

**The Relationship between Method of Placement and Success in College Algebra and English Composition I at Allen Community College**

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## **Abstract**

Community colleges attract students at varying levels of ability. Colleges use tests to place students in courses to increase the likelihood of success. Placement tests have become controversial because it is unclear if they increase the likelihood of a student being successful or have a negative effect on success and retention. Retention and success are important considerations at a time when colleges are being asked to increase the number of graduates with credentials, certificates, and degrees. In this research study, whether or not a relationship existed between the method of placement and student success in College Algebra (MAT105) and English Composition I (COL101) at Allen Community College was examined. Success was defined as earning grades of A, B, C, or P. The effect of age, gender, and the method of course delivery on success was also explored. Age was defined as traditional or non-traditional. Non-traditional students were age 24 and older. Data from Spring 2003 through Summer 2013 was utilized in this study. The results of this study suggested that a relationship existed between the method of placement and success for both math and composition. Students who were placed using the ACT and ASSET tended to be successful. Online and concurrent students were the exceptions because students placed for these modes of delivery using the ASSET tended to be unsuccessful. Students who were placed using the COMPASS, the prerequisite course, or a waiver tended to be unsuccessful. Online and concurrent math students were the exceptions and students placed for these modes of delivery using the COMPASS tended to be successful. Age and method of course delivery affected the relationship while gender generally did not. No relationship existed between the method of course placement and success for non-traditional students.

## **Dedication**

I would like to dedicate this work to my parents who have always encouraged my efforts. Regardless of the endeavor, their words of wisdom and confidence in me provided the necessary support network for success. I would also like to dedicate this work to my late husband, Phillip. While he cannot physically celebrate the final steps in achieving this goal with me, I know he proudly accompanied me throughout this journey.

## **Acknowledgements**

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## **Chapter One**

### **Introduction**

Community colleges, which were first known as junior colleges, originally provided general education coursework paralleling the first two years at a university (Beach, 2011). From humble beginnings, the mission of the community college expanded. Over time, the community college added workforce development coursework to its offerings to serve stakeholders more effectively (Beach, 2011). Community colleges attract students who may not wish to seek a bachelor's degree and may not be as well prepared as students who matriculate directly to a university. As a result, these institutions provide access to higher education for a broad variety of students at varying levels of preparation (Beach, 2011).

Before the popularity of placement tests increased, many community colleges used self-placement. While colleges may have had recommendations, students had the right to fail. Placement policies were permissive, and students could take courses regardless of test scores. The open door became the revolving door. Students failed and left community colleges. To increase the likelihood of student success, many community colleges now use placement testing to determine student readiness (Cohen & Brawer, 2008). Allen Community College uses placement testing to determine student readiness for math, science, English, and networking courses. College Algebra and English Composition I are two courses students historically struggle to complete, and that require placement test scores at many institutions (Cohen & Brawer, 1987).

Institutions choose a placement test or tests and establish cut-scores students must meet or exceed to enroll in courses requiring placement scores (Cohen & Brawer, 1987).

Students who score below these levels on tests such as the ACT, ASSET, and COMPASS complete developmental courses such as Intermediate Algebra and Pre-Composition before beginning College Algebra and English Composition I. Placement policies are designed to help students be more successful in courses. However, it is not known if mandatory placement helps students at Allen Community College.

## **Background**

Public community college history began with Joliet Junior College, which was founded in 1901 (Joliet Junior College, 2013). The founders wanted to create a postgraduate high school program that would parallel the first two years of a university degree program. Enrollment grew from six students the first year to 82 students in the sixteenth year (Joliet Junior College, 2013). The North Central Association granted Joliet Junior College accreditation the same year (Joliet Junior College, 2013). Community colleges quickly grew nationwide.

Junior college history in Kansas began about the time Joliet received accreditation. In 1917, a Kansas law outlined and authorized the taxation necessary to provide funding to support the establishment of junior colleges (Cohen & Brawer, 2008). Iola Junior College (IJC), located on the third floor of Iola High School, was established in 1923 under the auspices of Iola Public Schools as an extension of the high school (Allen Community College, 2014). The Board of Education of Iola Public Schools exercised supervision. IJC, which was supposed to serve the students of District 10, enrolled 93 students during its first year of operations.

As junior colleges grew and gained popularity, their mission also expanded. After World War II, a growing number of students needed workforce skills and wanted

transferable courses of study. Soldiers who served during World War II had military education benefits that they could use to attend college. Junior colleges provided these students with access to workforce training and transfer coursework.

Bogue (1950) defined the mission of the junior college as offering "a different type of curriculum suited to the larger and ever-changing civic, social, religious, and vocational needs of the entire community in which the college is located" (p. xvii). The number of two-year institutions and enrollments at two-year institutions grew quickly because junior colleges conveniently provided vocational training and transfer coursework in the local area. Many junior colleges also had a vocational function in their charter (Cohen & Brawer, 2008).

Since the 1960s, two-year colleges have strived to provide access to students (Brock, 2010; Zeidenberg & Bailey, 2010). In 1965, the local school district in Iola requested that IJC expand its service area. Rather than just serving students from District 10, students from Allen County had started to attend. Iola Junior College became Allen County Community Junior College in 1965. Its focus shifted from enhancing high school offerings to serving the county with courses that paralleled the first two years at a university (Allen Community College, 2014). Construction began in 1966 on a 90-acre campus in Iola. Classes were first offered on the Iola Campus in 1970. In the 1970s, the name junior college declined in use and the name community college gained popularity. As a result, Allen County Community Junior College changed its name to Allen County Community College in 1980 (Allen Community College, 2014).

In 1991, Allen Community College built an outreach campus in Burlingame and expanded to offer courses in communities in its service area of Allen, Coffey, Osage,

Woodson, southern Wabaunsee, and southern Anderson counties. The college offered concurrent courses for high school students, evening courses at community sites, and a growing number of day, night, and weekend courses in Burlingame. In Spring 2001, after having experimented with the use of the Internet to enhance courses, Allen Community College offered its first fully online course. In 2007, the college began using the name Allen Community College in recognition of the fact that many of its students attended classes outside the home county.

As the population in the United States has grown and the number of students attending college after high school continued to grow, community colleges have experienced growth as well. "Community colleges now operate in every state and enroll half of the students who begin college in the United States" (Cohen & Brawer, 2008, p. 19). By 2012, America's 1,132 community colleges served 13 million students (American Association of Community Colleges, 2012). In 2015, Allen Community College enrolled over 2,500 students per semester who sought personal enrichment, industry credentials, certificates, or associates degrees (Allen Community College, 2015).

Community college students come from a variety of backgrounds and enter higher education at varying levels of ability. According to the American Association of Community Colleges (AACC), 42% of attendees at community colleges are first-generation college students (AACC, 2012). First-generation college students are the first in their families to attend college. Students at community colleges include high school students taking dual credit courses, students looking for transfer college coursework, adults seeking workforce skills, and students seeking personal development. In 2012, the

average community college student was 28 years old with 15% of community college students over the age of 40 (AACC, 2012).

Increasing numbers of students enrolling in colleges today need remedial coursework. According to the 2011 Digest of Education Statistics, 42% of first-time undergraduates in public two-year institutions took at least one remedial course (Snyder & Dillow, 2012). The reasons undergraduates need remedial courses vary. Adult learners often have a break in studies between high school graduation and attending college, which can result in a need for remediation. High school students often graduate without adequate preparation for college-level coursework. According to Adelman (2005), "Over sixty percent of traditional-age students entering community colleges from both the High School class of 1982 and High School Class of 1992 wound up in at least one remedial course" (Adelman, 2005, p. xxii).

College personnel consider placing students in the appropriate courses, based on student skill level, a key factor that influences student success. To place students appropriately, colleges develop placement policies (Cohen & Brawer, 1987). Allen Community College's Mandatory Placement Policy specifies, "In an effort to assure that all students pursuing degrees or certificates at ACCC are fully prepared to succeed in college courses, the college administers assessment tests such as the COMPASS or ASSET to evaluate student readiness" (Allen Community College, 2012).

Misplacing students causes several issues. Students may fail courses if they are placed above their skill level. Students may waste money on unnecessary remedial courses if they are inaccurately placed in a course below their skill level. Students may be bored if placed in a course below their skill level. Placement practices influence the

schedules created by the college and staffing needs. Instructors also struggle to teach courses that include underprepared students. According to Hughes and Nelson (1991), student retention is likely to improve as the accuracy of placement improves. Assessment of student skill level and placement are important aspects of the advising and enrollment process.

Colleges use a variety of tests to place students in coursework including the ACT, SAT, ASSET, and COMPASS. According to ACT (2010), 47% of high school graduates in 2010 took the ACT (ACT, 2010). Of these students, 66% earned an 18 or higher in English, which is the standard for college readiness. Only 43% of the graduating seniors earned a 22 or higher in math and met the benchmark for college readiness (ACT, 2010). "Only 24% of all 2010 graduates met all four ACT College Readiness Benchmarks, meaning that 76% were not adequately prepared academically for first-year college courses in English Composition, College Algebra, social sciences, and Biology" (ACT, 2010, p. 19).

This study of the method of placement and student success in College Algebra (MAT105) and English Composition I (COL101) was conducted at a public, rural community college with about 3,000 students. Mandatory placement began at Allen Community College in 1997 (Allen Community College, 2012). Cut-scores were adjusted in August 2002 (Allen Community College, 2012). Based on Allen Community College's placement policy, students can be placed based on an ACT score that is less than three years old, an SAT score less than 3 years old, an ASSET test score, a COMPASS test score, successful completion of prerequisite coursework, or by waiver (Allen Community College, 2012). Few students at Allen use SAT scores for placement,

and few waivers are granted. Most students at Allen use ASSET, ACT, COMPASS, or the prerequisite course for placement in College Algebra (MAT105) and English Composition I (COL101) (Allen Community College, 2012).

At Allen Community College, students are placed into College Algebra (MAT105) with an ACT score of 20 or higher, an ASSET score of 39 or higher on the Intermediate Algebra assessment, a COMPASS score of 50-100 on the Algebra assessment, or a score of 0-43 on the College Algebra assessment (Allen Community College, 2012). At Allen Community College, placement in English Composition I (COL101) requires an appropriate reading score and an appropriate writing score (Allen Community College, 2012). Students can enroll in English Composition I (COL101) at Allen Community College with ACT Reading and Writing scores of 16 or higher, an ASSET Reading Score of 39 or higher and a Writing score of 41 or higher, or a COMPASS Reading score of 73 or higher and a Writing score of 55 or higher (Allen Community College, 2012).

Students who earn scores below the threshold for placement in College Algebra (MAT105) or English Composition I (COL101) enroll in the appropriate prerequisite course. A grade of C or better in Pre-Composition (COL011) or Intermediate Algebra (MAT020) would allow the student to enroll in English Composition I (COL101) or College Algebra (MAT105) at Allen Community College. Allen Community College allows students to appeal course placement and enroll in a course one level higher than cut-scores indicate with the approval of the Vice President for Academic Affairs (Allen Community College, 2012). In practice, the Vice President for Academic Affairs delegates the consideration of waivers to the deans.



Courses at Allen Community College are scheduled in various locations throughout the service area. Allen Community College offers courses on its main campus in Iola, Kansas; on its outreach campus in Burlingame, Kansas; at outreach sites around the multi-county service area; in area high schools; and online. Courses are scheduled in a variety of combinations. Iola Campus administrators schedule classes for 55 minutes three days a week or 85 minutes two times per week. Courses on the Burlingame Campus meet once a week for three hours or twice a week for 90 minutes. Courses at area high schools meet on the high school schedule, which varies from five days a week for 50 minutes to a block schedule. Spring and fall courses meet for eight or 16 weeks, and summer courses meet for four or eight weeks (Allen Community College, 2012).

Allen Community College allows instructors to manage courses. Instructors have the right to determine the assignment makeup of the course. Standardized outcomes and more recently common course outlines exist to ensure students learn the same skills in each course. Instructors sometimes develop their class materials, and others use materials provided by the publisher to construct course materials. All instructors at Allen Community College use common textbooks.

### **Statement of the Problem**

Community colleges strive to provide access to higher education for the locations they serve (Beach, 2011). Community colleges provide access by offering courses in a variety of locations and formats including concurrent enrollment of high school students, outreach sites in communities, and through online learning (Allen Community College, 2012). Student populations with varying levels of preparation are attracted to the courses

community colleges make accessible (Beach, 2011). Student success and retention are key concerns of college leaders because of the completion agenda announced by President Obama and funding (The White House, 2009). The completion agenda refers to the concept that a higher percentage of students should complete their degree or certificate, and colleges are accountable for the success of their students. Some leaders have said states need to consider student success as criteria for funding (U.S. Department of Education, 2011).

According to the U.S. Department of Education (2011), "Different financial incentives . . . in state funding formulas are likely to prompt actions by individual institutions to increase college completion" (U.S. Department of Education, 2011, p. 6). Great pressure exists for colleges to address student success and increase completion because students who access education at a community college often fail to complete a degree or certificate. U.S. Department of Education statistics presented by Hudson, Kienzl, and Diehl (2007) indicated,

Nearly four out of ten (38%) of those who enroll in occupational certificate programs fail to earn a credential of any type within six years. Nearly six out of ten (58%) of students seeking an associate degree in an occupational field fail to obtain a credential of any type within six years of starting their studies. (p. 38)

This trend is not limited to occupational credentials and degrees. According to the National Center for Education Statistics (2012), only 28% of community college students complete a degree within four years and over 70% of students needing remediation fail to graduate within five years. Because so many students fail to complete coursework successfully, colleges have created placement policies to help determine whether students

are ready for college-level classes and to place students at appropriate levels (Armstrong, 2000).

Placement tests are often part of placement policies as are developmental courses for those who place in courses below the college-level (Saxon and Morante, 2014).

Placement tests have come under fire for over and under placing students. Over placed students may struggle to be successful in classes above their skill level. Under placed students take developmental classes that lengthen their time to degree and add cost to their program (Saxon and Morante, 2014). Students in developmental courses often do not complete the courses or their college goals (Aud et al., 2012). Whether placement method has affected student success at Allen Community College is not known.

### **Purpose of the Study**

The first purpose of this study was to determine if there was a relationship between method of placement and student success in College Algebra (MAT105) of students who met the requirements of the mandatory placement policy using COMPASS, ASSET, or ACT scores, by passing the prerequisite course, or by waiver. The second purpose of this study was to determine if there was a relationship between student success in English Composition I (COL101) of students who met the requirements of the mandatory placement policy by use of COMPASS, ASSET, or ACT scores, by passing the prerequisite course, or by waiver. The final purpose of the study was to determine to what extent the relationship between how a student meets the placement requirement for English Composition I (COL101) and College Algebra (MAT105) is affected by age, gender, or the method of course delivery.

## **Significance of the Study**

Past studies have shown that placement tests vary in their effectiveness (Armstrong, 2000; Cohen & Brawer, 1987; Gillespie, 1993; Hughes & Nelson, 1991; Hughes & Scott-Clayton, 2011; Isonio, 1992). Allen Community College uses several methods to place students into math and English courses. What is not known is whether the method of placement used at Allen Community College relates to student success in College Algebra (MAT105) and English Composition I (COL101). Using the results of this study, the college could adjust its placement policy. If one method of placement leads to greater student success than the others, the policy could be rewritten to focus on that method of placement, and if a method currently used for placement is less likely to lead to student success, the policy can be rewritten to eliminate the less accurate method of placement. If students completing the prerequisite course are less likely to be successful, the curriculum may need revision. Changes in placement to focus on the most accurate methods should have a direct impact on student success. Students may be more likely to complete key courses required to earn degrees. This information could also help other community colleges establish placement guidelines, contribute to state data related to the accuracy of placement testing, and contribute to the body of knowledge on this topic. As Allen Community College considers future placement policy in AY2015-2016, the success or failure of previous methods is an important consideration.

## **Delimitations**

"Delimitations are self-imposed boundaries set by the researcher on the purpose and scope of the study" (Lunenburg & Irby, 2008, p. 134). One delimitation of this study was that the data came from one institution. Other community colleges working on

placement practices might be interested in the study, but the results may not be generalized to other institutions. Additionally, this study only included students at Allen Community College enrolled from Spring 2003 through Summer 2013. The study used data from Spring 2003 because that was the first semester advisors used the placement policy adopted in 2002 for enrollment. The sample included College Algebra (MAT105) students and English Composition I (COL101) students. All students who completed these courses were included; however, students were only included the first time they completed College Algebra (MAT105) or English Composition I (COL101).

### **Assumptions**

According to Lunenburg and Irby (2008), assumptions are "Postulates, premises, and propositions that are accepted as operational for the purposes of the research" (p. 135). Several assumptions have been made in this research study. First, it was assumed that the data from the Campus Administrative Resource Solution (CARS), the student information system, was accurate. This data included grades, demographic information, and placement information. Second, there was an assumption that students who receive the same grade did the same level of work. Several different instructors taught the sections of the courses over the years, and grading policies may vary among instructors. Third, there was an assumption that placement test scores are an accurate reflection of student ability. Finally, there was an assumption that students did their best on the placement tests.

### **Research Questions**

According to Lunenburg and Irby (2008), research questions are "critical components" of dissertations (p. 126). Lunenburg and Irby (2008) call research questions

"a directional beam for the study" (p. 126). The following research questions guided this study:

**RQ1.** To what extent is there a relationship between how a student meets the math placement requirement for College Algebra (MAT105) and student success?

**RQ2.** To what extent is the relationship between how a student meets the math placement requirement for College Algebra (MAT105) and student success affected by age?

**RQ3.** To what extent is the relationship between how a student meets the math placement requirement for College Algebra (MAT105) and student success affected by gender?

**RQ4.** To what extent is the relationship between how a student meets the math placement requirement for (College Algebra) MAT105 and student success affected by course delivery mode?

**RQ5.** To what extent is there a relationship between how a student meets the writing placement requirement for English Composition I (COL101) and student success?

