at least 55 is required for students who need MAT 110: College Algebra.

### Procedures

As part of the application process at the selected community college, students are required to take an ACT<sup>®</sup> COMPASS<sup>®</sup> placement test in math, reading, and writing unless they are transferring from another college and have already successfully completed one or more classes in these subject areas. ACT<sup>®</sup> or SAT scores are also sometimes used to establish placement. Applicants are directed to the Testing Center by the Admissions' staff. There, a member of the Testing Center staff logs them into the ACT<sup>®</sup> COMPASS<sup>®</sup> web-based system which provides access to the appropriate tests. Upon completion of the ACT<sup>®</sup> COMPASS<sup>®</sup> tests, a report is generated by the ACT<sup>®</sup> COMPASS<sup>®</sup> system. The report indicates the students' scores in the subject area(s) in which they tested (math, reading, and/or writing).

A copy of the score report is kept on file in the Testing Center, and a staff member logs the scores into the college's Banner system; ZogoTech automatically updates when Banner is updated. A second copy of the report is given to the student. The student takes the report to the Admissions' Office. A member of the Admissions' staff reviews the scores with the student and recommends remedial or college-level coursework based on the results of the ACT<sup>®</sup> COMPASS<sup>®</sup> test, or the student may be directed to Academic Advising for score review and initial course registration. If the students are not satisfied with their scores, or if the Admissions or Advising staff questions the scores, one retest (after a minimum 24-hour waiting period) is permitted. Should students retest, the higher of the two scores on each of the subject-area ACT<sup>®</sup> COMPASS<sup>®</sup> tests is used to determine appropriate course placement.

Archival data available via ZogoTech was accessed and analyzed to determine the predictability of completion (graduation) from one of the college's academic divisions: The Business, Information Technologies, and Public Service Division; the Engineering and Industrial

Technologies Division; the Health Science Division; or the Nursing Division. ZogoTech is a robust data storage product which houses enrollment, graduation, and biographical data and can be programmed to preserve the anonymity of the students. The ability of this college to collect, compile, and share relevant, credible data along with its proximity to the researcher (Gall, Gall, & Borg, 2007, p. 175) inspired the chosen convenience sampling. As noted on the homepage of the ZogoTech website, “ZogoTech's data warehouse and analytics tools deliver specialized, powerful ways of manipulating student and institutional data” (2015, par. 1).

After receiving IRB approval (See Appendix A for IRB Approval) which granted permission from the research institution to gather and use the data for the study, the researcher submitted a request for needed data via the college's online HelpDesk system. The data was sent to the researcher in the form of an Excel document. All student identifiers were stripped from the document, so that the researcher would not be able to determine the identity of any of the students. The report only included demographic, test, and graduation data. Descriptive statistics included the frequency count for the sex and race of each of the participants in the study. At least three test scores were provided for each student in the study: COMPASS<sup>®</sup> Math, coded as COMM; COMPASS<sup>®</sup> Reading, coded as COMR; and COMPASS<sup>®</sup> English, coded as COME. Only first-attempt scores were used in this study. Each test score had COMM, COMR, or COME (alpha code) along with a numeric code, representing the actual test score, recorded as a whole number, the lowest being a “1” and the highest being “99.” The criterion variable, graduation, was coded as “0” for non-graduate and “1” for graduate. A listing by division of the degrees and certificates applicable to this study at the subject college are detailed in Appendix B.

### **Data Analysis**

First, descriptive statistics were calculated in SPSS 23.0 in this study to indicate the sex and race of the participants. The descriptive statistics included the frequency count for the sex and race of the participants in the study.

Data screening was conducted on each group's predictor variables (math, reading, and writing COMPASS<sup>®</sup> placement scores) to check for any inconsistencies. The logistic regression required testing for the following assumptions: Distribution of scores on the criterion variable and the assumption of non-multicollinearity.

Per Warner (2013), one of the most important issues in logistic regression is the distribution of scores on the criterion variable. Meaningful results may not be obtained if the proportion of the two groups in the criterion variable deviate greatly from a 50/50 split. The researcher tested for the assumption of non-multicollinearity among the predictor variables. If a predictor variable (x) is highly correlated with another predictor variable (x), they essentially provide the same information about the criterion variable. If the Variance Inflation Factor (VIF) is too high (greater than 10), multicollinearity is evident, and the assumption is violated. Acceptable values must fall between 1 and 5. In this study, the values were all in the acceptable level as Chapter Four details.

The binary logistic regression analysis was conducted at a 95% confidence level. The effect size was measured using Cox and Snell's ( $R^2$ ) and Nagelkerke's ( $R^2$ ). The Wald Ratio was also examined for each variable.

### **Predictor Variable**

A combination of predictor variables (math, reading, and writing COMPASS<sup>®</sup> placement-test scores) for community college students who initially enrolled in the college in

one of two fall semesters (2013 and 2014) was used in the study.

The first predictor variable was the math COMPASS<sup>®</sup> placement test score. The variable was interval and was determined through the archived report (stored in the subject college's retention-management system, ZogoTech) of test results for students who took the math COMPASS<sup>®</sup> placement test as part of the college's admissions' process. The variable was coded as a whole number, the lowest being a "1" and the highest being "99." This data was retrieved by a data analyst at the subject college and was provided to the researcher after all student identifiers had been removed.

The second predictor variable was the reading COMPASS<sup>®</sup> placement test score. The variable was interval and was determined through the archived report (stored in the subject college's retention-management system, ZogoTech) of test results for students who took the reading COMPASS<sup>®</sup> placement test as part of the college's admissions' process. The variable was coded as a whole number, the lowest being a "1" and the highest being "99." This data was also retrieved by a data analyst at the subject college and was provided to the researcher after all student identifiers had been removed.

The third predictor variable was the writing COMPASS<sup>®</sup> placement test score. The variable was interval and was determined through the archived report (stored in the subject college's retention-management system, ZogoTech) of test results for students who took the writing COMPASS<sup>®</sup> placement test as part of the college's admissions' process. The variable was coded as a whole number, the lowest being a "1" and the highest being "99." Similarly, this data was also retrieved by a data analyst at the subject college and was provided to the researcher after all student identifiers had been removed.

**Criterion Variable**

One criterion variable (graduation with a degree or certificate from any of four academic divisions in the subject college: Business, Information Technologies, and Public Services Division; Engineering and Industrial Technologies Division; Health Science Division; and, Nursing Division) was used in the study. This variable was dichotomous (graduation from any level degree or certificate program was achieved or graduation from any level degree or certificate program was not achieved) and was determined by graduation records of the subject college. This criterion variable was coded as “0” for non-graduate and “1” for graduate. A listing by division of the degrees and certificates applicable to this study at the subject college is detailed in Appendix B.

**Logistic Regression**

The purpose of this study was to investigate the relationship between the entry placement-test scores of community college students as measured by the ACT<sup>®</sup> COMPASS<sup>®</sup> placement exams and the students’ successful completion of a degree or certificate program at a technical (community) college in South Carolina. Logistic regression “[f]or determining the correlation between a dichotomous criterion variable and a set of predictor variables” (Gall, Gall, & Borg, 2007, p. 354) was used. This was an appropriate analysis to use, for the criterion variable (graduation) was dichotomous, and there was a defined set of predictor variables that were used in the analysis. Logistic regression is robust and allows several variables to be analyzed at once, while still “reducing the effect of confounding factors” (Sperandei, 2014, p. 18). Logistic regression was the statistical analysis employed to test each of the four null hypotheses, and the Wald test was used to test the significance of the predictor variables.