**RQ6.** To what extent is the relationship between how a student meets the writing placement requirement for English Composition I (COL101) and student success affected by age?

**RQ7.** To what extent is the relationship between how a student meets the writing placement requirement for English Composition I (COL101) and student success affected by gender?

**RQ8.** To what extent is the relationship between how a student meets the writing placement requirement for English Composition I (COL101) and student success affected by course delivery mode?

**RQ9.** To what extent is there a relationship between how a student meets the reading placement requirement for English Composition I (COL101) and student success?

**RQ10.** To what extent is the relationship between how a student meets the reading placement requirement for English Composition I (COL101) and student success affected by age?

**RQ11.** To what extent is the relationship between how a student meets the reading placement requirement for English Composition I (COL101) and student success affected by gender?

**RQ12.** To what extent is the relationship between how a student meets the reading placement requirement for English Composition I (COL101) and student success affected by course delivery mode?

### **Definition of Terms**

To understand any study, one must first understand the terms used. Lunenburg and Irby (2008) purport, "You should define all key terms central to your study" (p. 118). For the purpose of this study, the following terms were defined:

**American College Testing Program (ACT).** The ACT is a test of college preparedness developed by the American College Testing Program. This test includes English, Mathematics, Reading, and Science subtests (ACT, 2014).

**Assessment Skills for Successful Entry and Transfer (ASSET).** ASSET is a placement test developed by the American College Testing Program (ACT). This test includes Numerical Skills, Intermediate Algebra, Reading Skills, and English Skills subtests (ACT, 2009).

**College Algebra.** College Algebra (MAT105) is the course offered by Allen Community College that satisfies the math requirement for an Associate of Arts, Associate of Science, or Associate of General Studies degrees. Under College Algebra (MAT105) the college catalog specifies, "Covers the same topics as MAT020 plus logarithms, sequences, series, determinants, and matrices" (Allen Community College, 2012, p. 114).

**College-level course.** Allen Community College considers a course numbered 100 or above that counts for college credit and toward a degree or certificate program a college-level course (Allen Community College, 2012).

**Computer-adaptive Placement Assessment and Support System (COMPASS).** The American College Testing program developed COMPASS. This placement test includes tests in Reading, Mathematics, and English (ACT, 2012).

**Cut-score.** A cut-score is a point on a test scale used to differentiate between different groups of students (Zieky & Perie, 2004).

**Developmental course.** A developmental course refers to coursework below the college-level. At Allen Community College, courses numbered below 100 are developmental. Developmental courses, which are sometimes referred to as remedial, prepare students to complete degree requirements such as College Algebra (MAT105) and English Composition I (COL101)(Allen Community College, 2012).



**Intermediate Algebra (MAT020).** Intermediate Algebra (MAT020) is a remedial course offered by Allen Community College that prepares students for College Algebra (MAT105). The Allen Community College 2012-13 catalog relates, “Developmental Education-MAT020 will not apply toward graduation requirements. Covers basic topics in algebra, including the solution of linear and quadratic equations, factoring, graphing, inequalities, rational and irrational numbers and functions” (Allen Community College, 2012, p. 114).

**Intermediate Reading (COL013).** Intermediate Reading (COL013) is a remedial course offered by Allen Community College that prepares students for English Composition I (COL101). According to the Allen Community College 2012-13 catalog, Developmental Education-COL013 does not apply toward graduation requirements. Intermediate Reading is designed to prepare students for academic and vocational reading at college level. Those skills stressed include perception and comprehension, strategies for learning, and language development, and skills designed to help individual read and understand college course work better. (p. 98)

**Non-traditional student.** A non-traditional student is any student attending classes who is 24 years of age or older (Horn & Carroll, 1996).

**Placement.** Placement is the process of assessing academic preparedness for enrollment in appropriate coursework. Allen Community College uses the ACT, ASSET, and COMPASS tests for placement as well as prerequisite completion and waiver (Allen Community College, 2012).

**Pre-Composition (COL011).** Pre-Composition (COL011) is a remedial course offered by Allen Community College that prepares students for English Composition I (COL101). According to the Allen Community College 2012-2013 catalog,

Developmental Education-COL011 does not apply toward graduation requirements. Pre-Composition is a preparatory course, emphasizing the writing processes that will be utilized in COL101 English Composition I. The course will progress from short pieces of writing to longer written essays emphasizing written focus, organization, clarity, and usage of Standard Edited English. (p. 98)

**Student success.** Student success is defined as earning a grade of A, B, C, or P as the final grade in a course. For purposes of this study, students earning a grade of D, F, I, or W were considered unsuccessful.

**Traditional Student.** For the purpose of this study, a traditional student is one who pursues a college education under the age of 24 (Horn & Carroll, 1996).

### **Overview of the Methodology**

A quantitative, descriptive research design was used in this study. Purposive sampling was utilized in this study. The subjects for the College Algebra (MAT105) portion of the study were students who earned a grade in College Algebra (MAT105) for the first time at Allen Community College from Spring 2003 through Summer 2013. The subjects for the English Composition I (COL101) portion of the study were students who earned a grade in English Composition I (COL101) for the first time at Allen Community College from Spring 2003 through Summer 2013. Data was extracted from the Campus Administrative Resource Solution (CARS) or Jenzabar. Multiple  $\chi^2$  tests of independence were used to test the hypotheses for the study.

## **Organization of the Study**

This research study is presented in five chapters. Chapter one consisted of the introduction, problem statement, background and conceptual framework, significance, purpose, delimitations, assumptions, research questions, definitions of terms, and an overview of the methodology employed. Chapter two consists of an overview of literature related to the topic, which includes information about community college students, placement testing, placement tests, the impact of remediation, and the completion agenda. Chapter three includes the research design, population and sample, sampling procedures, instrumentation, data collection procedures, of the data analysis and hypothesis testing, and limitations. Presented in Chapter four are a discussion the data collected and the results of the statistical analysis. Chapter five includes the study summary, findings related to the literature, implications for action, and the recommendations for future research.

## **Chapter Two**

### **Review of the Literature**

It is important to understand the role of the community college and the nature of the students who enroll at community colleges. This chapter first reviews literature related to community college students and their level of preparedness. Also included is a discussion of remedial education, its successes, and its failures. Second, the history of placement testing and the accuracy of placement testing are reviewed. Third, information is provided on different placement tests used by colleges and the ability of tests to predict student success in other studies. Fourth, the impact of remediation on students is shared. Finally, the completion agenda and its relationship to course placement are explored.

#### **Community College Students**

Thirteen million students attended community colleges in Fall 2009 (AACT, 2012). The community college is referred to as the open door in education (Cohen & Brawer, 2008). "Accessibility for all students who desire an education is one of the basic tenets upon which the community college was founded" (Dodson, 1987). Mickler and Chapel (1989) ask if, "Students should be penalized for a lifetime because they did not acquire basic skills" (p. 4). Students who enroll at the community college come from different backgrounds. Community college students include advanced high school students, traditional college students, and non-traditional students. "To suggest that the unmotivated 16 year-old high schooler never becomes a motivated 25 year-old, who sees the value of education, is sheer fallacy" (Mickler & Chapel, 1989, p. 3). These students have goals that range from a credential to a certificate to a degree.

Community college students arrive with varying levels of preparation. "Many students enter postsecondary education institutions lacking the reading, writing, or mathematics skills necessary to perform college-level work" (Wirt et al., 2000, p. 50). Students arriving at colleges with varying levels of preparation is not a new problem. In 1852, Henry Tappan complained about the level of preparation of students in his inaugural address at the University of Michigan (Maxwell, 1979). In 1862, Iowa State College created a remedial department to assist underprepared students (Maxwell, 1979). At Harvard, remedial coursework began in 1874 to help students who could not meet writing requirements. Maxwell (1979) shared that by 1907, 50% of the students at Harvard, Yale, and Princeton failed to meet admission requirements.

Institutions offer remedial courses to help students attain college-level skills. In 1961, Shaw wrote, "Two-thirds of freshmen lacked the reading skills required for college success" (p. 337). Maxwell (1979) indicated that 350 colleges in 1915 had college preparation departments. According to Maxwell (1979), in the 1930s reading remediation grew. Dodson (1987) stated, "Many colleges are now requiring students who as a result of testing indicate a need for remediation, to take remedial work before they are allowed to enter college-level courses" (p. 59). By 1995, almost all public 2-year and 81% of public 4-year institutions offered remedial reading, writing, or mathematics courses (Lewis & Farris, 1996).

Scholars and political leaders agree that student success is important. Some believe high schools use lower standards and poorly prepare students. Clark (1960) stated, "The disjuncture between ends and means, between the open door and standards, dooms large numbers of students to failure" (p. 162). When many students fail at the

community college, scholars sometimes refer to the phenomena as a revolving door. Richardson (1983) shared, "The open door of the community college too often becomes a revolving door when students' needs are not met and program quality decreases" (p. 1). Critics often look at cost and contend that districts use taxpayer dollars to educate students in high schools. Therefore, community colleges should not use taxpayer dollars to educate the same students again in remedial courses. Senator Richard Thompson said, "Remedial programs at colleges should be eliminated because they are more expensive than they would be at high schools" (as cited in Jaschik, 1985, p. 20). Representative Jim Scherer, said, "We should be spending our time and money on educating those people who have already demonstrated the ability to learn" (as cited in Jaschik, 1985, p. 20).

Scholars disagree on the topic of whether or not students needing remedial coursework should attend college. Some scholars believe that students who need remedial course work should not attend college (Harwood, 1997; Marcus, 2000; Trombley, 1998). The reasons scholars hold this position vary. Some believe institutions lowered curriculum standards to allow students who are underprepared to complete college (Bennett, 1994; MacDonald, 1997, 1998, 1999; Traub, 1995). These scholars believe colleges should not lower the standards. In their opinion, students who are not capable of college-level work should not attend college.

Other scholars believe a variety of factors impact college readiness. Young (2002) indicated that student demographics, required college preparatory courses taken in high school, and the quality of the college preparatory courses impact student success in college. Boggs and Shore (2004) also cited rigor of high school curriculum and student demographics as key factors in student success in college coursework. Others argue

these scholars are incorrect in the belief that students can succeed with preparation.

According to the Attewell, Lavin, Domina, and Levey (2006), the National Educational Longitudinal Study 1988 (NELS) data showed, "The impression that remedial coursework is taken by students with poor high school preparation or weak academic skills is inaccurate" (p. 914).

Many first-year students are unprepared for college-level math courses. In 1990, Sworder found that 98% of first-year students at El Paso Community College were unprepared for college-level math. Traditional students tend to possess a higher level of preparation for college-level courses than are non-traditional students. According to Woodham (1998), non-traditional students, who do not enter college immediately following high school, need remediation more often than do traditional students. Among the subjects students struggle to complete, math appears to be difficult for many. More students require remediation in math than in other subjects (Parsad, Lewis, & Greene, 2003). The background a student brings to college influences his or her ability to succeed. As reported by ACT (2010), the varying levels of required college preparatory courses in high school, as well as the rigor and content of these courses impacted student readiness for college-level coursework. Most first-time undergraduates need remedial coursework. In 2011, 42% of first-time undergraduates in public two-year institutions took at least one remedial course (U.S. Department of Education, 2011). According to Attewell et al. (2006), the NELS data also showed that public colleges are not easier than private sector colleges, but "have created higher hurdles than their private sector equivalents" (p. 914).

Some believe community colleges should offer developmental courses rather than universities. Lewis and Farris (1996) analyzed NCES data and found that twice as many community colleges offer developmental courses. They also discovered that four-year schools are sometimes discouraged from offering developmental courses. Lewis and Farris (1996) stated, "About twice as many public 2-year as public 4-year institutions were required to offer remedial courses, while more public 4-year than public 2-year institutions were discouraged from offering remedial education or their remedial offerings were restricted" (p. 29). Adelman (1996) shared, "Community colleges are better suited than four-year colleges to address a combination of multiple developmental needs" (p. A56). Ignash (1997) agreed and stated, "Community colleges have a greater role in addressing existing needs for remediation" (p. 15). Others believe relegating developmental education to the community college is detrimental. Roueche and Roueche (1999) believe universities should include developmental learners, so they have a more diverse population in attendance. Roueche and Roueche (1999) also contend that offering developmental courses only at community colleges will create a stigma that only underprepared students attend two-year colleges.

Degree completion is challenging for community college students. According to Complete College America (2011), only 40% of students graduate with a one-year certificate within two years, and 26.6% of students finish a two-year degree within four years. According to Complete College America (2011), 50.1% of students seeking an associate degree require remedial courses. Among all students in one-year certificate programs, 22.6% graduate in 1.5 years while only 13.1% of those requiring remedial work graduate. Among all students attempting a two-year associate degree in three years,



13.9% graduate, but only 9.5% of those who take required remedial courses graduate. College leaders, legislators, and others would like to see more students successfully complete their academic goals.

While some students meet the college readiness benchmark set by ACT, others do not. According to ACT (2010), 66% of all high school graduates taking the ACT met the College Readiness Benchmark in English, 52% in reading, and 43% in math. The benchmark for English is 18. The benchmark for math is 22. The benchmark for reading is 21. However, not all students take the ACT. Generally, students who take the ACT are those who are considered college-bound. College-bound students may choose to attend a university or a community college. Many students who later attend a community college did not consider themselves college-bound when in high school.

### **Placement Testing**

Although controversial, placement testing is widely used. According to Hughes and Scott-Clayton (2011), “The purpose of assessment is to sort students into courses whose content and instruction differ in their levels of difficulty” (p. 3). According to Boylan (2002), best practices in developmental education include mandatory testing and placement. Fulton (2012) stated, “The problems in developmental education can largely be attributed to weak assessment and placement policies and practices that often result in many students being placed in remedial instruction they don’t need” (p.1) Community colleges struggle to balance the open door philosophy with the need to sort students so they can be successful.

Historically, community colleges have seen periods where placement was required and periods when it was optional. According to Rounds and Anderson (1985),

the 1970s were a time when the student was seen as having the right to choose to fail. Placement tests were often not required. By the end of the 1970s, Rounds and Anderson (1985) indicate that there was pressure to lower dropout rates, so placement testing gained acceptance. Morante (1989) suggested letting students have the right to fail was likely detrimental because too many factors affected student ability to succeed. Boylan (2002) also argued for mandatory placement. Today, placement testing is required in some states but not in others. According to Armstrong (2001), the state of California began requiring colleges to use placement testing in the late 1980s. Fulton (2012) indicated that 30 states use a common placement test. In 13 of these states, the state chooses the instrument and in 17, the system chooses the instrument. In Kansas, individual institutions can choose the instrument, but the Placement Assessment Policy Committee at the Kansas Board of Regents made recommendations for a statewide placement instrument in January 2016.

Some criticize placement testing policies in the states. The decision in California to require placement testing resulted in a lawsuit. Due to the lawsuit, the legislature enacted a law in 1986 that requires colleges to use more than one measure for placement (Hughes & Scott-Clayton, 2011). Saxon and Morante (2014) stated, “Whether or not these instruments predict how students will perform once they enter their prescribed courses is a moot point” (p. 24). Saxon and Morante (2014) continued, “It should be considered that placement tests are measures of achievement rather than aptitude” (p. 26). Gordon stated, “While we should be able to predict a failing grade from assessment, we cannot and we should not attempt to, predict a passing grade” (as cited in Saxon & Morante, 2014, p. 4).

Some opponents of placement testing argue that it is inaccurate due to the processes used rather than the instruments used (Hodara, Jaggars, & Karp, 2012). In interviews conducted with staff at 38 colleges in seven states, Hodara et al. (2012) gathered information on placement processes from 183 respondents. Critics of the placement process used by institutions often focus on student preparation and awareness.

According to Venezia, Bracco, and Nodine (2010), students are often unaware of the purpose of the tests and the consequences of the tests. Venezia et al. (2010) conducted a study that explored student perspectives and experiences regarding placement testing. The study used data from focus groups at five community colleges in California. The researchers also interviewed counselors at 73 colleges. According to Venezia et al. (2010), "With so much riding on assessment and placement, it is important that students know the requirements early in their high school years so they can master the needed knowledge, skills, and cognitive strategies" (p. 2). Unfortunately, the results of the study indicated many students were ill-prepared for college. A student in the Venezia et al. (2010) study said, "[My college counselor] told me to just take easy classes" (p. 7). Additionally, Venezia et al. (2010) shared, "Since students knew they could attend a community college even without a high school diploma, many didn't think they needed to prepare much beyond passing high school courses" (p. 7). The results of the study indicated, "Fewer than half (44 percent) of the colleges that responded to the survey indicated that they provide practice placement tests to their students" (p. 9). Venezia et al. (2010) also determined that most students did not know the consequences of placement testing. One student said, "I thought it was one of those tests you take just to see what kind of field they were going to recommend" (p. 10).

Schools may be reluctant to share the high-stakes nature of the test with students due to a fear that it will make students more anxious or result in the student enrolling at an institution with lower standards for placement. Based on the results of a survey administered by a committee convened by the Kansas Board of Regents regarding placement testing, the cut-scores used in Kansas vary dramatically. For example, based on a survey administered by the KBOR Placement and Assessment Policy Committee, students with an ACT writing score of 16 or above take English Composition I (COL101) at Allen Community College but at Fort Scott Community College, which is within driving distance of Allen Community College, students must have an ACT writing score of 21 to take college-level English.

According to Hodara et al. (2012), students may or may not be aware of study materials provided on college websites. Use of study materials might increase the likelihood of students scoring high enough to undertake college-level coursework. Hodara et al. (2012) said, “Overall, implementing placement test review seems to improve placement accuracy, in that it increases student access to college-level coursework without harming their academic success” (p. 7). The results of the same study indicated that students who completed a review course before retesting improved their test results. About 50% of the students who completed a review course gained one level in developmental reading and English.

Some opponents argue that placement tests fail to consider non-cognitive factors that impact student success. According to Hodara et al. (2012), one school leader in Wisconsin stated,

We found common measures, like COMPASS, did not tell us who would succeed in programs and who would succeed in the courses. The biggest reason students were failing was because of non-cognitive factors: weaknesses in degree choice, a lack of social support, financial concerns, and self-efficacy. (p. 12)

Using a locally developed tool based on the Learning and Study Strategies Inventory, the college in Wisconsin added the non-cognitive test to the cognitive results for better placement decisions. Karp and Bork (2012) agree that both academic and non-academic factors influence success. Karp and Bork (2012) conducted a study using qualitative data from interviews with 96 community college students and 72 community college staff members at three colleges in Virginia. The researchers coded their interviews so they could analyze them for key terms. Karp and Bork (2012) determined, “Community college success is not only about academic preparation, but it is also dependent upon a host of equally important skills, attitudes, habits, and behaviors” (p. 1).

While some states have set cut-scores and attempted to adopt more accurate placement tests, others defend current placement policies and see other reasons for student failure in college-level coursework or see no better solution. According to Hodara et al. (2012), one administrator in Oregon said, “It’s not clear what the problem is—the students, the test, the curriculum. It might be all. But a lot of the change really needs to come from K-12” (p. 23). An administrator from Texas blamed developmental education for student failures in college-level work stating, “Overall, I think our system of assessment and placement is working. I don’t think that’s the part of the developmental education that’s giving us difficulty” (Hodara et al., 2012, p. 23). An administrator from Georgia said, “Bigger than the COMPASS is [developmental]

instruction delivery. That is the real challenge” (Hodara et al., 2012, p. 24). A faculty member from Oregon said, “Overall the perception is that placement testing is working pretty well. Upper level management are pretty okay with it” (Hodara et al., 2012, p. 23).

Others see there may be a problem but are not ready to tackle the problem.

Another respondent said, “[Multiple measures] sounds wonderful, but I cannot think about what measures could be implemented that would be practical, that you would have the personnel to implement” (Hodara et al., 2012, p. 23). A third respondent stated, “We know we need to do something different . . . There are some groups in the state that are getting together and working on it, but I doubt that we are going to be able to come up with a sound practice” (Hodara et al., 2012, p. 23). The difficulty of the problem leads to a reliance on placement testing for many students.

College-bound high school students often complete the ACT before they apply to colleges. Students can use a variety of support materials to prepare for this timed exam. Unlike the ACT, ASSET and COMPASS testing commonly occurs after the college admits a student and before a student enrolls. While ASSET is a series of timed tests, COMPASS testing is untimed. Colleges sometimes provide study materials for COMPASS and ASSET. According to Venezia et al. (2010), students often do not prepare for placement tests. Placement testing becomes high stakes when future enrollment is based on the scores earned on a single test.

College staff can use exams to determine student mastery of content or outcomes. Community college students who do not show mastery take remedial courses. Placement testing has existed since the early 1800s (Wechsler, 1977). Michael and Shaffer (1978) and Fowler and Ross (1982) determined that achievement tests could be used effectively

to place students in college courses. Michael and Shaffer (1978) conducted a study using data from the Northridge campus of a California State Universities and Colleges. The purpose of the study was to determine whether there were relationships among placement methods and course grades. Methods of placement compared in the study included an English placement test and high school grade point average. Michael and Shaffer discovered correlations between test scores and course grades. They also found correlations between high school grade point average and course grades.

Fowler and Ross (1982) examined 34 tests to determine which test served as a better predictor of student success in English Composition courses. They used Pearson product moment correlations and stepwise regression analysis to analyze their data. The sample for the study included 140 students enrolled in a composition course. Fowler and Ross found that the English subtest of the ACT had the highest correlation with course grades.

Cox (1985) found, "Appropriate placement has been shown to significantly increase the student's retention rate, skill growth, and GPA" (p. 19). Most colleges use placement tests to determine student course sequences. Ledermen, Ribaud, and Ryzewic (1985) found that 15% of colleges used other measures for placement instead of tests and 98% thought testing was necessary. Rounds and Anderson (1985) stated, "Life-changing decisions should not be made on the basis of a single test score" (p. 25). The results of Weber's (1986) study determined,

Content-specific placement tests in combination with other student data will yield effective assessment forming a basis for placement decisions. Performance on

general achievement tests (ACT or SAT) or a subsection of one achievement test should not determine basic skills course placement. (p. 28)

Morante (1989) agreed and stated, "Never use one score on one test as the sole factor in making placement decisions" (p. 3). Morante alluded to the fact that institutions should use multiple measures in placement decisions. According to Lagunoff, Michaels, Morris, and Yeagley (2012), multiple measures are a more accurate predictor of success than a single measure in the California Community College system. The results of studies indicate placement tests are often inaccurate in predicting course grades. According to Linn (1990), these tests predicted only 10-30% of the variances in first-year college grade point average. Regardless of the intricacies and difficulties of accurate placement, advocates strongly believe in the importance of mandatory placement. Akst and Hirsch (1991) stated, "Placement is one of the pillars on which a developmental program rests" (p. 3).

In a study conducted by Sawyer (1996), the accuracy of placement testing was investigated to determine whether it was dependent on how a college defines success. Using data from a large public college in the Midwest, Sawyer compared the accuracy of a locally developed exam and the ACT in math placement. Sawyer found ACT provided more accurate placement when success was defined as earning a B or higher. However, the locally developed test proved more accurate when success was defined as earning a C or higher. Sawyer (1996) determined that the accuracy of placement testing depended on how the college defined success.

Armstrong (2001) conducted a study in California using 3,925 students enrolled in English and 3,719 enrolled in math during Fall 1995 at three community colleges.



Armstrong used predictive validity coefficients and Pearson product-moment correlations to analyze the data to determine if placement tests predicted course grades. He also considered student characteristics and faculty characteristics. Armstrong (2001) determined a significant relationship existed between course grades in both math and English and placement test scores. However, other factors such as instructor employment status were also important to consider.

A team of researchers analyzed placement in the community college system in Virginia. Jenkins, Jaggars, and Roksa (2009) conducted a study that analyzed placement test scores and grades in college-level math and English courses for over 24,000 students who enrolled in Summer or Fall 2004. Jenkins et al. (2009) determined a weak correlation existed between placement scores and success in college-level courses. Jenkins et al. (2009) stated, "Placement test scores in reading and writing did not predict whether students passed gatekeeper English. Math test scores had a stronger association with passing gatekeeper math" (p. 7).

Scott-Clayton, Crosta, & Belfield (2012), studied severe error rate (SER) in placement and stated,

The SER combines the proportion of students predicted to earn a B or better in college-level but instead placed into remediation (the severe under-placement rate) with the proportion of students placed into college-level but predicted to fail there (the severe over-placement rate). (p. 13)

Scott-Clayton et al. (2012) conducted their research using data from a large, urban community college system and one statewide community college system. The results of their study indicated, "Roughly one in four test-takers in math and one in three test-takers

in English are severely mis-assigned, with severe underplacements in remediation much more common than severe over-placements in college-level coursework” (p. 4). The results of the study indicated that an analysis of high school transcript information would reduce the number of students placed inaccurately.

Community colleges attract students with varying levels of preparation and must develop methods of determining student readiness for college coursework. Monroe (1972) discussed the open door policy of community colleges and the use of placement tests to help students take classes in which they have the greatest likelihood to succeed. Cox (1985) stated, "Self-placement of students into classes is not a sound policy" (p. 4). Monroe noted that it was problematic that few colleges created placement tests specifically for community college students. Abraham (1991) stated, "An institution that has identified a student as academically deficient and enrolled the student has an ethical responsibility to help the student overcome his deficiencies" (p. 28). The ACT, ASSET, and COMPASS are tests commonly used for placement. However, ACT does not advocate the use of test scores alone for placement (ACT, 2014).

A crucial aspect of placement testing is setting cut scores. Cut scores are often determined in one of two ways. The first method is for an institution to set cut-scores for its chosen placement instruments. The second method is for a state or community college system to set cut scores for all colleges within the state or system. According to Bettinger and Long (2009), there is little consistency in cut scores. Based on the information provided by Fulton (2012), 28 states have common cut scores by either state or system. Three states mandate that colleges review their cut scores periodically. Kansas recently adopted a statewide placement instrument and statewide cut-scores.

ACT recommends cut scores for the ACT, ASSET, and COMPASS. ACT will also help institutions conduct studies to review their cut-scores (ACT, 2009).

### **Placement Tests**

Many options exist for placement testing. Some institutions use locally developed assessments, and others purchase assessment tests from vendors. Placement testing is popular because it is efficient and inexpensive. Hodara et al. (2012) stated, "Almost all institutions in our sample used standardized tests as the primary measure of placement. This process is highly efficient. Exams can be administered quickly, scored by computer, and almost instantaneously applied to determine the placement for each student" (p. 28).

According to researchers (Grable, 1988; Lederman, Ribaud, & Ryzewicz, 1985; Morante, 1989; Roueche, Baker, & Roueche, 1987), about half of community colleges use locally developed measures. According to Fields and Parsad (2012), 100% of the two-year colleges and 85% of four-year colleges reported using a test for math placement. Based on their research, 22% of the colleges used a test other than a standardized test for math placement. For reading placement, 53% of colleges used a test for reading placement. Only 10% used something other than a standardized test. Only 13% of institutions use an alternative method for placement in remedial English.

Alternative placement methods include the use of other cognitive and non-cognitive factors. Factors colleges sometimes consider include scores on other exams, achievements, high school curriculum, faculty recommendations, and high school grade point average. According to Fain (2012), "Adding more layers to the placement process can be labor intensive and expensive." Also, "High school grades aren't the best measure

for all students, particularly the many adults who attend community colleges and have been out of high school for years" (Fain, 2012).

The ACT is a standardized test used to determine college readiness. It is also used for placement. ACT collects data from test scores and college grades in first-year courses. Using this data, ACT can show that students who score at or above certain levels have a higher likelihood of earning a B or C in college-level math and English courses. According to ACT (2012), students who meet college readiness benchmarks have a 75% chance of earning a grade of C or higher in college-level courses.

While ACT defends the use of its tests, researchers have also shown the ACT is not an accurate predictor for placement in courses. Their study used data from first-time students who graduated from high school the previous year. The study was conducted in Florida and included 605 students. Wattenbarger and McLeod (1989) found a low correlation between ACT scores and grades in math courses. Naumann, Bandalos, and Gutkin (2003) conducted a study that investigated the predictive validity of self-regulated learning variables compared to the ACT for first and second-generation students at a large mid-Western university. The sample for this study was students in a foundations class. Students allowed researchers to review their ACT scores, enrollment information, and grade point averages. Students also completed a questionnaire that assessed motivation, goals, and other factors. Naumann et al. (2003) used an independent samples *t* test to compare the information for both first and second-generation students. Naumann et al. (2003) stated, "The ACT appears to be a valid predictor of GPA for first-generation students and should be used as an index in the college admission process" (p. 9).

Naumann et al. (2003) continued, "For the second-generation students, ACT was the most significant predictor" (p. 7).

ACT (2010) set college readiness benchmarks for students using information from 98 schools and 90,000 students. According to ACT's Condition of College and Career Readiness (2010), 40% of all high school graduates took the ACT in 2006. By 2010, 47% of graduating high school students took the ACT. In some states, the number of students taking the ACT is between 60% and 80%.

The ASSET is a standardized test used to determine placement in many colleges. Grable (1988) and Abraham (1991) reported community colleges frequently used the ASSET for placement in community colleges. ASSET is popular in situations where a paper and pencil test is necessary. According to ACT (2015), over 400 colleges use the ASSET to assess student skills.

In a study conducted at Broward Community College in 1989, Gabe reviewed placement test scores and grades of first-time college students entering in Fall 1986 or 1987 who took college-level courses and scored a little above the cut score or a little below the cut score. He examined math and writing scores. Gabe (1989) found writing students who scored just above a cut score withdrew more often than those who scored below the cut score. He also determined that many students who failed to enroll in required remedial courses passed college-level courses at a higher rate than those who completed the required remedial courses. Gabe (1989) determined ASSET was not a predictor of success in college courses.

The results of research conducted by Hughes and Nelson (1991) found a low correlation between the ASSET test and English course success. Hughes and Nelson

used data from Riverside Community College for their study. All new students at Riverside Community College were required to take the ASSET as a placement test. Using discriminant analysis for 578 instances, Hughes and Nelson looked at the relationship between test scores and student success. Success was defined as earning a grade of "C" or above. The results of the analysis showed that the ASSET was a weak predictor of student success in English composition at Riverside Community College.

In the early 1990s, Krol (1993) conducted a study at Henry Ford Community College, which is located in southeastern Michigan and used the ASSET for placement. Krol wanted to investigate how ASSET scores, high school GPA, and academic success were related. The researcher examined the records of 650 students enrolled in Fall 1992 in Biology, English, and Political Science. Krol used ANOVAs and Pearson correlations to test the hypotheses. Krol found students who earned higher scores on the ASSET earned higher grades in all three courses. The results of research conducted by Krol (1993) determined that ASSET was a useful predictor of success for community college students.

Shaw (1997) completed a study using data from Paradise Valley Community College in Phoenix, Arizona. Shaw's study considered the method of placement as well as the relationship between each method and gender. She conducted an ex post facto study of College Algebra classes from Fall 1990 through Spring 1995. This study included 1,529 students. Shaw used a Pearson chi-square and likelihood ratio test to evaluate the differences in student success and placement method. Shaw found that ASSET placement had significantly higher levels of success than self-placement. Shaw found no difference in the success of students related to gender and placement method.

In a study conducted by Hartl (1997), the success of students in mathematics courses related to ASSET scores was investigated. The sample for this study included 3,508 students who enrolled in math courses between Fall 1992 and Summer 1996 at Northeast Iowa Community College. ASSET scores were available for 1,557 students. Hartl used multiple regression analysis and determined that the ASSET numerical skills score provided helpful information for placement and students who followed placement recommendations had higher mean grades.

Hutson (1999) conducted a study at a rural, two-year college in southern Arkansas. Hutson used multiple regression analysis to determine the relationship between course grades and ASSET, SAT, and ACT scores for 594 students. The study used data from Fall 1993 to Spring 1996. Hutson also analyzed if there was a difference in students who completed a prerequisite course or placed directly into College Algebra and found no significant difference. Hutson found a weak correlation between ACT scores and final grade. The results of the study indicated ASSET and SAT were not predictors of student success.

In several studies, ACT (2009) compared grades in courses to ASSET test scores. ACT obtained data from 23 institutions chosen to be representative of those using ASSET in the United States. Students per institution were between 30 and 382. The success rate of students in Freshman English was .80 meaning that 80% of the students earned a C or higher in the course. Similarly, students who scored appropriately on the ASSET Reading Skills test had an 80% success rate in Freshman English.

COMPASS is a computerized adaptive test. Computerized adaptive tests use item response theory (IRT). On an assessment that uses IRT, mathematical models analyze

responses and determine a path of questions a person answers from a pool. The number of questions varies based on the responses. When a person misses too many questions, he or she receives easier questions. When a person answers several questions correctly, he or she receives harder questions. The test will move within a domain or between domains as it determines the knowledge of the test taker. Using IRT, the test can determine the proper course placement for a student. According to Primary Research Group (2008), 46% of community colleges use the COMPASS test for placement.

In a study conducted by Day (1997), the predictive validity of the COMPASS using data from the Roane County and Oak Ridge campuses of Roane State Community College in Tennessee was examined. Day used the Pearson product-moment correlation coefficient and independent chi-square tests to determine the relationship between course grades and COMPASS. The sample for this study was first-time freshmen who tested in Summer 1995. Roane State enrolls about 3,600 students and 317 volunteered for this study. Of the 317 student volunteers, 295 took the math placement test and 281 scored into developmental courses included in the study. Day found a significant relationship between final course grades and COMPASS scores for Elementary Algebra. Conversely, Day found no significant relationship between COMPASS scores and course grades in Intermediate Algebra.

At American River College, Barr, Rasor, and Grill (2002) investigated the relationship between COMPASS scores and course grades in English and math. The researchers had between 50 and 723 student records in their math analysis, between 72 and 461 with reading test scores, and 419 and 1,175 with writing test scores. Using this data, the researchers completed 27 Pearson correlations. Barr et al. (2002) reported,



"Students taking the COMPASS test produce scores that have little or no relationship to final grades in these English writing, reading, mathematics and ESL courses" (p. 43).

In a study conducted at a Midwestern community college, Long (2003) investigated the relationship between methods of placement and course grade. The study included 2,913 first-time students and their math placement scores between Fall 2000 and Spring 2002. Logistic regression was used to find what method of placement from COMPASS, high school GPA, ACT, age, and gender has the strongest relationship with course grades. Long found no relationship between mathematics placement and successful course completion.

Waycaster (2004) conducted a study to compare the success of students placed in developmental courses using COMPASS, ASSET, and a locally created test. Students enrolled in developmental math at Southwest Virginia Community College between Fall 2001 and Summer 2002 were the subjects of the study. The study included 364 students; success was based on final exam scores. Waycaster performed multiple regression to determine how well the placement exams placed students into math courses. He found the ASSET was the only significant predictor of student success for the final exam.

In a study conducted at an Iowa Community College, Owens (2005) compared self-directed placement, a writing sample placement, and COMPASS placement. The study was conducted using data from April through December 2004. Owens began her study with 201 students, but only 117 remained for the entire study. A Pearson correlation was used to analyze the data. While no single placement method was accurate for all students in the study, both COMPASS and a written essay proved reliable as single assessments.

Donovan and Wheland (2008) conducted a study to investigate the relationship between ACT math scores, COMPASS scores, and success in Intermediate Algebra. They conducted their study at a metropolitan university in Ohio. This public institution enrolled 23,000 students. The data they analyzed was from Fall 2004 and Spring 2007. There were 1,694 students in the sample. The researchers used an ANOVA and Tukey HSD tests. A strong relationship between COMPASS scores and student success in Intermediate Algebra emerged. A strong relationship between ACT math scores and student success in Intermediate Algebra occurred.