Additionally, to determine the strength and fit of the model, Cox and Snell as well as Nagelkerke statistics were used.

## CHAPTER FOUR: FINDINGS

### Overview

The data used in this study was analyzed by using binary logistic regression to explore the relationship between the dichotomous criterion variable (graduation) and a combination of predictor variables (English, math, and reading placement test scores) for community-college students at one of 16 technical colleges in a community college system in the South East. The goal of the study is to determine if initial ACT<sup>®</sup> COMPASS<sup>®</sup> placement test scores (scores resulting from the students' first attempt in each subject area of the placement test) can predict graduation from a degree or certificate program in one of the college's programs of study. The odds ratio, expressed as  $\exp(B)$  in the summary table in the logistic regression output indicates what each independent variable (in this case, each of three ACT<sup>®</sup> COMPASS<sup>®</sup> placement test scores) contributes to variation in the dichotomous independent variable (graduation).

Further, a correlative design is appropriate, for it "reflects the dynamic quality of the relationship between variables" and allows analysts to better understand the movement of the variables as they change (Salkind, 2014, p. 82). The results of this predictive correlative study could be used to ultimately help "guide the selection of students who will be successful" in the college's programs (Gall, Gall, & Borg, 2007, p. 4). Students are typically considered likely to succeed if the estimated probability of success generated by logistic regression is at least 50% (Hughes & Scott-Clayton, 2011, p. 355-336). The criterion variable, graduation, was defined as being awarded any-level degree, diploma, or certificate and the predictor variables (English, math, and reading COMPASS<sup>®</sup> placement-test scores) were defined as a single numeric score in the range of 1-99 for each subject referencing community-college students at the subject college.



### Research Question

One research question was formulated for this study:

**RQ1:** How accurately can the ACT<sup>®</sup> COMPASS<sup>®</sup> placement test scores in English, math, and reading predict the graduation of community college students seeking various types of diplomas or certificates?

### Null Hypotheses

The null hypotheses for this study are as follows:

**H<sub>01</sub>:** There is no significant predictive relationship between the criterion variable (graduation) and the combination of predictor variables (English, math, and reading placement-test scores) for community college students in the Business, Information Technologies, and Public Service Division.

**H<sub>02</sub>:** There is no significant predictive relationship between the criterion variable (graduation) and the combination of predictor variables (English, math, and reading placement-test scores) for community college students in the Engineering and Industrial Technologies Division.

**H<sub>03</sub>:** There is no significant predictive relationship between the criterion variable (graduation) and the combination of predictor variables (English, math, and reading placement-test scores) for community college students in the Health Science Division.

**H<sub>04</sub>:** There is no significant predictive relationship between the criterion variable (graduation) and the combination of predictor variables (English, math, and reading placement-test scores) for community college students in the Nursing Division.

### **Descriptive Statistics**

Data from 651 total students who had initial placement test scores in COMPASS<sup>®</sup> math, reading, and English were analyzed in the study. Further, the student data reviewed was of those who first enrolled at the institution of study in either Fall 2013 or Fall 2014, had graduated from high school in 2005 or later, and whose placement scores were determined after their high school graduation.

Participants included in this study are those enrolled in any one of four divisions at the college (Business, Information Technologies, and Public Service; Engineering and Industrial Technologies; Health Science; or Nursing). The sample was purposely selected because it represents the “population most pertinent to [this] study” (Gall, Gall, & Borg, 2007, p. 343). The diverse population in the convenience sample comprised of the following: 354 females, 297 males, 349 Caucasian students, 277 African American students, 12 multi-race students, and 13 students from other races.

Of the 651 total students in the sample, 534 (82%) did not graduate with a certificate, degree, or diploma; however, 117 (18%) of the students did graduate with a certificate, degree, or diploma. The sample size of students who began college in Fall 2014 is 280 and students who began college in Fall 2013 is 371 for a total sample of 651 unique students. This greatly exceeds the minimum required (66) for medium effect size with a .7 statistical power (Gall, Gall, & Borg, 2007, p. 145) at the .05 alpha level. The large sample size permits the inclusion of all variables in the logistic model being used (Sperandei, 2014, p. 17).

Table 1

*Degree Attainment in Sample Population*

	Fall 2013 Start	Fall 2014 Start	Totals
<b>Gender</b>			
Male	167	130	297
Female	204	150	354
<b>Race</b>			
Caucasian	195	154	349
African Am.	160	117	277
MR	11	6	17
Other	9	3	12
<b>Graduation Status</b>			
Not Completed	294	240	534
Completed	77	40	117

*Notes.* African Am. = African American; MR = Multiple Race; Completed = Earned a certificate, diploma, or degree; Not Completed = Did not earn a certificate, diploma, or degree.

Table 2

*Degree Attainment by Division*

Division	Not Completed	Completed	Totals
Health Science	151	28	179
Business, Information Technologies, and Public Service	188	36	224
Engineering and Industrial Technologies	119	42	161
Nursing	76	11	87

*Notes.* Completed = Earned a certificate, diploma, or degree; Not Completed = Did not earn a certificate, diploma, or degree.

## Results

### Data Preparation

In preparation for the statistical analysis in SPSS, the researcher carefully reviewed the data to ensure there were no missing data points. Additionally, any redundant and unnecessary data points were removed from the data prior to uploading the data into the SPSS system; this

included the removal of 24 data points which were of students in transfer majors (HSDA Dental Assisting Transfer -5, HSOA Occupational Therapy Transfer -1, and HSPA Physical Therapy Transfer -18).

For descriptive statistics, the gender variable was coded as 0 – female, 1 – male. The race variable was coded as 0- other, 1 – Caucasian, 2 – African American, and 3 – Multi-race. The dichotomous criterion variable was coded with a 1 (indicating the individual student graduated) or a 0 (indicating the individual student did not graduate). The three continuous predictor variables—which were the COMPASS® Placement Scores for English (COMP\_ENG\_SCORE), Math (COMP\_MATH\_SCORE), and Reading (COMP\_RDG\_SCORE)—each used score ranges from a low of 1 to a high of 99.

### **Assumption Testing**

Assumption testing for logistic regression was conducted after the descriptive statistics were calculated and reviewed. The assumption of non-multicollinearity was validated by calculating a variance inflation factor (VIF) for each variable. All the VIF statistics were found to be lower than ten on each of the three predictor variables: COMPASS® English Score (1.6), COMPASS® Math Score (1.4), and COMPASS® Reading Score (1.8). The data met the assumption of non-multicollinearity. The data also had an appropriate distribution of scores on the criterion variable (graduation), for “1” for graduated or “0” for did not graduate are the only possible values. Per Warner (2013), one of the most important issues in logistic regression is the distribution of scores on the criterion variable. Meaningful results may not be obtained if the proportion of the two groups in the criterion variable deviate greatly from a 50/50 split. To test for linearity of the continuous predictor variables, the researcher conducted a Box-Tidwell procedure in SPSS. Using the seven terms in the logistic-regression model, a Bonferroni

correction was applied. With this correction, statistical significance was accepted when  $p < .007143$ . This assessment showed that all of the continuous variables passed the assumption of linearity needed in order to perform a binary logistic regression.

**Analysis**

This study utilized binary logistic regression as the statistic to determine if students' likelihood of graduation from a certificate, degree, or diploma program at the subject college could be predicted by the initial placement scores the students earned on three placement tests in the subject areas English, math, and reading. Cox & Snell R Square and Nagelkerke R Square values were examined, and the results showed that little variation in the dependent variable could be explained by the developed model, for the range was only 3% to 5%. See summary data in Table 3 (below).

Table 3

*Logistic Regression Predicting Likelihood of Graduation Based on Placement Scores.*

	<i>B</i>	<i>SE</i>	<i>WALD</i>	<i>df</i>	<i>P</i>	Odds Ratio Exp(B)	95% CI for Odds Ratio	
							Lower	Upper
English Score	-.003	.005	.335	1	.563	.997	.989	1.006
Math Score	.024	.006	14.918	1	.000	1.024	1.012	1.037
Reading Score	.003	.009	.080	1	.778	1.003	.985	1.020
Graduation	-2.645	.525	25.394	1	.000	.071		

*Note.* All scores were generated through ACT<sup>®</sup> COMPASS<sup>®</sup> Placement Tests.

To further review the data and to determine if the null hypotheses could be rejected, the researcher assigned numeric codes to each of the four academic divisions of the subject college: Health Science Division -1; Business, Information Technologies, and Public Service Division – 2; Engineering and Industrial Technology Division – 3; and, Nursing Division – 4. As with the

full data set, assumption testing for logistic regression was conducted after the descriptive statistics were calculated and reviewed. The assumption of non-multicollinearity was validated by calculating a variance inflation factor (VIF) for each variable. All of the VIF statistics were found to be lower than ten for each sub data set as Table 4 (below) illustrates. Thus, the data in all four subsets met the assumption of non-multicollinearity.

Table 4

*Summary of Variance Inflation Factors (VIF) by Division*

	VIF Division 1	VIF Division 2	VIF Division 3	VIF Division 4
English Score	1.596	1.605	1.673	1.627
Math Score	1.355	1.266	1.591	1.542
Reading Score	1.771	1.713	2.037	1.704

*Note.* All scores were generated through ACT<sup>®</sup> COMPASS<sup>®</sup> Placement Tests.

Further, to test for linearity of the continuous predictor variables, the researcher conducted a Box-Tidwell procedure in SPSS. Using the seven terms in the logistic-regression model, a Bonferroni correction (calculated by taking the original alpha and dividing by the number of variables:  $.05/7=.007143$ ) was applied. With this correction, statistical significance was accepted when  $p < .007143$ . This assessment showed that all of the continuous variables in each of the subgroups (four academic divisions at the subject college) passed the assumption of linearity needed in order to perform a binary logistic regression. This is summarized in Table 5 (below).

Table 5

*Box-Tidwell Results by Division with Adjusted Alpha of .007143*

	VIF Division 1	VIF Division 2	VIF Division 3	VIF Division 4
English Score by ln English Score	.902	.013	.872	.401
Math Score by ln Math Score	.408	.051	.590	.612
Reading Score by ln Reading Score	.619	.162	.618	.412
English Score	.938	.015	.968	.388
Math Score	.377	.062	.694	.596
Reading Score	.619	.168	.641	.413
Graduation	.314	.122	.927	.212

*Note.* All scores were generated through ACT<sup>®</sup> COMPASS<sup>®</sup> Placement Tests.

### **Results for Null Hypothesis One**

To determine if there is a significant predictive relationship between the criterion variable (graduation) and the combination of predictor variables (English, math, and reading placement tests scores), a binary logistic regression analysis was conducted on a subset of the full data.

This subset was composed of 224 unique students, 125 of whom enrolled in the subject college in Fall 2012, and 99 of whom enrolled in college in Fall 2014. All 224 of these students initially identified themselves as majoring in a program of study in the Business, Information Technologies, and Public Service Division. The diverse population in the convenience sample comprised of the following: 114 females, 110 males, 103 Caucasian students, 112 African American students, 4 multi-race students, and 5 students from other races. Of the 224 total

students in the sample, 188 (83.9%) did not graduate with a certificate, degree, or diploma; however, 36 (16.1%) of the students did graduate with a certificate, degree, or diploma.

Cox & Snell R Square and Nagelkerke R Square values were examined, and the results showed that little variation in the dependent variable could be explained by the developed model, for the range was 3% to 5% which mirrors the full model which contained all four divisions. Thus, the strength of the association between the independent variables (ACT<sup>®</sup> COMPASS<sup>®</sup> Placement Test scores in English, math, and reading) and the dependent variable (graduation) was determined to be very weak.

Predictive significance of the model was further explored by using a Wald chi-square test and the associated odds ratio EXP(B) produced when using a 95% confidence interval (CI). The Wald chi-squared test for the three predictor variables did not produce statistically significant results for: English Score,  $\chi^2(1) = .335, p = .563$ ; Math Score,  $\chi^2(1) = 14.918, p = .000$ ; Reading Score,  $\chi^2(1) = .080, p = .778$ . The researcher failed to reject the null hypothesis. The Wald results and odd ratios are in summary Table 6 (below).

Table 6

*Logistic Regression for Business, Information Technologies, and Public Service Division.*

	<i>B</i>	SE	WALD	<i>df</i>	<i>p</i>	Odds Ratio Exp(B)	95% CI for Odds Ratio	
							Lower	Upper
English Score	-.003	.005	.335	1	.563	.997	1.006	1.024
Math Score	.024	.006	14.918	1	.000	1.024	1.037	1.043
Reading Score	.003	.009	.080	1	.778	1.003	1.020	1.043
Graduation	-2.645	.525	25.394	1	.000	.071		

*Note.* All scores were generated through ACT<sup>®</sup> COMPASS<sup>®</sup> Placement Tests.



### Results for Null Hypothesis Two

To determine if there is a significant predictive relationship between the criterion variable (graduation) and the combination of predictor variables (English, math, and reading placement tests scores), a binary logistic regression analysis was conducted on a subset of the full data. This subset was composed of 161 unique students, 82 of whom enrolled in the subject college in Fall 2013, and 79 of whom enrolled in college in Fall 2014. All 161 of these students initially identified themselves as majoring in a program of study in the Engineering and Industrial Technologies Division. This population of students in the convenience sample comprised of the following: 150 males, 11 females, 101 Caucasian students, 51 African American students, 4 multi-race students, and 5 students from other races.

Of the 161 total students in the sample, 119 (73.9%) did not graduate with a certificate, degree, or diploma; however, 42 (26.1%) of the students did graduate with a certificate, degree, or diploma.

Cox & Snell R Square and Nagelkerke R Square values were examined, and the results showed that little variation in the dependent variable could be explained by the developed model, for the range was 9% to 13%. Though this is greater than the full model, the strength of the association between the independent variables (ACT<sup>®</sup> COMPASS<sup>®</sup> Placement Test scores in English, math, and reading) and the dependent variable (graduation) was determined to be very weak.

Predictive significance of the model was further explored by using a Wald chi-square test and the associated odds ratio EXP(B) produced when using a 95% confidence interval (CI). The Wald chi-squared test for the three predictor variables did not produce statistically significant results for: English Score,  $\chi^2(1) = 4.566, p = .033$ ; Math Score,  $\chi^2(1) = 9.705, p = .002$ ; Reading

Score,  $\chi^2(1) = .154$ ,  $p = .694$ . The researcher failed to reject the null hypothesis.

The Wald results and odd ratios are in summary Table 7 (below).

Table 7

*Logistic Regression for Engineering and Industrial Technologies Division.*

	<i>B</i>	SE	WALD	<i>df</i>	<i>P</i>	Odds Ratio Exp(B)	95% CI for Odds Ratio	
							Lower	Upper
English Score	-.018	.008	4.566	1	.033	.982	.967	.999
Math Score	.036	.012	9.705	1	.002	1.037	1.013	1.061
Reading Score	.006	.016	.154	1	.694	1.006	.976	1.038
Graduation	-2.340	.860	7.403	1	.007	.095		

*Note.* All scores were generated through ACT<sup>®</sup> COMPASS<sup>®</sup> Placement Tests.