Self (2010) completed a study of 565 freshmen taking College Algebra at a community college in southeastern Louisiana. He looked at placement and success as well as the difference between a three-hour course and a five-hour course. Self used first-time students enrolling in and completing College Algebra in Fall 2006, 2007, and 2008. Additionally, he studied the effect of demographics including age, gender, and ethnicity. Self used a point biserial correlation matrix to find relationships between COMPASS scores and success in College Algebra. He used discriminant analysis to analyze the multivariate relationships. Finally, he used partial least squares to analyze how the variables affected each other. Through correlation analysis, the results of the study indicated a relationship between COMPASS Algebra scores and success in College Algebra.

In a study conducted in a statewide community college system, Belfield and Crosta (2012) analyzed tests and course grades. The sample for the study was students who took a placement test and enrolled between Fall 2008 and Summer 2010. The community college system studied used over 40 different placement tests including

ASSET and COMPASS. Belfield and Crosta (2012) narrowed the tests studied to two including COMPASS. Replicating the study conducted by Scott-Clayton (2012), Belfield and Crosta (2012) determined, “Placement test scores are not especially good predictors of course grades in developmental education classes” (p. 39). The results of the study indicated high error rates in placement. Belfield and Crosta (2012) share, “Three out of every ten test takers is either assigned to developmental education, despite being predicted to get at least a B in college-level English, or assigned to college-level English, despite being predicted to fail the course” (p. 39). According to Belfield and Crosta (2012), the COMPASS is not a strong predictor of student success in college.

Colvin (2014) analyzed whether ACT, COMPASS, or prerequisite courses were more likely to lead to student success in math. The study was conducted at Snead State Community College, a public, two-year institution located in Alabama. Quantitative methodology and logistic regression were used to determine the influence of age, gender, and ethnicity on success. Data were collected from Fall 2008 through Spring 2013 for 1,521 students enrolled in MTH100 and 682 enrolled in MTH112, but summer terms were excluded from the study. Colvin found that students who completed a prerequisite course were less likely to be successful in math than those placed using an ACT or COMPASS score. Additionally, COMPASS was more accurate in predicting success than the ACT but both were good indicators.

### **The Impact of Remediation**

The impact of remediation is seen in both the cost and the effect it has on students. The cost of remediation is high. Traub (2008) determined the annual cost of

remediation is \$1.9 to \$2.3 billion at community colleges and another \$500 million at four-year colleges. According to Scott-Clayton et al. (2012),

Half of all undergraduates will take one or more remedial courses while enrolled; among those who take any the average is 2.6 remedial courses. With over three million new students entering college each year, this implies a national cost of nearly \$7 billion dollars annually. (p. 1)

The Office of Program Policy Analysis and Government Accountability in Florida (2006), the Arkansas Department of Higher Education (n.d.), and Ohio Board of Regents (2006) reports estimate the cost of developmental education to be tens or hundreds of millions of dollars annually.

Students who enroll in remedial coursework often fail to persist in college. Losak (1982) conducted a study in which retention, graduation, and academic progress were analyzed. The research also analyzed the results of different ethnic groups. Data were drawn from Fall 1980 through Winter 1982 and generated 4,318 students who were full-time, first-time college students. In this study at Miami-Dade Community College, Losak (1982) found that less than 50% of the students who needed remediation returned.

The North Orange County Community College District was experiencing high withdrawal rates, so a Skills Prerequisite System was created to assess student abilities and place students. Fullerton College is located in the North Orange County Community College District. The goal was to reduce drop rates by 5%-10%. After two years, a study was conducted to analyze data from 1982 and determine if the system affected the drop rate. Borst (1984) showed that at Fullerton College, mandatory placement led to a drop rate decrease from 38% to 21%.

Haase and Caffrey (1984) investigated the assessment/advisement/placement process at Sacramento City College in Fall 1983. The study involved 506 students and followed a quantitative approach. The researchers analyzed the method of placement and student success. Methods of placement included prerequisites courses, ACT scores, SAT scores, TOEFL scores, and a college degree. Haase and Caffrey (1984) determined students who followed assessment, advising, and placement guidelines were retained at a higher level.

Oromaner (1985) discovered similar results in a study conducted at Hudson Community College in New Jersey. His study compared information regarding full-time students required to take remedial courses and those not required to take remedial courses. There were 413 students in this study of which 291 need remedial courses and 122 who did not. The study followed the students between Fall 1981 and Fall 1983. Oromaner found that students who needed no remedial courses were more likely to persist in college.

In 1985, the National Center for Educational Statistics (NCES) reported that students also avoid developmental coursework. Additionally, NCES reported that personnel and enrollment systems do not always enforce mandatory placement. Plisko and Stern (1985) reported that only 32% of students who were advised to take a remedial math course actually enrolled in the course.

Roueché and Baker (1987), Grable (1988), and Morante (1989) recommend schools establish mandatory placement policies. Morante (1989) stated, "Placement must be mandatory since it borders on the unethical to know that a student lacks basic skills but is still allowed to enroll in college courses requiring that skill" (p. 2). At Broward

Community College, Gabe (1989) discovered that 46% of those who took remedial courses passed college algebra while only 25% of students who avoided remedial courses passed college algebra. Conlin (1989) showed that 70% of the students who skipped remedial coursework failed their college-level math course. Akst and Hirsch (1991) noted, "The consequences of misplacement can be devastating for the student" (p. 3).

In a study conducted at Southwestern Community College, Conlin (1989) analyzed the persistence of students enrolling in basic grammar and math. Conlin used a random sample of 180 students for the study. These students had failed all or part of their placement test in 1988 or 1989. Many students simply did not register for courses. For the students who skipped a remedial math course, 90% failed or withdrew from the math course they attempted. Conlin (1989) found that 85% of the students required to enroll in basic grammar and 74% of the students required to enroll in basic math failed to persist in college.

Barr and Parker (1989) conducted a study in California at 23 community colleges. The study was conducted between Fall 1988 and 1989. The purpose of the study was to determine student goal satisfaction, retention, and skills acquisition at the colleges. Data were collected from pretests and posttests, surveys, and college records. Ten thousand students were included in the study. The researchers found that student confidence in mathematical ability increased 13% after remediation. Barr and Parker also found that test scores increased between 27% and 98% after remediation.

A similar result was determined by Einspruch and Downing (1990). These researchers conducted a study at Miami-Dade Community College in Fall 1989. These researchers compared demographic information and scores on the ACT, SAT, and

Florida placement tests. Einspruch and Downing (1990) determined that just more than half the students who took remedial math courses completed the courses successfully.

Sworder conducted a study in 1989 at Saddleback College. The study included 1,027 students who took a math placement test between July and August 1988 and who took a math class between Fall 1988 and Fall 1989. Sworder (1990) discovered that 36% of students advised to take a remedial math course enrolled in a higher-level course. Between 36% and 44% of the students successfully completed the course in which they enrolled regardless of the level. Sworder did not analyze the success of students who took a course at a higher level than placement scores indicated.

Adelman (1996) stated, "The extent of a student's need for remediation is inversely related to his or her eventual completion of a degree" (p. A56). Ignash (1997) presented results from the High School and Beyond Study that showed students who take more than one remedial course are less likely to succeed than those who take one remedial course. Of the students taking no remedial courses, 43.5% earned a degree by the age of thirty. Ignash (1997) stated, "Only 8% who took more than four remedial courses and 13% who took three or four remedial courses" earned a degree by 1993 (p. 12).

Critics contend that students become demotivated by remedial coursework and fail to complete their academic goals (Deil-Amen & Rosenbaum, 2002; Rosenbaum, 2011). Deil-Amen and Rosenbaum (2002) conducted a study using data from two Midwestern community colleges. Both colleges were located in large urban areas in Illinois. The researchers conducted interviews with students, faculty, and administrators. The researchers observed daily life at the colleges, reviewed college catalogs, and

administered a student survey. One author interviewed more than 130 students and 54 staff. Together, the researchers surveyed 804 students at the two colleges regarding goals, attitudes, experiences, and perceptions. The researchers stated, "Our study highlighted the possibility that the stigma free approach may represent a more subtle form of blocked opportunity" (p. 16). Deil-Amen and Rosenbaum (2002) found, "A stigma-free approach may be contributing to students dropping out of college altogether and hence accumulating no credentials rather than a lesser degree" (p. 16).

Bettinger and Long (2005) examined 13 years of longitudinal data collected by the Ohio Board of Regents beginning in 1998. The researchers used regression analysis to compare students of similar backgrounds and levels of preparation rather than all students. Bettinger and Long (2005) found,

Students who were placed in math remediation were found to be 15% more likely to transfer to a four-year college than students with similar test scores and high school preparation who attended colleges with policies that did not require placement in remedial courses (p. 24).

Students who took remedial math classes dropped out or graduated at the same rate as those who were prepared for college-level work. The differences for students in remedial English were not significant. Bettinger and Long (2005) showed that remediation has a positive impact on student retention rates.

According to Attewell et al. (2006), 68% of students pass all of the developmental writing courses in which they enroll. Similarly, 71% pass all of the developmental reading courses. Unfortunately, only 30% pass all of the developmental math courses. Less than 25% of community college students required to enroll in developmental classes



completes a degree or certificate within eight years (Attewell et al., 2006). Duranczyk and Higbee (2006) shared, "The majority of [students] who start out at a two-year institution never receive a baccalaureate degree" (p. 1). Attewell et al. (2006) conducted a study of NELS data and showed that taking some remedial or developmental coursework did not result in lower chances of earning a two-year degree. Furthermore, the results of the study showed that students who take remedial courses in three areas are also just as likely to graduate with a two-year degree. Attewell et al. (2006) also determined that students who completed remedial reading courses were 11% more likely to earn a degree. For students who take two or more remedial math courses, the chance of completing a degree is 3% lower. For students taking remedial courses in writing, they are more likely to graduate with a degree. Students who complete remedial coursework are more likely to complete gateway courses successfully.

Calcagno and Long (2008) conducted a study that analyzed student age and remediation. Using the records of 100,000 college students in Florida, Calcagno and Long implemented a regression discontinuity design to look at the effect of remedial coursework on success in college-level work, credit accumulation, and degree or certificate completion. Calcagno and Long found that remedial coursework in math slightly increased persistence to the second year of college but not persistence to graduation.

Donovan and Wheland (2008) analyzed the records of 1,694 students who completed Intermediate Algebra between Fall 2004 and Spring 2007 at a public, metropolitan, open-enrollment university in Ohio. Donovan and Wheland determined that women succeeded more often than men did in completing a developmental math

course. The results of their study indicated that for Intermediate Algebra, the ACT and COMPASS are more likely to predict success for a male student than for a female student. Donovan and Wheland (2008) determined that students who completed a developmental math course succeed at a 50% higher rate than those who placed directly into the course.

Rosenbaum (2011) used data from the High School and Beyond (1992) survey and the National Education Longitudinal Studies (2000) to show, "That 80% of low-achieving seniors with college plans will fail to get any degree in the next 8 to 10 years" (p. 2). Rosenbaum theorized that schools failed to prepare students for the reality of college. For example, students are not aware of the need for and importance of placement testing. Students have inflated expectations due to a lack of information and understanding. As a result, many do not complete a credential, degree, or even college-level courses.

Jenkins et al., (2009) conducted a study in the Virginia Community College system. Jenkins et al. (2009) determined that "Over one-third of those recommended to developmental education in a given subject did not take any developmental courses in that subject" (p. 2). Jenkins et al. (2009) also discovered, "Among those who did enroll in gatekeeper courses, pass rates were fairly high" (p. 8) and "Gatekeeper course pass rates also did not vary strongly by whether or not students complied with their developmental course recommendation" (p. 9).

Among the reasons students fail to enroll in remedial courses, one finds both student and faculty attitudes about developmental coursework. Perin (2006) conducted a qualitative case study with students, faculty, advisors, and administrators from 15

community colleges in six states. Researchers visited each college and interviewed students, faculty, advisors, and administrators. The researcher interviewed 630 people for one hour each. The project resulted in 458 interview transcripts. Of these, 290 transcripts were selected for the study. Key terms were coded from the interviews. Through the analysis of interview transcripts, Perin showed that faculty and advisors worked together to help students avoid developmental courses.

### **The Completion Agenda**

Community college students often struggle to complete their programs. Only 27.5% of the first-time, full-time degree or certificate-seeking students at community colleges completed their program within 150% of the time required in 2005 (Snyder & Dillow, 2012). For comparison, 58.8% of first-time, full-time degree-seeking students at universities completed their program within 150% of the time required in 2005 (Snyder & Dillow, 2012).

Progressively, governments and non-profit organizations have made increasing college success part of their agendas. President Obama brought the issue of completion to the forefront in 2009 during an address to Congress (The White House, 2009) when he set a goal of degree completion as a national priority and said, “By 2020, America will once again have the highest proportion of college graduates in the world.” According to a state-level official in North Carolina quoted in Hodara et al. (2012),

The registration agenda has given way to the completion agenda and success agenda, and so that means we have a little room to change that foolish policy of having students do everything all in one stroke. We put some money into the advisement of students and assessment of students, investing on the front end so

that students can be properly placed, saving money for colleges and students later.  
(p. 27)

The president is not alone in focusing on completion.

In its Strategic Plan, the Lumina Foundation for Education (2009) made degree completion its big goal. The Lumina Foundation for Education (2009) stated the foundation's goal as, "To increase the percentage of Americans with high-quality degrees and credentials from the longstanding rate of 39 percent to 60 percent by the year 2025" (p. 1). Other philanthropic organizations such as the Gates Foundation also contribute to innovative programs that lead to student success.

The state of Kansas is also focusing on degree and credential completion. In September 2010, the Kansas Board of Regents (KBOR) released its strategic plan for the next ten years (Kansas Board of Regents, 2015). KBOR named its plan *Foresight 2020*. Originally, *Foresight 2020* had six goals, but the number of goals was reduced in 2012. According to the KBOR website, the first of the three goals is to, "Increase Higher Education Attainment among Kansans" (KBOR, 2015). KBOR (2015) wants to, "Increase to 60 percent the number of Kansas adults who have earned a certificate, associate or bachelor's degree by 2020" (p. 1). Each year, KBOR provides a *Foresight 2020* progress report. Each college and university that is coordinated by or reports to KBOR have increasing degree and credential completion as a goal in its performance agreement. Each year, KBOR considers new funding for the colleges and universities based on the completion of performance agreement goals. Colleges that fail to meet their goals may receive lower funding.

**Summary**

This chapter related the role of the community college and information about students who attend community colleges. Literature related to community college students and their level of preparation was shared. The successes and failures of remedial education, the history of placement testing, and studies related to the accuracy of placement testing and placement policies were reviewed. Information about placement tests used by colleges and the predictive validity of placement tests were included. The impact of remediation on students was discussed. Finally, the completion agenda was described. The methodology used in this study is addressed in chapter three.

## **Chapter Three**

### **Methods**

The purpose of this study was to determine if there was a relationship between method of placement and student success in College Algebra (MAT105) and English Composition I (COL101). A second purpose was to determine to what extent age, gender, or method of course delivery affected student success in these courses. Chapter three includes the methodology used in conducting this study. This chapter provides an explanation of the research design, population, and sampling procedures as well as a description of the instrumentation, including measurement, validity, and reliability. Information regarding data collection is included. Finally, contained in this chapter is an explanation of data analysis and hypothesis testing and limitations of the study.

#### **Research Design**

This quantitative, descriptive study used archived data collected from the Jenzabar student information system at Allen Community College. According to Aliaga and Gunderson (2002), quantitative research is, "Explaining phenomena by collecting numerical data that are analyzed using mathematically based methods (in particular statistics)" (p. 81). According to Lunenburg and Irby (2008), a descriptive study looks to "describe phenomena in our world" (p. 30), and these studies, "are important to the public and to educators" (p. 31).

For this study, the dependent variable was success and was defined by course grade. Grades of A, B, C, and P were defined as successful completion. Grades of D, F, I, and W were considered unsuccessful completion. The independent variable for this study included the method of placement (ACT scores, ASSET scores, COMPASS scores,

successful completion of the prerequisite course, or waiver). Independent variables also included student age, gender, and mode of course delivery.

### **Population and Sample**

The population for this study was community college students. The sample was students who attended Allen Community College. Approximately 3,000 students attend Allen Community College each semester (Allen Community College, 2012). From this number, the study focused on students who completed College Algebra (MAT105) or English Composition I (COL101) for the first time who earned a course grade. The sample for the College Algebra (MAT105) portion of the study was students who earned a course grade in College Algebra (MAT105) for the first time at Allen Community College from Spring 2003 through Summer 2013. The sample for the English Composition I (COL101) portion of the study was students who earned a course grade in English Composition I (COL101) for the first time at Allen Community College from Spring 2003 through Summer 2013.

### **Sampling Procedures**

This study used purposive sampling. According to Lunenburg and Irby (2008), "Purposive sampling involves selecting a sample based on the researcher's experience or knowledge of the group to be sampled" (p. 175). Student completion of College Algebra (MAT105) or English Composition I (COL101) at Allen Community College between Spring 2003 and Summer 2013 served as the first criteria for inclusion in the study. A second criterion of the study narrowed the sample to students who completed the course under placement guidelines adopted in 2002. The third criteria of the study narrowed the sample to only the first attempt to complete the course by a student. The third criteria

considered the method of placement for College Algebra (MAT105) or English Composition I (COL101). Methods of placement used at Allen Community College include ACT scores, ASSET scores, COMPASS scores, completion of prerequisite courses, and waivers. Students who qualified using an SAT score were omitted.

### **Instrumentation**

According to Lunenburg and Irby (2008), instrumentation describes, "The psychometric adequacy of the instruments used in a study" (p. 181). Lunenburg and Irby (2008) also noted that researchers should provide key information for each instrument including the name, acronym, authors, key references, purpose, number of items, subtests or subscales, definitions, response format, scoring, reliability, and validity. Instruments used in this study include the ACT, COMPASS, and ASSET tests.