### Results for Null Hypothesis Three

To determine if there is a significant predictive relationship between the criterion variable (graduation) and the combination of predictor variables (English, math, and reading placement tests scores), a binary logistic regression analysis was conducted on a subset of the full data. This subset was composed of 179 unique students, 112 of whom enrolled in the subject college in Fall 2012, and 67 of whom enrolled in college in Fall 2014. All 179 of these students initially identified themselves as majoring in a program of study in the Health Science Division. The diverse population in the convenience sample comprised of the following: 149 females, 30 males, 107 Caucasian students, 68 African American students, 2 multi-race students, and 2 students from other races. Of the 179 total students in the sample, 151 (84.4%) did not graduate with a certificate, degree, or diploma; however, 28 (15.6%) of the students did graduate with a certificate, degree, or diploma.

Cox & Snell R Square and Nagelkerke R Square values were examined, and the results showed that little variation in the dependent variable could be explained by the developed model, for the range was 2% to 3% which is less than the full model which contained all four divisions. Thus, the strength of the association between the independent variables (ACT<sup>®</sup> COMPASS<sup>®</sup> Placement Test scores in English, math, and reading) and the dependent variable (graduation) was determined to be very weak.

Predictive significance of the model was further explored by using a Wald chi-square test and the associated odds ratio EXP(B) produced when using a 95% confidence interval (CI). The Wald chi-squared test for the three predictor variables did not produce statistically significant results for: English Score,  $\chi^2(1) = .365, p = .546$ ; Math Score,  $\chi^2(1) = 1.540, p = .215$ ; Reading Score,  $\chi^2(1) = .004, p = .947$ . The researcher failed to reject the null hypothesis. The Wald results and odd ratios are in summary Table 8 (below).

Table 8

*Logistic Regression for Health Science Division.*

	<i>B</i>	<i>SE</i>	<i>WALD</i>	<i>df</i>	<i>P</i>	<i>Odds Ratio Exp(B)</i>	<i>95% CI for Odds Ratio</i>	
							<i>Lower</i>	<i>Upper</i>
English Score	.006	.009	.368	1	.546	1.006	.987	1.024
Math Score	.016	.013	1.540	1	.215	1.016	.991	1.043
Reading Score	.001	.021	.004	1	.947	1.001	.962	1.043
Graduation	-2.811	1.238	5.157	1	.023	.060		

*Note.* All scores were generated through ACT<sup>®</sup> COMPASS<sup>®</sup> Placement Tests.

**Results for Null Hypothesis Four**

To determine if there is a significant predictive relationship between the criterion variable (graduation) and the combination of predictor variables (English, math, and reading placement

tests scores), a binary logistic regression analysis was conducted on a subset of the full data. This subset was composed of 87 unique students, 52 of whom enrolled in the subject college in Fall 2012, and 35 of whom enrolled in college in Fall 2014. All 87 of these students initially identified themselves as majoring in a program of study in the Nursing Division. The population in the convenience sample comprised of the following: 80 females, 7 males, 38 Caucasian students, 46 African American students, 2 multi-race students, and 1 student from another race.

Of the 87 total students in the sample, 76 (87.4%) did not graduate with a certificate, degree, or diploma; however, 11 (12.6%) of the students did graduate with a certificate, degree, or diploma.

Cox & Snell R Square and Nagelkerke R Square values were examined, and the results showed that little variation in the dependent variable could be explained by the developed model, for the range was 12% to 23% which is substantially higher than the full model (3% to 5%) which contained all four divisions. However, the strength of the association between the independent variables (ACT<sup>®</sup> COMPASS<sup>®</sup> Placement Test scores in English, math, and reading) and the dependent variable (graduation) was determined to be weak.

Predictive significance of the model was further explored by using a Wald chi-square test and the associated odds ratio EXP(B) produced when using a 95% confidence interval (CI). The Wald chi-squared test for the three predictor variables did not produce statistically significant results for: English Score,  $\chi^2(1) = .3.570$ ;  $p = .059$ ; Math Score,  $\chi^2(1) = .497$ ,  $p = .481$ ; Reading Score,  $\chi^2(1) = .058$ ,  $p = .810$ . The researcher failed to reject the null hypothesis. The Wald results and odd ratios are in summary Table 9 (below).

Table 9

*Logistic Regression for Nursing Division.*

	<i>B</i>	SE	WALD	<i>df</i>	<i>p</i>	Odds Ratio Exp(B)	95% CI for Odds Ratio	
							Lower	Upper
English Score	.039	.020	3.570	1	.059	1.039	.999	1.082
Math Score	.017	.024	.497	1	.481	1.017	.970	1.067
Reading Score	.009	.036	.058	1	.810	1.009	.940	1.082
Graduation	-6.123	2.529	5.860	1	.015	.002		

*Note.* All scores were generated through ACT<sup>®</sup> COMPASS<sup>®</sup> Placement Tests.

### Summary

This chapter offered a summary of the archival data used in the study as well as the procedures used for reviewing and analyzing the data. Binary logistic regression was used to explore the relationship between the dichotomous criterion variable (graduation) and a combination of predictor variables (English, math, and reading placement test scores) for community-college students at one of 16 technical colleges in a community college system in the South East. Descriptive statistics and the results of the binary logistic regression were presented. The analysis of the statistical information showed that none of the three predictor variables were significantly predictive of graduation from the subject college. The researcher failed to reject all of the null hypotheses. Chapter Five will discuss the results of the research as they relate to similar research and possible future studies.

## CHAPTER FIVE: CONCLUSIONS

### Overview

The researcher performed a binary logistic regression to determine if there was a predictive relationship between a set of predictor variables (COMPASS<sup>®</sup> English, math, and reading placement test scores) and a single criterion variable (graduation from a certificate, diploma, or degree program in any of four academic divisions at a community college in the southeast). An analysis of the statistical findings gained through the binary logistic regression is included in this chapter. The chapter begins with a discussion of the study (its purpose and type), the study's focus, research question and null hypotheses, the implications of the study as well as the study's limitations. The chapter concludes with recommendations for future research that will further develop this body of scholarship and closes with a summary of the chapter.

### Discussion

The purpose of this study was to determine if ACT<sup>®</sup> COMPASS<sup>®</sup> placement test scores were predictors of graduation from a degree, diploma, or certificate program in one or more of the subject college's programs of study. Using a predictive correlative design, this quantitative study explored the relationship between the criterion variable (graduation, defined as being awarded a certificate, degree, or diploma) and the combination of predictor variables (English, math, and reading COMPASS<sup>®</sup> placement-test scores – defined as a single numeric score in the range of 1-99 for each subject) for community-college students at a community college in the southeastern United States. An overall binary logistic regression analysis was completed on the full student sample acquired through archival data, and then four subsequent individual binary logistic regressions were completed on each subset of the archival data in the sample. The subsets were determined by student enrollment in any one of four academic divisions as the

subject college: (1) Business, Information Technologies, and Public Service Division, (2) Engineering and Industrial Technologies Division, (3) Health Science Division, and (4) Nursing Division.

### **Null Hypothesis One**

The research question this study sought to answer is “How well do the ACT<sup>®</sup> COMPASS<sup>®</sup> placement test scores in math, reading, and writing predict the graduation of community college students seeking various types of diplomas or certificates? The null hypothesis tied to the Business, Information Technologies, and Public Service Division at the subject college is as follows: “There is no significant predictive relationship between the criterion variable (graduation) and the combination of predictor variables (English, math, and reading placement-test scores) for community college students in the Business, Information Technologies, and Public Service Division.”

The results of this study showed that the use of ACT<sup>®</sup> COMPASS<sup>®</sup> placement test scores are not significantly predictive of a student’s overall likelihood to complete his or her program of study in the Business, Information Technologies, and Public Services Division at the subject college. There was a weak association between the independent variables (ACT<sup>®</sup> COMPASS<sup>®</sup> Placement Test scores in English, math, and reading) and the dependent variable (graduation). The results support findings of research (Hassel & Giordano, 2015, p. 57-58) that found “test scores poorly correlate with students' ultimate success in college” (Hassel & Giordano, 2015, p. 57-58). The results also support previous research that showed the predictive value of placement scores (even when used for individual course success) has often shown limited promise. Some students, though directly placed into college-level courses, do not have the necessary skills to complete them, [and] many students placed into math remediation could have earned at least a C

or B in a college-level math course (Kurlaender, 2014, p. 39). Further, the results of this study support the body of research that promotes multiple measures as a stronger and more accurate predictor of student success, for “single measure, placement exams have measurement error” (Jaggars, Hodara, Cho, & Xu, 2015, p. 5).

Additionally, student completion, particularly at community colleges, is frequently discussed in current literature, but Handel (2017) argued that community colleges fail to graduate most of their students. This study supports Handel’s research. Though there were 224 total students in the sample who identified themselves as majoring in a program of study in the Business, Information Technologies, and Public Service Division, most (188 or 83.9%) did not graduate with a certificate, degree, or diploma. This lack of graduation is evidenced nearly five years after students in this subset initially enrolled in college in Fall of 2013 and nearly four years after students in this subset initially enrolled in college in Fall of 2014. This timeframe supported (Linderman & Kolenovic, 2013, p. 43) that three years after initial enrollment, less than 25% of community-college students have earned a two-year degree. The lack of graduation from a program of study in the Business, Information Technologies, and Public Services Division at the subject college is connected to a current body of literature focused on completion.

Additionally, Tinto (1982), through his persistence theory, worked to discover and analyze what caused students not to persist. Student competence (which many community colleges currently assess through an initial placement test) is an aspect of that theory. He noted there is value in “distinguish[ing] between those with the competence or interest, motivation, and drive to finish given courses of study and those who, for a variety of reasons, do not or simply will not seek to complete their programs” (p. 692). This study directly addresses the argument Tinto (1975) presented, for it seeks to closely look at placement score sets to determine if they



are predictors of successful community-college program completion and ultimately “sets of individual characteristics . . . relevant to educational persistence” (p. 93).

The results of this study did not support the premise that a significant predictive relationship exists between the criterion variable (graduation) and the combination of predictor variables (English, math, and reading placement-test scores) for community college students in the Business, Information Technologies, and Public Service Division at the subject college. Placement scores proved not to be the best indicators of the level of student competence needed to reach college completion. The findings are in line with recent research that shows that test scores in and of themselves are not sufficient predictors of student success at the course level (Heiny, Heiny, & Raymond 2017) or at the course-sequence level (Fong, Melquizo, & Prather 2015).

### **Null Hypothesis Two**

The null hypothesis tied to the Engineering and Industrial Technologies Division at the subject college is as follows: “There is no significant predictive relationship between the criterion variable (graduation) and the combination of predictor variables (English, math, and reading placement-test scores) for community college students in the Engineering and Industrial Technologies Division.”

The results of this study showed that the use of ACT<sup>®</sup> COMPASS<sup>®</sup> placement test scores are not significantly predictive of a student’s overall likelihood to complete his or her program of study in the Engineering and Industrial Technologies Division at the subject college. There was a weak association between the independent variables (ACT<sup>®</sup> COMPASS<sup>®</sup> Placement Test scores in English, math, and reading) and the dependent variable (graduation). The results support findings of research that found “test scores poorly correlate with students' ultimate

success in college” (Hassel & Giordano, 2015, p. 57-58). The results also support previous research that showed the predictive value of placement scores (even when used for individual course success) has often shown limited promise. Some students, though directly placed into college-level courses, do not have the necessary skills to complete them, [and] many students placed into math remediation could have earned at least a C or B in a college-level math course (Kurlander, 2014, p. 39). The results showed that little variation in the dependent (graduation) variable could be explained by the developed model, for the range was 9% to 13%. Though this is greater than the full model (3%-5%), the strength of the association between the independent variables (ACT<sup>®</sup> COMPASS<sup>®</sup> Placement Test scores in English, math, and reading) and the dependent variable (graduation) was determined to be very weak. Further, the results of this study support the body of research that promotes multiple measures as a stronger and more accurate predictor of student success, for “single measure, placement exams have measurement error” (Jaggars, Hodara, Cho, & Xu, 2015, p. 5).

Additionally, student completion, particularly at community colleges, is frequently discussed in current literature, but Handel (2017) argued that community colleges fail to graduate the majority of their students. This study supports Handel’s research. Though there were 161 total students in the sample who identified themselves as majoring in a program of study in the Engineering and Industrial Technologies Division, most (119 or 73.9%) did not graduate with a certificate, degree, or diploma. This lack of graduation is evidenced nearly five years after students in this subset initially enrolled in college in Fall of 2013 and nearly four years after students in this subset initially enrolled in college in Fall of 2014. This timeframe supported (Linderman & Kolenovic, 2013, p. 43) that three years after initial enrollment, less than 25% of community-college students have earned a two-year degree.

The lack of graduation from a program of study in the Engineering and Industrial Technologies Division at the subject college is connected to a current body of literature focused on completion. Additionally, Tinto (1982), through his persistence theory, worked to discover and analyze what caused students not to persist. Student competence (which many community colleges currently assess through an initial placement test) is an aspect of that theory. He noted there is value in “distinguish[ing] between those with the competence or interest, motivation, and drive to finish given courses of study and those who, for a variety of reasons, do not or simply will not seek to complete their programs” (p. 692). This study directly addresses the argument Tinto (1975) presented, for it seeks to closely look at placement score sets to determine if they are predictors of successful community-college program completion and ultimately “sets of individual characteristics . . . relevant to educational persistence” (p. 93).

The results of this study did not support the premise that a significant predictive relationship exists between the criterion variable (graduation) and the combination of predictor variables (English, math, and reading placement-test scores) for community college students in the Engineering and Industrial Technologies Division at the subject college. Placement scores proved not to be the best indicators of the level of student competence needed to reach college completion. The findings are in line with recent research that shows that test scores in and of themselves are not sufficient predictors of student success at the course level (Heiny et al., 2017), or at the course-sequence level (Fong et al., 2015).

### **Null Hypothesis Three**

The null hypothesis tied to the Health Science Division at the subject college is as follows: “There is no significant predictive relationship between the criterion variable (graduation) and the combination of predictor variables (English, math, and reading placement-

test scores) for community college students in the Health Science Division.”