### **Instrumentation: ACT**

ACT (2014) provides background information about the ACT, which colleges have used as an admissions test since 1959. ACT (2014) reported that three million students take the ACT each year and three thousand institutions use it for admission. The ACT includes multiple-choice English, mathematics, reading, and science tests. According to ACT (2014), the English test determines knowledge of punctuation, grammar, usage, sentence structure, strategy, organization, and style. The mathematics test includes algebra, geometry trigonometry subtests. Based on the information presented by ACT (2014), the reading test was designed to assess reading comprehension and reasoning. According to ACT (2014), the science test measures the ability of the student to interpret, analyze, evaluate, reason, and solve problems with questions from subjects including biology, chemistry, physics, earth science, and space science. Table 1



provides information regarding the number of items and time allowed for each ACT subtest.

Table 1

*ACT Subtest Information*

Test	Number of Items	Time Allowed
English	75	45
Mathematics	60	60
Reading	40	35
Science	40	35

*Note:* Adapted from ACT Technical Manual (2014)

ACT (2014) claims test specifications are based on content and statistical criteria.

Students who take the ACT receive a score in each category as well as a composite score between 1 and 36.

**Instrumentation: COMPASS**

ACT (2012) indicated COMPASS was developed between 1985 and 1989. ACT set the technical and content guidelines for the exam in 1990 (ACT, 2012). According to ACT (2012), working groups developed items for the reading, writing, and math tests. ACT included counselors, staff, and faculty in the working groups. Stakeholders requested that COMPASS provide both placement and diagnostic information (ACT, 2012).

Working groups determined what content would be most relevant for each area. The groups reviewed catalogs from colleges to gather information about remedial, college-level, and advanced courses (ACT, 2012). As the working groups developed test items, ACT subjected the items to internal and external review (ACT, 2012).

Internal review involves looking at each question for fairness, content, accuracy, and quality (ACT, 2012). Revisions occurred as the process progressed. Each item, according to ACT (2012), was also reviewed to ensure there was only one right answer, that answer options were convincing, and at the appropriate cognitive level. ACT also reviewed each item to ensure it represented society accurately (ACT, 2012).

Consultants completed an external review in 1992 (ACT, 2012). According to ACT (2012), external reviewers represented African Americans, Asian Americans, Hispanics, Native Americans, and women. Advocacy groups were included in the process. ACT conducted conference calls with the group members to ensure items were appropriate. ACT then decided to remove items, revise items, or leave items (ACT, 2012). According to ACT (2012), a second external review occurred in 1997 following the same process as the original development.

ACT used placement validity indices to estimate the probability of student success in courses (ACT, 2012). ACT (2012) reported that the company looked at the percentage of students who scored below the cutoff and would have failed, the percentage who scored below the cutoff and would have succeeded, the percentage who scored at or above the cutoff and succeeded, and the percentage who scored at or above the cutoff and failed. According to ACT (2012), ACT determined the sum of correctly placed students to determine validation. COMPASS varies between 59% and 72% accuracy for students earning a C or better (ACT, 2012).

According to ACT (2012), colleges have used the COMPASS since 1993. The COMPASS is a computer-adaptive test made up of five mathematics levels, reading, and writing (ACT, 2012). Within mathematics, the COMPASS tests numerical skills/pre-

algebra, algebra, college algebra, trigonometry, and geometry. Based on information provided by ACT (2012), the numerical skills/pre-algebra test has a pool of over 300 questions covering basic arithmetic to exponents, absolute values, and percentages. Students who do well on the numerical skills questions, claims ACT (2012), move up to the algebra test. The algebra portion of the mathematics test includes 300 questions covering elementary algebra, coordinate geometry, and intermediate algebra.

ACT (2012) indicated that the college algebra portion of the COMPASS has a pool of 210 questions and covers functions, matrices, and factorials. Students who do well on the college algebra portion of the test move on to the geometry test. The geometry test covers geometry and spatial reasoning with a pool of 178 questions (ACT, 2012). ACT (2012) specifies the trigonometry test assesses understanding of trigonometry and problem solving with 146 questions in the pool.

The reading test consists of a pool of 71 passages of about 300 words each from prose, fiction, humanities, social sciences, natural sciences, and practical reading. For each passage, ACT (2012) claims there are up to five test questions. The total number of items a student receives during any given attempt is based on how many questions the student answers correctly and incorrectly. If a student answers questions correctly, the student receives questions that are more difficult. The process continues until the student begins to miss questions. When the student misses a certain number of questions, the student receives easier questions. The test ends when the student cannot answer the more difficult questions correctly and has proven mastery on the level below.

The writing skills COMPASS test, covers grammar, usage, mechanics, and rhetorical skill with a pool of 228 multiple-choice questions. Software routes the students

through the test so each test taker may take a different amount of time to complete the test. The COMPASS test report provides scores in each category and a course recommendation based on the profile set up by the institution.

**Instrumentation: ASSET**

ACT (2009) developed the ASSET placement test in 1982 to assist the Los Angeles Community College District with retention and other objectives. By 1983, community and technical colleges all over the United States were able to use ASSET. Between 1986 and 1988, ACT revised ASSET to meet the needs of community colleges in placement better. According to ACT (2009), they introduced the ASSET test form used by Allen Community College in 1989. ACT conducted tests at 23 institutions to norm the test.

Several different forms of the ASSET placement test exist. Each form of the ASSET placement test consists of several subtests. The ASSET subtests used by Allen Community College include the writing skills, reading skills, numerical skills, elementary algebra, intermediate algebra, and college algebra assessments (Allen Community College, 2012). The writing skills test entails answering 36 multiple-choice questions covering usage and mechanics, sentence structure, and rhetorical skills. The student is allowed 25 minutes to test. The reading skills test entails answering 24 multiple-choice questions covering reading comprehension. The numerical skills test contains 32 multiple-choice questions covering arithmetic and pre-algebra. The elementary algebra test consists of 25 multiple-choice questions covering expressions, factoring, polynomials, exponents, and linear equations. According to ACT, the intermediate algebra test consists of 25 multiple-choice questions covering polynomials, graphs,

radicals, and slope. The college algebra test consists of 25 multiple-choice questions covering exponential functions, factorials, complex numbers, and graphs of polynomials (ACT, 2009).

ASSET development, based on information provided in ACT (2009), included curriculum surveys at hundreds of schools across the country. Advisory panels also met to provide input. Writers, from institutions all over the United States, then developed questions based on the guidelines set by ACT. ACT staff reviewed the items submitted by writers for accuracy, quality, language, and cognitive level. Reviewers from outside ACT then reviewed the exam for soundness and fairness. The review of soundness included instructions, content, knowledge, and skill level. The fairness review considered multicultural perspectives and included advice from advocacy groups for several different subgroups. Fairness reviews included groups of African Americans, Asian Americans, Hispanic Americans, Native Americans, and women.

ACT also used analysis of differential functioning (DIF) as part of its product development. ACT (2009) stated, "A DIF analysis compares the performance of a focal (minority) group against a relevant base (majority) group" (p. 13). Members of each group are chosen who have similar abilities based on the test score. ACT used the Mantel-Haenszel common-odds ratio to compare the results of the two groups. ACT compared data for 4,154 students at sixteen colleges in the United States in Fall 1991 to complete DIF analysis on the Advanced Mathematics tests. For the Basic Skills Tests, the company used 444 comparisons. Nine items were flagged out of 148 based on the data.

ACT also reviews item discrimination. According to ACT (2009), item discrimination is, "the degree to which an item differentiates between students who performed well on the total test and those who did not" (p. 15). ACT (2009) explains, "Correlations near zero indicate that the test did not discriminate well between able and less able examinees" (p. 15). "Correlations between .40 and .80 indicate that the test distinguishes well between able and less able examinees" (ACT, 2009, p. 15).

### **Cut Scores and Placement Policy**

Each school sets cut scores for placement tests. Table 2 provides a breakdown of the cut scores required by Allen Community College on the various placement tests in writing and reading for students to enroll in English Composition I (COL101). Students must meet placement requirements in both writing and reading for English Composition I. Students may also place into English Composition I (COL101) by passing a prerequisite course in an area in which they have a deficiency. For a writing deficiency, students take Pre-Composition and must earn a C or higher to progress to English Composition I. Students with a reading deficiency must pass Intermediate Reading with a C or higher before enrolling in English Composition I. Students may also enroll in English Composition I (COL101) using a waiver.

Table 2

*Allen Community College Placement Scores for English Composition I (COL101)*

Placement Method	Writing Score Needed	Reading Score Needed
ACT	16 or above	16 or above
COMPASS	55 or above	73 or above
ASSET	41 or above	39 or above

*Note:* Adapted from Allen Community College 2012-2013 Catalog (2013)

Table 3 provides a breakdown of the cut scores required on the various standardized placement tests in math for students to enroll in College Algebra (MAT105). Because the names and procedures for the mathematics tests vary, some titles are not applicable to certain tests. The abbreviation "NA" was included in the table below where items are not applicable due to test name and administration differences. Students may also place into College Algebra (MAT105) by passing Intermediate Algebra (MAT020) with a C or higher or by obtaining a waiver from the appropriate dean.

Table 3

*Allen Community College Placement Scores for College Algebra (MAT105)*

Placement Method	Intermediate Algebra	Algebra	College Algebra
ACT	NA	20 or above	NA
COMPASS	NA	50-100	0-43
ASSET	39 or above	NA	NA

*Note:* Adapted from Allen Community College 2012-2013 Catalog (2013)

**Measurement.** In the Allen Community College catalog, student success is defined as course completion with a C or higher or a grade of Pass. For research questions 1, 2, 3, and 4 the course grade in College Algebra (MAT105) was determined to be successful for grades of A, B, C, and P. Grades of D, F, I, and W were determined to be unsuccessful. The method of placement variable was measured categorically, and there were six categories. For all research questions, the method of placement included ACT, SAT, ASSET, COMPASS, completion of the prerequisite course, or waiver. For age, the variable was measured categorically, and there were two categories. Age was based on the self-reported birth date listed on the student's application for admission. For research questions 2, 6, and 8, the traditional/non-traditional status of students was determined by considering students age 24 and over as non-traditional. All students whose ages were under 24 were considered traditional. These categories are based on the same definition used by the National Center for Education Statistics (2011). For gender, the variable was measured categorically, and there were two categories. For research questions 3, 7, and 9, the determination of gender (male or female) was based on information reported by students on their application for admission. For Research Questions 5, 6, 7, and 8 the course grade in English Composition I (COL101) was defined as successful for grades of A, B, C, and P. Grades of D, F, I, and W was defined as unsuccessful.

Delivery mode of courses varies by location. The course delivery mode was measured categorically, and there were four categories. For research question 4, 8 and 10, the determination of delivery mode (Burlingame/Outreach, Iola, online, concurrent), for each student, was found in the data file in the course section code from the CARS



system. Class meetings vary from one time per week on the Burlingame Campus in a three-hour block, two times per week on the Burlingame Campus in two ninety-minute sessions, three times per week on the Iola Campus for fifty-five minutes, or two times per week on the Iola Campus for eighty-five minutes. During summer sessions, these courses may be offered four days a week for three hours a day during a four-week session or for three hours a day twice a week for eight weeks. Partner high schools offer these courses on the block schedule or period schedule. Allen Community College also offers College Algebra (MAT105) and English Composition I (COL101) online in eight-week and sixteen-week sessions. The category concurrent means classes delivered by a teacher employed by the high school, taught during the high school day, and taught at the high school in accordance with the high school schedule. The category Burlingame/Outreach describes classes delivered off campus at outreach sites or the Burlingame Campus and offered based on the site schedule. The category online describes a course offered asynchronously through distance education. The category Iola refers to a course taught at the Iola Campus and based on its schedule.

**Validity and reliability.** According to Lunenburg and Irby (2008), "Validity is the degree to which an instrument measures what it purports to measure" (p. 181). This study was based on the assumption that the ACT, COMPASS, and ASSET are reliable, which has been verified by the test providers. ACT has spent a great deal of time and effort making sure its tests are reliable and valid. Validity can be classified as content validity, criterion-related validity, and construct validity. According to Lunenburg and Irby (2008), "Content validity is the degree to which an instrument measures an intended content area," and, "is determined by expert judgment" (p.181). Criterion-related validity

is classified as concurrent and predictive forms. Concurrent validity refers to the relationship between scores on two tests like the ASSET and COMPASS. Predictive validity addresses the ability of an instrument to predict success in some future endeavor. Finally, Lunenburg and Irby (2008) shared that construct validity, "deals with what the instrument is really measuring" (p. 182). Construct validity is evidence that the instrument measures what is it supposed to measure.

The validity of the ASSET exam can be determined several ways. One method utilized was correlation coefficients. This method looks at the relationship between test scores and course grades. Placement validity indices are a second method of looking at the validity of placement. "This method," according to ACT (2009), "uses placement validity indices generated from logistic regression models and distributions of placement variables (e.g., test scores) to determine placement effectiveness" (p. 42). ACT (2009) recommended institutions conduct their own validity studies to determine appropriate cut scores.

ACT (2012) provided information regarding the validity of the COMPASS placement exam. ACT provided information using, "Placement validity indices generated from logistic regression models and distributions of predictor variables to determine placement effectiveness" (p. 19). ACT researchers estimated the likelihood of a student earning a grade of B or C. Researchers look at four possibilities. First, researchers looked at, "The percentage of students who scored below the cutoff who would have failed the standard course had they enrolled in it" (p. 20). Second, researchers looked at, "The percentage of students who scored below the cutoff who would have succeeded in the standard course had they enrolled in it" (p. 20). Third,

researchers considered, "The percentage of students who scored at or above the cutoff who actually succeeded in the standard course" (p. 20). Finally, the researchers considered, "The percentage of students who scored at or above the cutoff who actually failed in the standard course" (p. 20). Using these four criteria, researchers calculated the percentage of students who were placed correctly for a certain cut score that is the accuracy rate.

Using data gathered through ACT Placement Services, ACT analyzed placement tests administered beginning in Fall 1993 and compared student success in courses to COMPASS scores to determine predictive validity. ACT reviewed student success, defined as a C or B or higher, in classes including English Composition and College Algebra. For students who took the COMPASS between January 1995 and November 2001 in classes with at least 40 enrolled, students who met the Writing cut-score had a 19% greater chance of getting a B. Students who met the Reading cut-score had a 10% greater chance of getting a B. Students who met the Intermediate algebra cut-score had a 25% greater chance of getting a B and students who met the College algebra cut-score had a 43% greater chance of getting a B. For students who took the COMPASS between January 1995 and November 2001 in classes with at least 40 enrolled, students who met the Writing cut-score had a 2% greater chance of getting a C. Students who met the Reading cut-score also had a 2% greater chance of getting a C. Students who met the Intermediate algebra cut-score had a 5% greater chance of getting a C and students who met the College algebra cut-score had a 20% greater chance of getting a C.

ACT (2014) addressed how the test maker determined the content validity or the degree to which the instrument measured an intended content area. ACT used panels of

secondary and postsecondary instructors to determine content that reflects the first year college curriculum. According to ACT (2014), "Students with higher ACT scores should be more successful than students with lower ACT scores" if the content is valid (p. 116). ACT used grades from courses at over 100 colleges to study validity. ACT used logistic regression models to determine the likelihood that a student would earn a B or higher in a course for courses with 40 or more students to determine an accuracy rate for each test. For math placement, use of ACT scores resulted in a 24% greater success rate in College Algebra and a 25% greater success rate in composition. ACT used this information to indicate that the test had content reliability or measured the intended content area.

According to Lunenburg and Irby (2008), "Reliability is the degree to which an instrument consistently measures whatever it is measuring" (p. 182). Reliability is classified into five different types: test-retest reliability, equivalent forms reliability, internal consistency reliability, alpha reliability, split-half reliability, and interrater reliability. Test-retest reliability looks at whether or not scores are consistent on an instrument. Equivalent forms reliability refers to the similarity between versions of an instrument. Internal consistency reliability is measured by split half reliability, alpha reliability, and interrater reliability. Lunenburg and Irby (2008) defined split-half reliability as, "breaking a single instrument into two halves" (p. 183). Subjects take both halves of a test then the odds and evens are divided so the score on each part can be compared to the other part. For Kuder-Richardson and Cronbach's Alpha Reliabilities, Lunenburg and Irby (2008) instructed us to consider, "How all items on an instrument relate to all other instrument items and to the total instrument" (p. 183). Interrater

reliability is considered when an instrument has answers that different graders might rate differently.

ACT (2009) included reliability information for the ASSET exam using internal consistency, test-retest, and consistency of scores on equivalent forms in the ASSET Technical Manual. The first measure of internal consistency was the Kuder-Richardson Formula (KR-20). According to ACT (2009), this measure indicated how well "each item on an exam relates to all other items on the test and to the test as a whole" (p. 18). ACT (2009) indicated, "KR-20 reliabilities can range from 0.0 and +1.0, with higher numbers indicating greater reliability" (p.18). According to ACT (2009), Forms B2 and C2 have KR-20 internal consistency reliabilities from .65 to .87.

The second measure of reliability used for ASSET evaluation was the standard error of measurement (SEM). According to ACT (2009), "The SEM provides information about the difference that could be expected between a student's obtained score and the average score that student would earn if he or she could be tested an infinite number of times under identical circumstances" (p. 18). According to ACT (2009), SEM scores for Forms B2 and C2 ranged from 2.24 to 3.84 in the companies reliability testing.

The third evaluation of reliability for ASSET was the test-retest reliability. According to ACT (2009) one can "administer the same test to the same examinees at two different points in time and compare the rank ordering of the examinees for the two administrations" (p. 19). ACT asked 1,047 examinees to take the ASSET twice with three weeks between the test and retest. The test-retest correlations ranged from .76 to .90, which indicated reliability between the two test dates.

ACT also investigated the reliability of equivalent forms of the ASSET. For this test, subjects take two forms of the same test and scores are compared. According to ACT (2009), reliability for Forms B2 and C2 ranged from .73 to .88 for tests taken on the same day and .66 to .86 for tests given two weeks apart. This result indicated the ASSET provides reliable results.