The results of this study showed that the use of ACT<sup>®</sup> COMPASS<sup>®</sup> placement test scores are not significantly predictive of a student’s overall likelihood to complete his or her program of study in the Health Science Division at the subject college. There was a weak association between the independent variables (ACT<sup>®</sup> COMPASS<sup>®</sup> Placement Test scores in English, math, and reading) and the dependent variable (graduation). The results support findings of research that found “test scores poorly correlate with students' ultimate success in college” (Hassel & Giordano, 2015, p. 57-58). The results also support previous research that showed the predictive value of placement scores (even when used for individual course success) has often shown limited promise. Some students, though directly placed into college-level courses, do not have the necessary skills to complete them, [and] many students placed into math remediation could have earned at least a C or B in a college-level math course (Kurlaender, 2014, p. 39). The results showed that little variation in the dependent (graduation) variable could be explained by the developed model, for the range was 2% to 3%. This range is even less than the full model (3%-5%). Thus, the strength of the association between the independent variables (ACT<sup>®</sup> COMPASS<sup>®</sup> Placement Test scores in English, math, and reading) and the dependent variable (graduation) was determined to be very weak. Further, the results of this study support the body of research that promotes multiple measures as a stronger and more accurate predictor of student success, for “single measure, placement exams have measurement error” (Jaggars, Hodara, Cho, & Xu, 2015, p. 5).

Additionally, student completion, particularly at community colleges, is frequently discussed in current literature, but Handel (2017) argued that community colleges fail to graduate most of their students. This study supports Handel’s research. Though there were 179 total

students in the sample who identified themselves as majoring in a program of study in the Health Science, most (151 or 84.4%) did not graduate with a certificate, degree, or diploma.

This lack of graduation is evidenced nearly five years after students in this subset initially enrolled in college in Fall of 2013 and nearly four years after students in this subset initially enrolled in college in Fall of 2014. This timeframe supported (Linderman & Kolenovic, 2013, p. 43) that three years after initial enrollment, less than 25% of community-college students have earned a two-year degree. The lack of graduation from a program of study in the Health Science Division at the subject college is definitely connected to a current body of literature focused on completion.

Additionally, Tinto (1982), through his persistence theory, worked to discover and analyze what caused students not to persist. Student competence (which many community colleges currently assess through an initial placement test) is an aspect of that theory. He noted there is value in “distinguish[ing] between those with the competence or interest, motivation, and drive to finish given courses of study and those who, for a variety of reasons, do not or simply will not seek to complete their programs” (p. 692). This study directly addresses the argument Tinto (1975) presented, for it seeks to closely look at placement score sets to determine if they are predictors of successful community-college program completion and ultimately “sets of individual characteristics . . . relevant to educational persistence” (p. 93).

The results of this study did not support the premise that a significant predictive relationship exists between the criterion variable (graduation) and the combination of predictor variables (English, math, and reading placement-test scores) for community college students in the Health Science Division at the subject college. Placement scores proved not to be the best indicators of the level of student competence needed to reach college completion. The findings

are in line with recent research that shows that test scores in and of themselves are not sufficient predictors of student success at the course level (Heiny et al, 2017) or at the course-sequence level (Fong et al., 2015).

#### **Null Hypothesis Four**

The null hypothesis tied to the Nursing Division at the subject college is as follows:

“There is no significant predictive relationship between the criterion variable (graduation) and the combination of predictor variables (English, math, and reading placement-test scores) for community college students in the Nursing Division.”

The results of this study showed that the use of ACT<sup>®</sup> COMPASS<sup>®</sup> placement test scores are not significantly predictive of a student’s overall likelihood to complete his or her program of study in Nursing Division at the subject college. There was a weak association between the independent variables (ACT<sup>®</sup> COMPASS<sup>®</sup> Placement Test scores in English, math, and reading) and the dependent variable (graduation). The results support findings of research that found “test scores poorly correlate with students' ultimate success in college” (Hassel & Giordano, 2015, p. 57-58). The results also support previous research that showed the predictive value of placement scores (even when used for individual course success) has often shown limited promise. Some students, though directly placed into college-level courses, do not have the necessary skills to complete them, [and] many students placed into math remediation could have earned at least a C or B in a college-level math course (Kurlaender, 2014, p. 39). The results showed that little variation in the dependent (graduation) variable could be explained by the developed model, for the range was 12% to 23%. This range is substantially higher than the full model (3%-5%). However, the strength of the association between the independent variables (ACT<sup>®</sup> COMPASS<sup>®</sup> Placement Test scores in English, math, and reading) and the dependent variable (graduation)

was determined to be very weak. Further, the results of this study support the body of research that promotes multiple measures as a stronger and more accurate predictor of student success, for “single measure, placement exams have measurement error” (Jaggars, Hodara, Cho, & Xu, 2015, p. 5).

Additionally, student completion, particularly at community colleges, is frequently discussed in current literature, but Handel (2017) argued that community colleges fail to graduate the majority of their students. This study supports Handel’s research. Though there were 87 total students in the sample who identified themselves as majoring in a program of study in the Nursing Division, most (76 or 87.4%) did not graduate with a certificate, degree, or diploma.

This lack of graduation is evidenced nearly five years after students in this subset initially enrolled in college in Fall of 2013 and nearly four years after students in this subset initially enrolled in college in Fall of 2014. This timeframe supported (Linderman & Kolenovic, 2013, p. 43) that three years after initial enrollment, less than 25% of community-college students have earned a two-year degree. The lack of graduation from a program of study in the Nursing Division at the subject college is connected to a current body of literature focused on completion.

Additionally, Tinto (1982), through his persistence theory, worked to discover and analyze what caused students not to persist. Student competence (which many community colleges currently assess through an initial placement test) is an aspect of that theory. He noted there is value in “distinguish[ing] between those with the competence or interest, motivation, and drive to finish given courses of study and those who, for a variety of reasons, do not or simply will not seek to complete their programs” (p. 692). This study directly addresses the argument Tinto (1975) presented, for it seeks to closely look at placement score sets to determine if they are predictors of successful community-college program completion and ultimately “sets of

individual characteristics . . . relevant to educational persistence” (p. 93).

The results of this study did not support the premise that a significant predictive relationship exists between the criterion variable (graduation) and the combination of predictor variables (English, math, and reading placement-test scores) for community college students in the Nursing Division at the subject college. Placement scores proved not to be the best indicators of the level of student competence needed to reach college completion. The findings are in line with recent research that shows that test scores in and of themselves are not sufficient predictors of student success at the course level (Heiny et al., 2017) or at the course-sequence level (Fong et al., 2015).

### **Implications**

This study contributes to the body of scholarship that focuses on informed placement decisions, student success, community college completion, and the timeliness of completion.

An implication of this study is the need for administrators to further refine placement guidelines so that informed placement decisions that lead to student success and ultimately to college completion can be reached. The use of standardized placement tests as part of the community college admissions processes is common practice across the country; these tests are used to place incoming students in classes appropriate for their determined academic skills in order to enhance overall student success (Peng, Le, & Milburn, 2011, p. 42). These tests are most often viewed as necessary to see students be as successful as they can possibly be, and their use “is nearly universal in community colleges” (Hughes & Scott-Clayton, 2011, p. 333). However, “As with any single measure, placement exams have measurement error” (Jaggars, Hodara, Cho, & Xu, 2015, p. 5). The inherent error is of more interest when stakeholders consider that the tests are often used “as a high-stakes determinant of students' access to college-level courses”



(Hughes & Scott-Clayton, 2011, p.328).

One problem with current placement tests is that no “clear boundary [being] universally shared” is used to decide “where ‘remediation’ starts and ‘degree-credit’ begins” (Hassel & Giordano, 2015, p. 57-58). The technical college system in this present study is just beginning to determine cut scores as it transitions to a new placement instrument, ACCUPLACER® Next Generation, and those will need to be aligned with cut score ranges its state system later determines. Currently, each college in the state system sets its own scores, but a closer look at which scores are associated with student success is needed. The results of this study support the idea that cut scores may need to be revisited, reevaluated, and perhaps revamped so that they more accurately express predictive value (Secolsky, Krishnan & Judd, 2013, p. 6). Little predictive value of established test scores was evidenced in the current study.

Placement scores alone, as this study further confirmed, are not the best indicators of how students will perform once admitted to college. One study, for example, showed as many as one third of college students may be incorrectly placed and found that “test scores poorly correlate with students' ultimate success in college” (Hassel & Giordano, 2015, p. 57-58). It stands to reason, then, that researchers are now starting to argue the use of multiple-placement measures as better predictors of student success (Scott-Clayton et al., 2014; Hassel & Giordano, 2015; Ngo & Kwon, 2015); this study’s results are supportive of these arguments. Additionally, consistency in student success is missing for students who place very close to the assigned cut-off scores (whether they are slightly above or slightly below); this could be another indicator that college readiness may not be sufficiently measured by a single assessment instrument (Scott-Clayton, 2012, p. 39).

Thus, a careful consideration of appropriate scores in conjunction with other placement measures should be explored if student success and community college completion are to be enhanced. Current literature shows that the use of multiple placement measures to better assess student motivation, ability, and likeliness to reach college completion is becoming more relevant. An implication of this study is a stronger awareness that using just one measure (like an initial, academic placement test) to judge student readiness for college and ultimately college completion can be problematic. Consideration of using multiple placement measures (where placement scores are one of several measures that could be utilized to assess student readiness and motivation to be successful in college) is warranted.

Another implication of this study is a needed emphasis on community college completion. Currently, the percentage of community college students who actually graduate is often staggeringly low; the results of this study confirm this argument. Most community colleges are open-access institutions. However, if students are not appropriately placed, graduation from the colleges can be hindered. Additionally, graduation is not the only measure of “success,” for some researchers argued that community colleges must include job-related data like employment numbers, job satisfaction, and average earnings when measuring student success (Stuart, Rios-Aguilar, & Deil-Amen, 2014).

Moreover, timeliness of college completion is another implication of this study. Much of the more recent literature focuses on ensuring students earn a degree or certificate in their chosen programs of study at community colleges in a timely manner. If the students do not reach this goal, Brown (2012) argued the stakeholders have failed: More people in America need to reach academic success, and people with relevant knowledge and skills are “necessary to continuously stoke the nation’s economic engines” (p. 82). A decline in enrollment can further negatively

impact graduation numbers, and a greater emphasis will also need to be placed on persistence. Inaccuracy in placement, then, can have lasting, negative effects.

Persistence leads to student success and, most often, to college completion. Community colleges, due to historically low enrollment trends across the country, are now more than ever before seeing the importance of students persisting through graduation (Pierce 2015; Harbour and Smith 2016; Bailey 2016). Retaining students for a growing number of colleges is seen as “the only reasonable course of action left to insure their survival” (Tinto, 2012, p. 2). Moreover, seeing more students persist to graduation will inevitably benefit our communities and society in general (Dorsey, 2012, par. 7).

In the introduction to his original persistence model, Tinto (1975) captured a truth that is still relevant today: “Despite the very extensive literature on dropout from higher education, much remains unknown about the dropout process” (p. 89). This study contributes to the body of on-going research that is focused on determining how to best place incoming students in the most appropriate academic level (developmental or curriculum) in order for the students to reach success (completion or graduation). Currently, as this study supports, the percentage of community college students who actually graduate is often staggeringly low. Using the placement test as the sole placement indicator has become “problematic” for the colleges that follow this practice (Hassel & Giordano, 2015, p. 64).

Attention should continue to be placed on placement, persistence, and completion. Stakeholders – parents; students; community members; industry representatives; and local, state, and national government – are seeking assurance that tuition dollars and student aid are being spent appropriately and that community colleges are producing qualified graduates in a timely manner (Davidson & Bush 2016; Pierce 2015; McDonnell 2015; Davidson, 2015). In response to

this issue, the Obama Administration also set goals to see improvement in completion. To see our country as competitive in the global workforce, his administration's goals for 2020 called for 10 million more graduates from institutions of higher education and all Americans completing at least a year of college or some type of advanced training (Friedel et al., 2013, p. 69). Much work is still needed to reach this ambitious, yet important, goal.

### **Limitations**

There were several limitations to this study. First, all the community college students included in this study were from one community college in the Southeastern United States. Though most states use a placement instrument (similar to the instrument referenced in this study), the process used, actual placement scores referenced, and student success (completion or graduation) do vary by college and state (Fong et al., 2015, p. 742), the findings in this study are primarily generalizable to the subject college and to some sister community college in the same community-college system. Since limited generalization of the findings of the study is evident, this should be considered a limitation of the study.

A second limitation of the study was the timeframe of the data used. The sample data was comprised of 651 students who began their academic careers at the subject community college in one of two fall starts (Fall 2013 and Fall 2014). However, only 117 (18%) of the students did graduate with a certificate, degree, or diploma. Though the timeframe covered in the study (Fall 2013 through Spring 2018) is enough time for students to begin enrollment in Fall 2013 and progress to graduation, the study did not consider the number of times a developmental student might fail a course or how much time students, in general, spend progressing to/through their selected majors. This limitation is shared with a Fong et al. study (2015).

A third limitation of the study was the placement instrument referenced in the study (COMPASS<sup>®</sup> Placement), though similar to, is not the same as the more popular ACCUPLACER<sup>®</sup> Classic or its newly developed upgrade ACCUPLACER<sup>®</sup> Next Generation. Additionally, the company actually has decided to no longer offer COMPASS<sup>®</sup> Placement Test options, since it acknowledges that ACT<sup>®</sup> COMPASS<sup>®</sup> “is not contributing as effectively to student placement and success as it had in the past” (ACT<sup>®</sup> COMPASS<sup>®</sup>, 2016, para. 4).

### **Recommendations for Future Research**

1. *Use ACCUPLACER<sup>®</sup> Scores in Similar Study.* A similar study using ACCUPLACER<sup>®</sup> Classic as well as ACCUPLACER<sup>®</sup> Next Generation placement scores in the subject areas of English, math, and reading is a logical next step. Once a competitor of the ACT<sup>®</sup> COMPASS<sup>®</sup> Placement test system, ACCUPLACER<sup>®</sup> has positioned itself as the go-to placement-test provider to much of the country.
2. *Connect Placement Scores with Other Multiple Placement Measure Indicators.* Much research is being conducted on the topic of multiple placement measures (Ngo & Kwon 2015; Woods, Park, Hu & Bertrand 2018; and Barbitta & Munn, 2018), and placement test scores are certainly being utilized to help in determining appropriate placement. Using a combination of placement test scores in English, math, and reading in conjunction with other popular multiple measures like high school GPA, a worthwhile and current study could be developed. Thus, future researchers should consider a study where a combination of ACCUPLACER<sup>®</sup> test scores could be used with other identified multiple measure options to determine if predictive value is evident and available to help ensure student success.

3. *Use a Longer Timeframe and Larger Student Population.* Finally, since this study used only two semesters to determine its sample population, a future study with a longer timeframe and larger student population is warranted.