Reliability is a challenge for a computer adaptive test such as the COMPASS. Individuals taking the exam access different test items and numbers of questions. According to ACT (2012), "In an adaptive test, the examinees are measured with a slightly different reliability, which aligns with the items administered" (p. 4). Based on information in the reference manual, "The marginal reliability coefficient usually reported for adaptive tests takes this variation into account by averaging the reliabilities across examinees" (ACT, 2012, p. 4). Simulations can also be used to determine a marginal reliability coefficient. Data from the simulations can be compared to actual test results to evaluate the results. According to ACT (2012), "The slight tradeoff between test length and test reliability is that longer tests are more reliable than shorter tests" (p. 4). ACT (2012) reported the reliability of its Mathematics, Reading, and Writing tests in the technical manual. For the standard length test in mathematics placement, reliability varied from .86 to .88. For the extended length test, the reliability varies from .87 to .89. For the maximum length, reliability varied from .88 to .90. For the test in Reading placement, the reliability varied from .87 on the standard length test to .90 on the maximum length test. For the test in writing placement, reliability varied from .88 on the standard length exam to .90 on the maximum length exam.

According to ACT (2012), the conditional standard error of measurement (CSEM) provides, "a more useful indicator of score precision" (p. 7). According to ACT (2012), "The CSEM can be estimated for different values across the score scale, thereby helping users interpret likely reliability throughout the score scale" (p. 7). ACT provided CSEM information for each of the COMPASS placement tests. ACT (2014) listed the reliability of the ACT English test as .92, the Mathematics test as .90, and the reading test as .88 for exams given to high school seniors in 1995. For high school seniors who tested in 2011 and 2012, the reliability of the ACT English test was listed as .92, the reliability of the ACT mathematics test was listed as .91, and the reliability of the ACT Reading test was listed as .88. For the 2011-2012 data, ACT used groups of 2,000 or more students at six different test administrations. The average standard error of measurement for the 2011-2012 tests was between 1.72 and 1.74 for the English test, between 1.50 and 1.60 for the mathematics test, and between 2.09 and 2.21 for the reading test.

ACT expended considerable effort to prove the validity of the ACT, ASSET, and COMPASS. For ASSET, ACT provided evidence of validity using correlation coefficients and placement validity indices. For COMPASS, ACT provided evidence of validity using placement validity indices and content validity. For the ACT, content validity was used to show test validity. For the ASSET reliability studies, ACT used internal consistency, standard error of measurement testing, test-retest reliability, and the reliability of equivalent forms to demonstrate reliability. For COMPASS, ACT demonstrated the reliability of the test through marginal reliability coefficients, simulations, and standard error of measurement. The ACT demonstrated reliability for the ACT assessment using standard error of measurement.

## **Data Collection Procedures**

The Vice President for Academic Affairs at Allen Community College granted the researcher permission to work with the Director of Information Technology to extract the data for this study from the student information system on March 12, 2012 (see Appendix A). Permission to complete this study was requested on October 14, 2015, from the Baker University Institutional Review Board (see Appendix B). The Institutional Review Board at Baker University approved this study on October 21, 2015 (see Appendix C).

The Director of Information Technology extracted all data from the Jenzabar student information system at Allen Community College and downloaded the data into Excel spreadsheets. The data harvested from the student information system included the method of student placement, age, gender, course section, instructor, and final grade for students in both College Algebra (MAT105) and English Composition I (COL101).

## **Data Analysis and Hypothesis Testing**

Each hypothesis in the research study was tested using a  $\chi^2$  test of independence. Data was analyzed using IBM<sup>®</sup> SPSS<sup>®</sup> Statistics Faculty Pack 22 software for Windows.

**RQ1.** To what extent is there a relationship between how a student meets the math placement requirement for College Algebra (MAT105) and student success?

**H1.** There is a relationship between how a student meets the math placement requirement for College Algebra (MAT105) and student success.

A  $\chi^2$  test of independence was conducted to test H1. The observed frequencies were compared to those expected by chance. The level of significance was set at .05.



**RQ2.** To what extent is the relationship between how a student meets the math placement requirement for College Algebra (MAT105) and student success affected by age?

**H2.** The relationship between how a student meets the math placement requirement for College Algebra (MAT105) and student success is affected by age.

Two  $\chi^2$  tests of independence were conducted to test H2 after disaggregating the data by age. The observed frequencies were compared to those expected by chance. The level of significance was set at .05.

**RQ3.** To what extent is the relationship between how a student meets the math placement requirement for College Algebra (MAT105) and student success affected by gender?

**H3.** The relationship between how a student meets the math placement requirement for College Algebra (MAT105) and student success is affected by gender.

Two  $\chi^2$  tests of independence were conducted to test H3 after disaggregating the data by gender. The observed frequencies were compared to those expected by chance. The level of significance was set at .05.

**RQ4.** To what extent is the relationship between how a student meets the math placement requirement for (College Algebra) MAT105 and student success affected by course delivery mode?

**H4.** The relationship between how a student meets the math placement requirement for College Algebra (MAT105) and student success is affected by course delivery mode.

Four  $\chi^2$  tests of independence were conducted to test H4 after disaggregating the data by course delivery mode (Burlingame/Outreach, Iola, online, concurrent). The observed frequencies were compared to those expected by chance. The level of significance was set at .05.

**RQ5.** To what extent is there a relationship between how a student meets the writing placement requirement for English Composition I (COL101) and student success?

**H5.** There is a relationship between how a student meets the writing placement requirement for English Composition I (COL101) and student success.

A  $\chi^2$  test of independence was conducted to test H5. The observed frequencies were compared to those expected by chance. The level of significance was set at .05.

**RQ6.** To what extent is the relationship between how a student meets the writing placement requirement for English Composition I (COL101) and student success affected by age?

**H6.** The relationship between how a student meets the writing placement requirement for English Composition I (COL101) and student success is affected by age.

Two  $\chi^2$  tests of independence were conducted to test H6 after disaggregating the data by age. The observed frequencies were compared to those expected by chance. The level of significance was set at .05.

**RQ7.** To what extent is the relationship between how a student meets the writing placement requirement for English Composition I (COL101) and student success affected by gender?

**H7.** The relationship between how a student meets the writing placement requirement for English Composition I (COL101) and student success is affected by gender.

Two  $\chi^2$  tests of independence were conducted to test H7 after disaggregating the data by gender. The observed frequencies were compared to those expected by chance. The level of significance was set at .05.

**RQ8.** To what extent is the relationship between how a student meets the writing placement requirement for English Composition I (COL101) and student success affected by delivery mode?

**H8.** The relationship between how a student meets the writing placement requirement for English Composition I (COL101) and student success is affected by course delivery mode.

Four  $\chi^2$  tests of independence were conducted to test H8 after disaggregating the data by course delivery mode. The observed frequencies were compared to those expected by chance. The level of significance was set at .05.

**RQ9.** To what extent is there a relationship between how a student meets the reading placement requirement for English Composition I (COL101) and student success?

**H9.** There is a relationship between how a student meets the reading placement requirement for English Composition I (COL101) and student success.

A  $\chi^2$  test of independence was conducted to test H9. The observed frequencies were compared to those expected by chance. The level of significance was set at .05.

**RQ10.** To what extent is the relationship between how a student meets the

reading placement requirement for English Composition I (COL101) and student success affected by age?

**H10.** The relationship between how a student meets the reading placement requirement for English Composition I (COL101) and student success is affected by age.

Two  $\chi^2$  tests of independence were conducted to test H10 after disaggregating the data by age. The observed frequencies were compared to those expected by chance. The level of significance was set at .05.

**RQ11.** To what extent is the relationship between how a student meets the reading placement requirement for English Composition I (COL101) and student success affected by gender?

**H11.** The relationship between how a student meets the reading placement requirement for English Composition I (COL101) and student success is affected by gender.

Two  $\chi^2$  tests of independence were conducted to test H11 after disaggregating the data by gender. The observed frequencies were compared to those expected by chance. The level of significance was set at .05.

**RQ12.** To what extent is the relationship between how a student meets the reading placement requirement for English Composition I (COL101) and student success affected by course delivery mode?

**H12.** The relationship between how a student meets the reading placement requirement for English Composition I (COL101) and student success is affected by course delivery mode.

Four  $\chi^2$  tests of independence were conducted to test H12 after disaggregating the data by course delivery mode. The observed frequencies were compared to those expected by chance. The level of significance was set at .05.

### **Limitations**

According to Lunenburg and Irby (2008), the limitations of a study are factors that are not controlled by the researcher. Limitations can affect the interpretation of results or the generalizability of the results (Lunenburg & Irby, 2008). The limitations of this study included

1. Data extracted from the student information system may include errors. College employees processing student applications and entering placement scores may make data entry errors or typographical errors that would impact the data used in this study.
2. The Director of Information Technology could have extracted incorrect data fields from the student information system, which could result in bad data.
3. Instructors may grade work and assign grades differently. For example, some instructors may award partial credit and others may not. Instructors set their grading scales. One instructor might consider a 69.5 a "C" and a successful completion while others may consider it a "D" and unsuccessful completion. According to Cronbach (1971), "If teachers use different bases for judgment and some are more generous than others, throwing grades from several algebra teachers into a single distribution merely piles one source of error upon another" (p. 491). Armstrong (2001) found, "A relatively high degree of variation in grading practices by instructors" (p. 13).

4. Other factors might affect student success in a course. Students may have accessed tutoring services from the college or an outside entity. Students may have spent varying amounts of time on coursework and had varying attitudes toward the courses. Students may have outside demands on their time related to family responsibilities, extra-curricular activities, work, or health. Students can withdraw from a course through the 70th day of class in a sixteen-week sessions. For shorter terms, students can withdraw through 90% of the class meeting days. Students might also be withdrawn by their instructor for violation of class policies such as attendance or academic honesty.
5. The level of high school preparation for students was unknown and was not considered in placement.
6. This study did not include students who dropped a course before Census day. When a student drops before Census day, enrollment is not noted on his or her transcript. This study only looked at students who were enrolled on Census day and thus had a grade on their transcript for the course.

### **Summary**

Provided in chapter three was the research design for a study of placement testing and student success in College Algebra (MAT105) and English Composition I (COL101) at Allen Community College. The research design, population and sample, sampling procedures, instrumentation, measurement, validity and reliability, data collection and procedures, data analysis and hypothesis testing, and limitations were explored in chapter three. Chapter four includes the results of the study.

## Chapter Four

### Results

The purpose of this study was to investigate whether a relationship existed between the method of placement in College Algebra (MAT105) and student success at Allen Community College. The second purpose of this study was to determine whether a relationship existed between the method of placement in English Composition I (COL101) and student success at Allen Community College. An additional purpose of the study was to examine the effect age, gender, and method of delivery had on the relationship between method of placement and success. Descriptive statistics for the sample are included in this chapter. Each hypothesis in this study was tested using the  $\chi^2$  test of independence.

#### Descriptive Statistics

For the math data, there were 8,472 students in the sample. Students earning the grades of A, B, C, and P were considered successful. Students earning the grades of D, F, W, or I were considered unsuccessful. Of the 8,472 students in the math dataset, 80.7% were traditional students (under age 24) and 19.3% were non-traditional students (age 24 or older). Included in Table 4 is the breakdown of the ages of students in the math dataset.

Table 4

#### *Math Dataset - Age*

Age Category	<i>N</i>	%
Non-traditional	1,631	19.3
Traditional	6,841	80.7

Another demographic investigated in three hypotheses in this study was gender. In the math data set, 59.3% of the students were female, and 40.7% were male. The gender breakdown for the math data is found in Table 5.

Table 5

*Math Dataset - Gender*

Gender	<i>N</i>	%
Male	3,445	40.7
Female	5,027	59.3

Three hypotheses in the study investigated the effect of delivery method (Burlingame/Outreach, Iola, online, concurrent) on success. Burlingame/Outreach students made up 34% of the sample, concurrent students made up 33.2% of the sample, Iola students made up 18.8% of the sample, and online students made up 14% of the sample. Provided in Table 6 are the numbers of students in each category.

Table 6

*Math Dataset - Delivery Method*

Category	<i>N</i>	%
Burlingame/Outreach	2,884	34.0
Iola	1,589	18.8
Online	1,183	14.0
Concurrent	2,816	33.2

Student success was an important consideration in this study. Students who successfully completed their College Algebra (MAT105) course made up 75.1% of the



sample and those who were unsuccessful made up 24.9% of the sample. The breakdown of successful and unsuccessful students in the math dataset is found in Table 7.

Table 7

*Math Dataset - Success*

Category	<i>N</i>	%
Successful	6,359	75.1
Unsuccessful	2,113	24.9

Included in Table 8 is a breakdown of the method of placement by which the students in the sample were placed. Two students were placed using COMPASS Algebra test scores. These students were combined with those who were placed using COMPASS College Algebra scores for the hypothesis testing analyses. Two students were placed using SAT scores. These students were removed from the hypothesis testing analyses because the sample size for the category was too small to analyze statistically.

Table 8

*Math Dataset - Method of Placement*

Placement Method	<i>N</i>	%
ACT	2,223	26.2
ASSET Intermediate Algebra	2,289	27.0
COMPASS Algebra	2	.0
COMPASS College Algebra	1,156	13.6
Prerequisite Course	2,663	31.4
SAT	2	.0
Waiver	137	1.6

For the composition dataset, there were 8,789 students in the sample. Three hypotheses considered the effect of age (traditional/non-traditional status) on student success. Of these 8,789 students, 81.3% were traditional students and 18.7% were non-traditional students. Included in Table 9 is a breakdown of the age of students in the composition dataset.

Table 9

*Composition Dataset - Age*

Category	<i>N</i>	%
Non-traditional	1,643	18.7
Traditional	7,146	81.3

Another demographic considered by three hypotheses in the study was gender. In the composition data set, 58% of the students were female, and 41.9% were male.

Included in Table 10 is the gender breakdown of the composition data set.

Table 10

*Composition Dataset - Gender*

Category	<i>N</i>	%
Male	3,686	41.9
Female	5,102	58.0

Three hypotheses in the study investigated the effect of delivery method (Burlingame/Outreach, Iola, online, concurrent) on success. Burlingame/Outreach students made up 26.6% of the sample for composition, concurrent students made up 27.1% of the sample, Iola students made up 26.9% of the sample, and online students made up 19.4% of the sample. Included in Table 11 is the breakdown of the numbers of students in each category.

Table 11

*Composition Dataset - Delivery Method*

Category	<i>N</i>	%
Burlingame/Outreach	2,339	26.6
Iola	2,363	26.9
Online	1,704	19.4
Concurrent	2,383	27.1

Student success in English Composition I (COL101) was an important consideration in this study. Students who successfully completed their English Composition I (COL101) course made up 78.6% of the sample and those who were unsuccessful made up 21.4% of the sample. A student who audited the course was excluded from the study. Included in Table 12 is the breakdown of successful and unsuccessful students.

Table 12

*Composition Dataset - Success*

Category	<i>N</i>	%
Successful	6,911	78.6
Unsuccessful	1,877	21.4
Audit	1	.0

Included in Table 13 is a breakdown of which method of placement students in the composition dataset. Of the 8,789 students in the composition dataset, 31.5% were placed using an ACT score, 27.7% were placed using an ASSET score, 27.1% were placed using a COMPASS score, 12.5% took the prerequisite course, and 1.3% were placed using a waiver. Four students were placed using SAT scores. These students were removed from the hypothesis testing analyses because the sample size for the category was too small to analyze statistically.

Table 13

*Composition Dataset - Method of Writing Placement*

Placement Method	<i>N</i>	%
ACT	2,767	31.5
ASSET	2,436	27.7
COMPASS	2,378	27.1
Prerequisite Course	1,097	12.5
SAT	4	.0
Waiver	111	1.3

Included Table 14 is a breakdown of which method of placement by which students were placed for reading. Of the 8,789 students in the composition dataset, 32.1% were placed using an ACT score, 31.1% were placed using an ASSET score, 27.6% were placed using a COMPASS score, 7.7% took a prerequisite course, and 1.5% were placed using a waiver. The four students who were placed using SAT scores were removed from the hypothesis testing analyses because the sample size for the category was too small to analyze statistically.

Table 14

*Composition Dataset - Method of Reading Placement*

Placement Method	<i>N</i>	%
ACT	2,819	32.1
ASSET	2,729	31.1
COMPASS	2,429	27.6
Prerequisite Course	677	7.7
SAT	4	.0
Waiver	134	1.5

**Hypothesis Testing**

For hypotheses 1, 5, and 9 in the research study, the data was tested using a  $\chi^2$  test of independence. For hypotheses 2, 3, 4, 6, 7, 8, 10, 11, and 12 the data was disaggregated based on a demographic and multiple  $\chi^2$  tests of independence were conducted. Data was analyzed using IBM® SPSS® Statistics Faculty Pack 22 software for Windows. The level of significance was set at .05 for all tests.

**RQ1.** To what extent is there a relationship between how a student meets the math placement requirement for College Algebra (MAT105) and student success?

**H1.** There is a relationship between how a student meets the math placement requirement for College Algebra (MAT105) and student success.

A  $\chi^2$  test of independence was conducted to address RQ1. The observed frequencies were compared to those expected by chance. The level of significance was set at .05. The results of the test indicated a statistically significant difference between the observed and expected values,  $\chi^2 = 269.673$ ,  $df = 4$ ,  $p = .000$ . See Table 15 for the

observed and expected frequencies. The observed frequency ( $n = 1794$ ) was higher than the expected frequency ( $n = 1668.7$ ) for students who were placed using an ACT score and were successful. The observed frequency ( $n = 1905$ ) was higher than the expected frequency ( $n = 1718.2$ ) for students who were placed using an ASSET score and were successful. The observed frequency ( $n = 326.0$ ) was higher than the expected frequency ( $n = 288.7$ ) for students who were placed using a COMPASS score and were unsuccessful. The observed frequency ( $n = 926.0$ ) was higher than the expected frequency ( $n = 664.0$ ) for students who were placed using a prerequisite course and were unsuccessful. The observed frequency ( $n = 47.0$ ) was higher than the expected frequency ( $n = 34.2$ ) for students who were placed using a waiver and were unsuccessful in the course. Students who were placed using the ACT and ASSET tended to be successful in College Algebra (MAT105) at Allen Community College. Students who were placed using the COMPASS, prerequisite course, and waiver tended to be unsuccessful.

Table 15

*Observed and Expected Frequencies for H1*

Placement Method		Course Results	
		Successful	Unsuccessful
ACT	Observed	1,794.0	429.0
	Expected	1,668.7	554.3
ASSET	Observed	1,905.0	384.0
	Expected	1,718.2	570.8
COMPASS	Observed	832.0	326.0
	Expected	869.3	288.7
Prerequisite	Observed	1,737	926.0
	Expected	1,999.0	664.0
Waiver	Observed	90.0	47.0
	Expected	102.8	34.2

**RQ2.** To what extent is the relationship between how a student meets the math placement requirement for College Algebra (MAT105) and student success affected by age?

**H2.** The relationship between how a student meets the math placement requirement for College Algebra (MAT105) and student success is affected by age.

Before conducting the two  $\chi^2$  tests of independence used to address RQ2, the sample was disaggregated by student age (traditional, non-traditional). For the first test, using the traditional student data, the observed frequencies were compared to those expected by chance. The level of significance was set at .05. The results of the test



indicated a statistically significant difference between the observed and expected values,  $\chi^2 = 316.668$ ,  $df = 4$ ,  $p = .000$ . See Table 16 for the observed and expected frequencies. The observed frequency ( $n = 1771.0$ ) was higher than the expected frequency ( $n = 1663.1$ ) for traditional students who were placed using an ACT score and were successful. The observed frequency ( $n = 1841.0$ ) was higher than the expected frequency ( $n = 1663.1$ ) for traditional students who were placed using an ASSET score and were successful. The observed frequency ( $n = 263.0$ ) was higher than the expected frequency ( $n = 213.0$ ) for traditional students who were placed using a COMPASS score and were unsuccessful. The observed frequency ( $n = 584.0$ ) was higher than the expected frequency ( $n = 358.6$ ) for traditional students who were placed using a prerequisite course and were unsuccessful. The observed frequency ( $n = 57.0$ ) was lower than the expected frequency ( $n = 67.5$ ) for traditional students who were placed using a waiver and were successful. The observed frequency ( $n = 32.0$ ) was higher than the expected frequency ( $n = 21.5$ ) for traditional students who were placed using a waiver and were unsuccessful. Traditional students who were placed using the ACT and ASSET tended to be successful in College Algebra (MAT105) at Allen Community College. Traditional students who were placed using the COMPASS, prerequisite course, and waiver tended to be unsuccessful in College Algebra (MAT105) at Allen Community College.

Table 16

*Observed and Expected Frequencies for H2 - Traditional Students*

Placement Method		Course Results	
		Successful	Unsuccessful
ACT	Observed	1,771.0	423.0
	Expected	1,663.1	530.9
ASSET	Observed	1,841.0	354.0
	Expected	1663.1	530.9
COMPASS	Observed	617.0	263.0
	Expected	667.0	213.0
Prerequisite	Observed	898.0	584.0
	Expected	1,123.4	358.6
Waiver	Observed	57.0	32.0
	Expected	67.5	21.5

For the second test, using the non-traditional student data, the observed frequencies were compared to those expected by chance. The level of significance was set at .05. The results of the test indicated no statistically significant difference between the observed and expected values,  $\chi^2 = 6.496$ ,  $df = 4$ ,  $p = .165$ . See Table 17 for the observed and expected frequencies. For traditional students, the results of the test indicated a statistically significant relationship between method of placement and student success. For non-traditional students, no statistically significant relationship was found. The data supported the hypothesis that the relationship between how a student meets the math placement requirement for College Algebra (MAT105) and student success is

affected by age (traditional/non-traditional status) because the results varied between traditional and non-traditional students.

Table 17

*Observed and Expected Frequencies for H2 - Non-traditional Students*

Placement Method		Course Results	
		Successful	Unsuccessful
ACT	Observed	23.0	6.0
	Expected	20.9	8.1
ASSET	Observed	64.0	31.0
	Expected	68.4	26.6
COMPASS	Observed	215	63.0
	Expected	200.1	77.9
Prerequisite	Observed	839.0	342.0
	Expected	850.1	330.9
Waiver	Observed	33.0	15.0
	Expected	34.6	13.4

**RQ3.** To what extent is the relationship between how a student meets the math placement requirement for College Algebra (MAT105) and student success affected by gender?

**H3.** The relationship between how a student meets the math placement requirement for College Algebra (MAT105) and student success is affected by gender.

Before conducting the two  $\chi^2$  tests of independence used to address RQ3, the sample was disaggregated by student gender (male, female). For the first test, using the

male student data, the observed frequencies were compared to those expected by chance. The level of significance was set at .05. The results of the test indicated a statistically significant difference between the observed and expected values,  $\chi^2 = 133.918$ ,  $df = 4$ ,  $p = .000$ . See Table 18 for the observed and expected frequencies. The observed frequency ( $n = 765.0$ ) was higher than the expected frequency ( $n = 726.0$ ) for male students who were placed using an ACT score and were successful. The observed frequency ( $n = 779.0$ ) was higher than the expected frequency ( $n = 675.7$ ) for male students who were placed using an ASSET score and were successful. The observed frequency ( $n = 182.0$ ) was higher than the expected frequency ( $n = 151.4$ ) for male students who were placed using a COMPASS score and were unsuccessful. The observed frequency ( $n = 363.0$ ) was higher than the expected frequency ( $n = 257.9$ ) for male students who were placed using a prerequisite course and were successful. The observed frequency ( $n = 25.0$ ) was higher than the expected frequency ( $n = 18.4$ ) for male students who were placed using a waiver and were unsuccessful. Male students who were placed using the ACT and ASSET tended to be successful in College Algebra (MAT105) at Allen Community College. Male students who were placed using the COMPASS, prerequisite course, and waiver tended to be unsuccessful in College Algebra at Allen Community College.

Table 18

*Observed and Expected Frequencies for H3 - Male Students*

Placement Method		Course Results	
		Successful	Unsuccessful
ACT	Observed	765.0	260.0
	Expected	726.0	299.0
ASSET	Observed	779.0	175.0
	Expected	675.7	278.3
COMPASS	Observed	337.0	182.0
	Expected	367.6	151.4
Prerequisite	Observed	521.0	363.0
	Expected	626.1	257.9
Waiver	Observed	38.0	25.0
	Expected	44.6	18.4

For the second test, using the female student data, the observed frequencies were compared to those expected by chance. The level of significance was set at .05. The results of the test indicated a statistically significant difference between the observed and expected values,  $\chi^2 = 173.804$ ,  $df = 4$ ,  $p = .000$ . See Table 19 for the observed and expected frequencies. The observed frequency ( $n = 1029.0$ ) was higher than the expected frequency ( $n = 934.1$ ) for female students who were placed using an ACT score and were successful. The observed frequency ( $n = 1126$ ) was higher than the expected frequency ( $n = 1040.9$ ) for female students who were placed using an ASSET score and were successful. The observed frequency ( $n = 144.0$ ) was higher than the expected frequency

( $n = 140.8$ ) for female students who were placed using a COMPASS score and were unsuccessful. The observed frequency ( $n = 563.0$ ) was higher than the expected frequency ( $n = 391.9$ ) for female students who were placed using a prerequisite course and were unsuccessful. The observed frequency ( $n = 22.0$ ) was higher than the expected frequency ( $n = 16.3$ ) for female students who were placed using a waiver and were unsuccessful. Female students who were placed using the ACT and ASSET tended to be successful in College Algebra (MAT105) at Allen Community College. Female students who were placed using the COMPASS, prerequisite course, and waiver tended to be unsuccessful in College Algebra (MAT105) at Allen Community College. The hypothesis was not supported by the data. The same methods of placement tended to lead to student success regardless of gender.

Table 19

*Observed and Expected Frequencies for H3 - Female Students*

Placement Method		Course Results	
		Successful	Unsuccessful
ACT	Observed	1,029.0	169.0
	Expected	934.1	263.9
ASSET	Observed	1126	209.0
	Expected	1,040.9	294.1
COMPASS	Observed	495	144.0
	Expected	498.2	140.8
Prerequisite	Observed	1,216.0	563.0
	Expected	1387.1	391.9
Waiver	Observed	52.0	22.0
	Expected	57.7	16.3

**RQ4.** To what extent is the relationship between how a student meets the math placement requirement for (College Algebra) MAT105 and student success affected by delivery mode?

**H4.** The relationship between how a student meets the math placement requirement for College Algebra (MAT105) and student success is affected by course delivery mode.

Before conducting the four  $\chi^2$  tests of independence used to address RQ4, the sample was disaggregated by delivery mode (Burlingame/Outreach, Iola, online, concurrent). For the first test, using the Burlingame/Outreach data, the observed

frequencies were compared to those expected by chance. The level of significance was set at .05. The results of the first test indicated no statistically significant difference between the observed and expected values,  $\chi^2 = 5.592$ ,  $df = 4$ ,  $p = .232$ . See Table 20 for the observed and expected frequencies.

Table 20

*Observed and Expected Frequencies for H4 - Burlingame/Outreach Students*

Placement Method		Course Results	
		Successful	Unsuccessful
ACT	Observed	390.0	112.0
	Expected	382.9	119.1
ASSET	Observed	302.0	76.0
	Expected	288.3	89.7
COMPASS	Observed	292.0	95.0
	Expected	295.2	91.8
Prerequisite	Observed	1,162.0	388.0
	Expected	1,182.4	367.6
Waiver	Observed	54.0	13.0
	Expected	51.1	15.9

For the second test, using the Iola student data, the observed frequencies were compared to those expected by chance. The level of significance was set at .05. The results of the test indicated a statistically significant difference between the observed and expected values,  $\chi^2 = 47.869$ ,  $df = 4$ ,  $p = .000$ . See Table 21 for the observed and expected frequencies. The observed frequency ( $n = 335.0$ ) was higher than the expected



frequency ( $n = 293.5$ ) for Iola students who were placed using an ACT score and were successful. The observed frequency ( $n = 126.0$ ) was higher than the expected frequency ( $n = 104.7$ ) for Iola students who were placed using an ASSET score and were successful. The observed frequency ( $n = 134$ ) was higher than the expected frequency ( $n = 125.2$ ) for Iola students who were placed using a COMPASS score and were unsuccessful. The observed frequency ( $n = 238.0$ ) was higher than the expected frequency ( $n = 233.3$ ) for Iola students who were placed using a prerequisite course and were unsuccessful. The observed frequency ( $n = 13.0$ ) was higher than the expected frequency ( $n = 18.7$ ) for Iola students who were placed using a waiver and were unsuccessful. Iola students who were placed using the ACT and ASSET tended to be successful in College Algebra (MAT105) at Allen Community College. Iola students who were placed using the COMPASS, the prerequisite, and a waiver tended to be unsuccessful in College Algebra (MAT105) at Allen Community College.

Table 21

*Observed and Expected Frequencies for H4 - Iola Students*

Placement Method		Course Results	
		Successful	Unsuccessful
ACT	Observed	335.0	150.0
	Expected	293.5	191.5
ASSET	Observed	126.0	47.0
	Expected	104.7	68.3
COMPASS	Observed	183.0	134.0
	Expected	191.8	125.2
Prerequisite	Observed	308.0	283.0
	Expected	357.7	233.3
Waiver	Observed	9.0	13.0
	Expected	13.3	8.7

For the third test, using the online student data, the observed frequencies were compared to those expected by chance. The level of significance was set at .05. The results of the test indicated a statistically significant difference between the observed and expected values,  $\chi^2 = 41.811$ ,  $df = 4$ ,  $p = .000$ . See Table 22 for the observed and expected frequencies. The observed frequency ( $n = 190.0$ ) was higher than the expected frequency ( $n = 158.7$ ) for online students who were placed using an ACT score and were successful. The observed frequency ( $n = 49.0$ ) was higher than the expected frequency ( $n = 44.5$ ) for online students who were placed using an ASSET score and were unsuccessful. The observed frequency ( $n = 171.0$ ) was higher than the expected

frequency ( $n = 149.1$ ) for online students who were placed using a COMPASS score and were successful. The observed frequency ( $n = 253.0$ ) was higher than the expected frequency ( $n = 207.3$ ) for online students who were placed using a prerequisite course and were unsuccessful. The observed frequency ( $n = 19.0$ ) was higher than the expected frequency ( $n = 16.0$ ) for online students who were placed using a waiver and were successful. Online students who were placed using the ACT, ASSET, and COMPASS tended to be successful in College Algebra (MAT105) at Allen Community College. Online students who were placed using the prerequisite course and waiver tended to be unsuccessful in College Algebra (MAT105) at Allen Community College.

Table 22

*Observed and Expected Frequencies for H4 - Online Students*

Placement Method		Course Results	
		Successful	Unsuccessful
ACT	Observed	190.0	75.0
	Expected	158.7	106.3
ASSET	Observed	62.0	49.0
	Expected	66.5	44.5
COMPASS	Observed	171.0	78.0
	Expected	149.1	99.9
Prerequisite	Observed	264.0	253.0
	Expected	309.7	207.3
Waiver	Observed	21.0	19.0
	Expected	24.0	16.0

For the fourth test, using the concurrent student data, the observed frequencies were compared to those expected by chance. The level of significance was set at .05. The results of the test indicated a statistically significant difference between the observed and expected values,  $\chi^2 = 13.929$ ,  $df = 4$ ,  $p = .008$ . See Table 23 for the observed and expected frequencies. The observed frequency ( $n = 879.0$ ) was higher than the expected frequency ( $n = 858.2$ ) for concurrent students who were placed using an ACT score and were successful. The observed frequency ( $n = 212.0$ ) was higher than the expected frequency ( $n = 188.9$ ) for concurrent students who were placed using an ASSET score and were unsuccessful. The observed frequency ( $n = 186.0$ ) was higher than the expected frequency ( $n = 181.2$ ) for concurrent students who were placed using a COMPASS score and were successful. The observed frequency ( $n = 2.0$ ) was higher than the expected frequency ( $n = 0.6$ ) for concurrent students who were placed using a prerequisite course and were unsuccessful. The observed frequency ( $n = 2.0$ ) was higher than the expected frequency ( $n = 0.9$ ) for concurrent students who were placed using a waiver and were unsuccessful. Concurrent students who were placed using the ACT and COMPASS tended to be successful in College Algebra (MAT105) at Allen Community College. Concurrent students who were placed using the ASSET, prerequisite course, and waiver tended to be unsuccessful in College Algebra (MAT105) at Allen Community College.

Table 23

*Observed and Expected Frequencies for H4 - Concurrent Students*

Placement Method		Course Results	
		Successful	Unsuccessful
ACT	Observed	879.0	92.0
	Expected	858.2	112.8
ASSET	Observed	1,415.0	212.0
	Expected	1,438.1	188.9
COMPASS	Observed	186.0	19.0
	Expected	181.2	23.8
Prerequisite	Observed	3.0	2.0
	Expected	4.4	.6
Waiver	Observed	6.0	2.0
	Expected	7.1	.9

The hypothesis that the relationship between how a student meets the math placement requirement for College Algebra (MAT105) and student success is affected by delivery mode (Burlingame/Outreach, Iola, online, concurrent) was supported. Different methods of placement tended to lead to success for different methods of course delivery. For Burlingame/Outreach students, no statistically significant relationship existed. Iola students who were placed using the ACT and ASSET tended to be successful in College Algebra (MAT105) at Allen Community College. Iola students who were placed using the COMPASS, the prerequisite, and a waiver tended to be unsuccessful in College Algebra (MAT105). Online students who were placed using the ACT, ASSET, and

COMPASS tended to be successful in College Algebra (MAT105) at Allen Community College. Online students who were placed using the prerequisite course and waiver tended to be unsuccessful in College Algebra (MAT105) at Allen Community College. Concurrent students who were placed using the ACT and COMPASS tended to be successful in College Algebra (MAT105) at Allen Community College. Concurrent students who were placed using the ASSET, prerequisite course, and waiver tended to be unsuccessful in College Algebra (MAT105) at Allen Community College.

**RQ5.** To what extent is there a relationship between how a student meets the writing placement requirement for English Composition I (COL101) and student success?

**H5.** There is a relationship between how a student meets the writing placement requirement for English Composition I (COL101) and student success.

A  $\chi^2$  test of independence was conducted to address RQ5. The observed frequencies were compared to those expected by chance. The level of significance was set at .05. The results of the test indicated a statistically significant difference between the observed and expected values,  $\chi^2 = 374.152$ ,  $df = 4$ ,  $p = .000$ . See Table 24 for the observed and expected frequencies. The observed frequency ( $n = 2264.0$ ) was higher than the expected frequency ( $n = 2176.3$ ) for students who were placed using an ACT score and were successful. The observed frequency ( $n = 2151.0$ ) was higher than the expected frequency ( $n = 1914.3$ ) for students who were placed using an ASSET score and were successful. The observed frequency ( $n = 658.0$ ) was higher than the expected frequency ( $n = 507.7$ ) for students who were placed using a COMPASS score for students and were unsuccessful. The observed frequency ( $n = 408.0$ ) was higher than the expected frequency ( $n = 234.2$ ) for students who were placed using a prerequisite course

and were unsuccessful. The observed frequency ( $n = 87.0$ ) was too close to the expected frequency ( $n = 87.3$ ) for students who placed using a waiver who were successful in the course to be meaningful. Students who were placed using the ACT and ASSET tended to be successful in English Composition I (COL101) at Allen Community College.

Students who were placed using the COMPASS test and prerequisite course tended to be unsuccessful in English Composition I (COL101) at Allen Community College. The data was inconclusive for the waiver.