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**APPENDIX A: IRB APPROVAL**



May 14, 2018

Mrs. Lisa Martin



Dear Mrs. Martin:

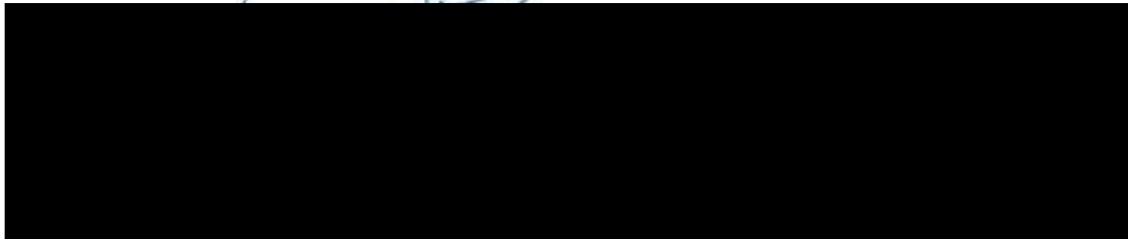
Your request to use archival student data available in our retention-management system (Zogotech) to conduct your doctoral research titled *Community College Completion: The Predictive Relationship Between Placement Scores and Graduation* has been approved. I understand the main purpose of your study is to determine if placement test scores can predict graduation from a degree or certificate program in one or more of [redacted] [redacted] programs of study.

This approval is granted with the following stipulations:

- No student participants will be recruited to take part in the research; only archival data will be used.
- Data and findings will be reported in an aggregate format so that no individual(s) will be identifiable; data will be stripped of student identifiers prior to being sent to the researcher.
- [redacted] College will not be mentioned by name in the research but may be referenced by type (Ex: two-year, comprehensive technical college).
- All data related to this project will be kept secure at all times and will be destroyed after a period of three years.

Should your doctoral research result in any journal publications or presentations, please let my office know. I commend you on the progress you have made in this endeavor to date.

Sincerely,



**APPENDIX B: MAJOR CODES**

Table 10

*Certificates and Degrees in Business, Information Technology, and Public Service Division*

Major	Code
Business Administration—Accounting	ACC3
Accounting Certificate	ACC7
Administrative Office Tech –Accounting Concentration	AOA3
Administrative Office Tech – Medical coding/Billing	AOB3
Administrative Office Tech – Legal Concentration	AOL3
Administrative Office Tech – Medical Concentration	AOM3
Digital Rendering and Gaming Development Certificate	ARV5
Advertising Design Certificate	ARV6
Photography Certificate	ARV9
Business Administration	BUS3
Cybersecurity Certificate	CBS6
Certified IT Professional Certificate	CIT6
Criminal Justice	CRJ3
Computer Technology – Cybersecurity Conc.	CTC3
Computer Technology – Networking Conc.	CTN3
Computer Technology – Programming Conc.	CPT3
Early Care and Education	ECD3
Early Childhood Development	ECD7
Entrepreneurship Certificate	ETR6

General Technology – Advertising Design with Photography	GADP
General Technology – Digital Rendering with Advertising Design	GDR A
General Technology – Photography with Advertising Design	GPAD
Human Resource Management Certificate	HRMA
Human Services	HSR3
Infant Toddler Certificate	INF7
Business Administration – Management	MGT3
Microsoft Office Specialist	MOS6
Business Administration—Office Management	OMG3
Office Technician Certificate	OTC7
PC Service Technician Certificate	PCS7

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*Note.* Curriculum codes updated December 7, 2017. (2018). Retrieved from Subject College's website

Table 11

*Certificates and Degrees in Engineering and Industrial Technologies Division*

Major	Code
Refrigeration Applications Certificate	ACR7
Diversified Agriculture	AGR3
Automotive Technology	AUT3
Automotive Fundamentals	AUT7
Basic Diversified Agriculture Certificate	BAC7
Building Construction Technology	BCT3



Carpentry Certificate	BCT8
Machine Tool CNC Precision Operator	CNC6
Computerized Numerical Control Certificate	CNC7
Electronic Engineering Technology	EET3
Engineering Design Technology	EGT3
Electrical Maintenance Technician Certificate	ELM7
Gunsmithing Certificate	GSM7
Gunsmithing – Advanced Certificate	GSMA
General Technology – Gunsmithing	GSMG
Horticulture Technology	HRT3
Horticulture Landscape Management Certificate	HRT7
Heating Fundamentals Certificate	HGT7
Heating, Ventilation, and AC Technology	HVA3
HVACR Installers Certificate	HVA6
Industrial Electronics Technology	IEE3
Mechatronics Technology	MCT3
Mechatronics Technology I Certificate	MCT6
Introduction to Automation Certificate	MCA6
Mechanical Engineering Technology	MET3
Mechanical Engineering Transfer Track	MET4
Manufacturing Production Technician	MFG8
Masonry Certificate	MSY6
Machine Tool Operator Certificate	MTO7

Machine Tool Diploma	MTT1
Machine Tool Technology	MTT3
Precision Metrology Certificate	PMC6
Welding Diploma	WLD1
General Technology—Welding	WLDG
Basic Welding Certificate	WLD6
MIG Welding Certificate	WLM6
Stick Welding Certificate	WLS6
TIG Welding Certificate	WLT6

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*Notes:* Curriculum codes updated December 7, 2017. (2018). Retrieved from Retrieved from  
Subject College's website

Table 12

*Certificates and Degrees in Health Science Division*

Major	Code
Cardiovascular Technology (clinical—first semester only)	CVT3
Cardiovascular Technology Invasive (clinical)	CVTI
Cardiovascular Technology Non-Invasive (clinical)	CVTN
Emergency Medical Technician Certificate	EMT6
Embalmer's Certificate	FSR6
Funeral Services	FSR3
Funeral Services Certificate	FSR7
Health Care Certificate	HCC7
Cardiovascular – Health Care Certificate	HCCV

Medical Assisting – Health Care Certificate	HCMA
Occupational Therapy Asst – Health Care Certificate	HCOT
Patient Care – Health Care Certificate	HCPC
Radiologic – Health Care Certificate	HCRA
Respiratory – Health Care Certificate	HCRE
Surgical – Health Care Certificate	HCSU
Veterinary – Health Care Certificate	HCVE
Dental Hygiene – Health Science Transfer	HSDA
Medical Laboratory Technology – Health Science Transfer	HSMA
Physical Therapy – Health Science Transfer	HSPA
Massage Therapy Certificate	MAS7
General Technology—Massage Therapy	MASO
Medical Assisting (clinical)	MED1
General Technology – Medical Assisting	MEDO
Occupational Therapy Assistant (clinical)	OTA3
Patient Care Technician Certificate (clinical)	PCT7
General Technology—Patient Care	PCTO
Phlebotomy Technician Certificate	PHB6
Pharmacy Technology	PHM1
General Technology—Pharmacy Technology	PHMO
Radiologic Technology (clinical)	RAD3
Respiratory Care (clinical)	RES3
Surgical Technology (clinical)	SUR1

General Technology—Surgical Technology	SURO
Veterinary Technology	VET3

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*Notes:* Curriculum codes updated December 7, 2017. (2018). Retrieved from Retrieved from  
Subject College's website

Table 13

*Certificates and Degrees in Nursing Division*

Major	Code
Associate Degree Nursing (clinical)	ADN3
Associate Degree Nursing-Transition (clinical)	ADN5
Pre-Transition Nursing, AA	ADNT
Practical Nursing (clinical)	LPN1
Nursing Care Certificate	NCC6
Nursing (ADN)—Certificate	NCAD
Nursing (LPN) —Certificate	NCLP

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*Notes:* Curriculum codes updated December 7, 2017. (2018). Retrieved from Retrieved from  
Subject College's website