Table 24

*Observed and Expected Frequencies for H5*

Placement Method		Course Results	
		Successful	Unsuccessful
ACT	Observed	2,264.0	503.0
	Expected	2,176.3	590.7
ASSET	Observed	2,151.0	283.0
	Expected	1,914.3	519.7
COMPASS	Observed	1,720.0	658.0
	Expected	1,870.3	507.7
Prerequisite	Observed	689.0	408.0
	Expected	862.8	234.2
Waiver	Observed	87.0	24.0
	Expected	87.3	23.7

**RQ6.** To what extent is the relationship between how a student meets the writing placement requirement for English Composition I (COL101) and student success affected by age?

**H6.** The relationship between how a student meets the writing placement requirement for English Composition I (COL101) and student success is affected by age.

Before conducting the two  $\chi^2$  tests of independence used to address RQ6, the sample was disaggregated by student age (traditional, non-traditional). For the first test, using the traditional student data, the observed frequencies were compared to those expected by chance. The level of significance was set at .05. The results of the test indicated a statistically significant difference between the observed and expected values,  $\chi^2 = 467.779$ ,  $df = 4$ ,  $p = .000$ . See Table 25 for the observed and expected frequencies. The observed frequency ( $n = 2231.0$ ) was higher than the expected frequency ( $n = 2148.1$ ) for traditional students who were placed using an ACT score and were successful. The observed frequency ( $n = 1874.0$ ) was higher than the expected frequency ( $n = 1638.3$ ) for traditional students who were placed using an ASSET score and were successful. The observed frequency ( $n = 474.0$ ) was higher than the expected frequency ( $n = 314.7$ ) for traditional students who placed using a COMPASS score and were unsuccessful. The observed frequency ( $n = 323.0$ ) was higher than the expected frequency ( $n = 165.9$ ) for traditional students who were placed using a prerequisite course and were unsuccessful. The observed frequency ( $n = 15.0$ ) was higher than the expected frequency ( $n = 12.8$ ) for traditional students who were placed using a waiver and were unsuccessful. Traditional students who were placed using the ACT and ASSET tended to be successful in English Composition I (COL101) at Allen Community College.



Traditional students who were placed using the COMPASS, prerequisite course, and waiver tended to be unsuccessful in English Composition I (COL101) at Allen Community College.

Table 25

*Observed and Expected Frequencies for H6 - Traditional Students*

Placement Method		Course Results	
		Successful	Unsuccessful
ACT	Observed	2,231.0	487.0
	Expected	2,148.1	569.9
ASSET	Observed	1,874.0	199.0
	Expected	1,638.3	434.7
COMPASS	Observed	1,027.0	474.0
	Expected	1,186.3	314.7
Prerequisite	Observed	468.0	323.0
	Expected	625.1	165.9
Waiver	Observed	46.0	15.0
	Expected	48.2	12.8

For the second test, using the non-traditional student data, the observed frequencies were compared to those expected by chance. The level of significance was set at .05. The results of the test indicated no statistically significant difference between the observed and expected values,  $\chi^2 = 9.260$ ,  $df = 4$ ,  $p = .055$ . See Table 26 for the observed and expected frequencies. For traditional students, a statistically significant relationship existed but for non-traditional students no relationship existed. The

hypothesis that the relationship between how a student meets the writing placement requirement for English Composition I (COL101) and student success is affected by age was supported.

Table 26

*Observed and Expected Frequencies for H6 - Non-traditional Students*

Placement Method		Course Results	
		Successful	Unsuccessful
ACT	Observed	33.0	16.0
	Expected	37.7	11.3
ASSET	Observed	277.0	84.0
	Expected	277.9	83.1
COMPASS	Observed	693.0	184.0
	Expected	675.2	201.8
Prerequisite	Observed	221.0	85.0
	Expected	235.6	70.4
Waiver	Observed	41.0	9.0
	Expected	38.5	11.5

**RQ7.** To what extent is the relationship between how a student meets the writing placement requirement for English Composition I (COL101) and student success affected by gender?

**H7.** The relationship between how a student meets the writing placement requirement for English Composition I (COL101) and student success is affected by gender.

Before conducting the two  $\chi^2$  tests of independence used to address RQ7, the sample was disaggregated by student gender (male, female). For the first test, using the male student data, the observed frequencies were compared to those expected by chance. The level of significance was set at .05. The results of the test indicated a statistically significant difference between the observed and expected values,  $\chi^2 = 180.630$ ,  $df = 4$ ,  $p = .000$ . See Table 27 for the observed and expected frequencies. The observed frequency ( $n = 979.0$ ) was higher than the expected frequency ( $n = 934.7$ ) for male students who were placed using an ACT score and were successful. The observed frequency ( $n = 815.0$ ) was higher than the expected frequency ( $n = 700.8$ ) for male students who were placed using an ASSET score and were successful. The observed frequency ( $n = 315.0$ ) was higher than the expected frequency ( $n = 238.7$ ) for male students who were placed using a COMPASS score and were unsuccessful. The observed frequency ( $n = 204.0$ ) was higher than the expected frequency ( $n = 126.2$ ) for male students who were placed using a prerequisite course and were unsuccessful. The observed frequency ( $n = 18.0$ ) was higher than the expected frequency ( $n = 13.7$ ) for male students who were placed using a waiver and were unsuccessful. Male students who were placed using the ACT and ASSET for writing tended to be successful in English Composition I (COL101) at Allen Community College. Male students who were placed using the COMPASS, prerequisite course, and waiver for writing tended to be unsuccessful in English Composition I (COL101) at Allen Community College.

Table 27

*Observed and Expected Frequencies for H7 - Male Students*

Placement Method		Course Results	
		Successful	Unsuccessful
ACT	Observed	979.0	272.0
	Expected	934.7	316.3
ASSET	Observed	815.0	123.0
	Expected	700.8	237.2
COMPASS	Observed	629.0	315.0
	Expected	705.3	238.7
Prerequisite	Observed	295.0	204.0
	Expected	372.8	126.2
Waiver	Observed	36.0	18.0
	Expected	40.3	13.7

For the second test, using the female student data, the observed frequencies were compared to those expected by chance. The level of significance was set at .05. The results of the test indicated a statistically significant difference between the observed and expected values,  $\chi^2 = 198.116$ ,  $df = 4$ ,  $p = .000$ . See Table 28 for the observed and expected frequencies. The observed frequency ( $n = 1285.0$ ) was higher than the expected frequency ( $n = 1235.4$ ) for female students who were placed using an ACT score and were successful. The observed frequency ( $n = 1336.0$ ) was higher than the expected frequency ( $n = 1219.1$ ) for female students who were placed using an ASSET score and were successful. The observed frequency ( $n = 343.0$ ) was higher than the expected

frequency ( $n = 265.4$ ) for female students who were placed using a COMPASS score and were unsuccessful. The observed frequency ( $n = 204.0$ ) was higher than the expected frequency ( $n = 110.7$ ) for female students who were placed using a prerequisite course and were unsuccessful. The observed frequency ( $n = 51.0$ ) was higher than the expected frequency ( $n = 46.5$ ) for female students who were placed using a waiver and were successful. Female students who were placed using the ACT, ASSET, and waiver for writing tended to be successful in English Composition I (COL101) at Allen Community College. Female students who were placed using the COMPASS and prerequisite course for writing tended to be unsuccessful in English Composition I (COL101) at Allen Community College.

The hypothesis that the relationship between how a student meets the writing placement requirement for English Composition I (COL101) and student success is affected by gender was supported. Male students who were placed using the ACT and ASSET for writing tended to be successful in English Composition I (COL101) at Allen Community College. Male students who were placed using the COMPASS, prerequisite course, and waiver for writing tended to be unsuccessful in English Composition I (COL101) at Allen Community College. Female students who were placed using the ACT, ASSET, and waiver for writing tended to be successful in English Composition I (COL101) at Allen Community College. Female students who were placed using the COMPASS and prerequisite course for writing tended to be unsuccessful in English Composition I (COL101) at Allen Community College.

Table 28

*Observed and Expected Frequencies for H7 - Female Students*

Placement Method		Course Results	
		Successful	Unsuccessful
ACT	Observed	1,285.0	231.0
	Expected	1,235.4	280.6
ASSET	Observed	1,336.0	160.0
	Expected	1,219.1	276.9
COMPASS	Observed	1,091.0	343.0
	Expected	1,168.6	265.4
Prerequisite	Observed	394.0	204.0
	Expected	487.3	110.7
Waiver	Observed	51.0	6.0
	Expected	46.5	10.5

**RQ8.** To what extent is the relationship between how a student meets the writing placement requirement for English Composition I (COL101) and student success affected by course delivery mode?

**H8.** The relationship between how a student meets the writing placement requirement for English Composition I (COL101) and student success is affected by course delivery mode.

Before conducting the four  $\chi^2$  tests of independence used to address RQ8, the sample was disaggregated by delivery mode (Burlingame/Outreach, Iola, online, concurrent). For the Burlingame/Outreach data, the observed frequencies were compared

to those expected by chance. The level of significance was set at .05. The results of the test indicated a statistically significant difference between the observed and expected values,  $\chi^2 = 40.898$ ,  $df = 4$ ,  $p = .000$ . See Table 29 for the observed and expected frequencies. The observed frequency ( $n = 509.0$ ) was higher than the expected frequency ( $n = 483.7$ ) for Burlingame/Outreach students who were placed using an ACT score and were successful. The observed frequency ( $n = 455.0$ ) was higher than the expected frequency ( $n = 422.5$ ) for Burlingame/Outreach students who were placed using an ASSET score and were successful. The observed frequency ( $n = 209.0$ ) was higher than the expected frequency ( $n = 190.0$ ) for Burlingame/Outreach students who were placed using a COMPASS score and were unsuccessful. The observed frequency ( $n = 149.0$ ) was higher than the expected frequency ( $n = 106.8$ ) for Burlingame/Outreach students who were placed using a prerequisite course and were unsuccessful. The observed frequency ( $n = 29.0$ ) was higher than the expected frequency ( $n = 25.6$ ) for Burlingame/Outreach students who were placed using a waiver and were successful. Burlingame students who were placed using the ACT, ASSET, and waiver for writing placement tended to be successful in English Composition I (COL101) at Allen Community College. Burlingame/Outreach students who were placed using the COMPASS and prerequisite for writing placement tended to be unsuccessful in English Composition I (COL101) at Allen Community College.

Table 29

*Observed and Expected Frequencies for H8 - Burlingame/Outreach Students*

Placement Method		Course Results	
		Successful	Unsuccessful
ACT	Observed	509.0	171.0
	Expected	483.7	196.3
ASSET	Observed	455.0	139.0
	Expected	422.5	171.5
COMPASS	Observed	449.0	209.0
	Expected	468.0	190.0
Prerequisite	Observed	221.0	149.0
	Expected	263.2	106.8
Waiver	Observed	29.0	7.0
	Expected	25.6	10.4

For the Iola students, the observed frequencies were compared to those expected by chance. The level of significance was set at .05. The results of the test indicated a statistically significant difference between the observed and expected values,  $\chi^2 = 78.074$ ,  $df = 4$ ,  $p = .000$ . See Table 30 for the observed and expected frequencies. The observed frequency ( $n = 742.0$ ) was higher than the expected frequency ( $n = 663.1$ ) for Iola students who were placed using an ACT score and were successful. The observed frequency ( $n = 151$ ) was higher than the expected frequency ( $n = 134.0$ ) for Iola students who were placed using an ASSET score and were successful. The observed frequency ( $n = 260.0$ ) was higher than the expected frequency ( $n = 195.1$ ) for Iola students who were



placed using a COMPASS score and were unsuccessful. The observed frequency ( $n = 191.0$ ) was higher than the expected frequency ( $n = 159.9$ ) for Iola students who were placed using a prerequisite course and were unsuccessful. The observed frequency ( $n = 26$ ) was at the expected frequency ( $n = 26.0$ ) for Iola students who were placed using a waiver and were successful. Iola students who were placed using the ACT and ASSET for writing placement tended to be successful in English Composition I (COL101) at Allen Community College. Iola students who were placed using the COMPASS and prerequisite for writing placement tended to be unsuccessful in English Composition I (COL101) at Allen Community College. The waiver returned the same results as one would expect by chance when used for writing placement in English Composition I (COL101) at Allen Community College.

Table 30

*Observed and Expected Frequencies for H8 - Iola Students*

Placement Method		Course Results	
		Successful	Unsuccessful
ACT	Observed	742.0	203.0
	Expected	663.1	281.9
ASSET	Observed	151.0	40.0
	Expected	134.0	57.0
COMPASS	Observed	394.0	260.0
	Expected	458.9	195.1
Prerequisite	Observed	345.0	191.0
	Expected	376.1	159.9
Waiver	Observed	26.0	11.0
	Expected	26.0	11.0

For the online students, the observed frequencies were compared to those expected by chance. The level of significance was set at .05. The results of the test indicated a statistically significant difference between the observed and expected values,  $\chi^2 = 14.731$ ,  $df = 4$ ,  $p = .005$ . See Table 31 for the observed and expected frequencies. The observed frequency ( $n = 320.0$ ) was higher than the expected frequency ( $n = 317.2$ ) for online students who were placed using an ACT score and were successful. The observed frequency ( $n = 8.0$ ) was higher than the expected frequency ( $n = 70.2$ ) for online students who were placed using an ASSET score and were unsuccessful. The observed frequency ( $n = 598.0$ ) was higher than the expected frequency ( $n = 577.3$ ) for

online students who were placed using a COMPASS score and were successful. The observed frequency ( $n = 123.0$ ) was lower than the expected frequency ( $n = 141.5$ ) for online students who were placed using a prerequisite course and were successful. The observed frequency ( $n = 28.0$ ) was higher than the expected frequency ( $n = 25.2$ ) for online students who were placed using a waiver and were successful. Online students who were placed using the ACT, COMPASS, and waiver tended to be successful. Online students who were placed using the prerequisite course and ASSET tended to be unsuccessful.

Table 31

*Observed and Expected Frequencies for H8 - Online Students*

Placement Method		Course Results	
		Successful	Unsuccessful
ACT	Observed	320.0	108.0
	Expected	317.2	110.8
ASSET	Observed	193.0	78.0
	Expected	200.8	70.2
COMPASS	Observed	598.0	181.0
	Expected	577.3	201.7
Prerequisite	Observed	123.0	68.0
	Expected	141.5	49.5
Waiver	Observed	28.0	6.0
	Expected	25.2	8.8

For concurrent students, the observed frequencies were compared to those expected by chance. The level of significance was set at .05. The results of the test indicated no statistically significant difference between the observed and expected values,  $\chi^2 = 2.741$ ,  $df = 3$ ,  $p = .433$ . See Table 32 for the observed and expected frequencies. No statistically significant relationship existed for the concurrent student data.

Table 32

*Observed and Expected Frequencies for H8 - Concurrent Students*

Placement Method		Course Results	
		Successful	Unsuccessful
ACT	Observed	693.0	21.0
	Expected	697.5	16.5
ASSET	Observed	1,352.0	26.0
	Expected	1,346.2	31.8
COMPASS	Observed	279.0	8.0
	Expected	280.4	6.6
Prerequisite	Observed	0	0
	Expected	0	0
Waiver	Observed	4.0	0
	Expected	3.9	.1

The hypothesis was not supported that a relationship existed between the method of course delivery and student success. Burlingame students who were placed using the ACT, ASSET, and waiver for writing placement tended to be successful in English Composition I (COL101) at Allen Community College. Burlingame/Outreach students

who were placed using the COMPASS and prerequisite for writing placement tended to be unsuccessful in English Composition I (COL101) at Allen Community College. Iola students who were placed using the ACT and ASSET for writing placement tended to be successful in English Composition I (COL101) at Allen Community College. Iola students who were placed using the COMPASS and prerequisite for writing placement tended to be unsuccessful in English Composition I (COL101) at Allen Community College. The waiver returned the same results as one would expect by chance when used for writing placement in English Composition I (COL101) at Allen Community College. Online students who were placed using the ACT, COMPASS, and waiver tended to be successful. Online students who were placed using the prerequisite course and ASSET tended to be unsuccessful. No statistically significant relationship existed for the concurrent student data.

**RQ9.** To what extent is there a relationship between how a student meets the reading placement requirement for English Composition I (COL101) and student success?

**H9.** There is a relationship between how a student meets the reading placement requirement for English Composition I (COL101) and student success.

A  $\chi^2$  test of independence was conducted to address RQ9. The observed frequencies were compared to those expected by chance. The level of significance was set at .05. The results of the test indicated a statistically significant difference between the observed and expected values,  $\chi^2 = 298.003$ ,  $df = 4$ ,  $p = .000$ . See Table 33 for the observed and expected frequencies. The observed frequency ( $n = 2284.0$ ) was higher than the expected frequency ( $n = 2217.2$ ) for students who were placed using an ACT

reading score and were successful. The observed frequency ( $n = 2366.0$ ) was higher than the expected frequency ( $n = 2145.6$ ) for students who were placed using an ASSET reading score and were successful. The observed frequency ( $n = 682.0$ ) was higher than the expected frequency ( $n = 518.6$ ) for students who were placed using a COMPASS reading score for students and were unsuccessful. The observed frequency ( $n = 257.0$ ) was higher than the expected frequency ( $n = 144.5$ ) for students who were placed using a prerequisite reading course and were unsuccessful. The observed frequency ( $n = 40.0$ ) was higher than the expected frequency ( $n = 28.6$ ) for students who were placed using a reading waiver and were unsuccessful in the course. Students who were placed using the ACT and ASSET for reading placement tended to be successful in English Composition I (COL101) at Allen Community College. Students who were placed using the COMPASS test, prerequisite, and waiver for reading placement tended to be unsuccessful in English Composition I (COL101) at Allen Community College.

Table 33

*Observed and Expected Frequencies for H9*

Placement Method		Course Results	
		Successful	Unsuccessful
ACT	Observed	2,284.0	535.0
	Expected	2,217.2	601.8
ASSET	Observed	2,366.0	362.0
	Expected	2,145.6	582.4
COMPASS	Observed	1,747.0	682.0
	Expected	1,910.4	518.6
Prerequisite	Observed	420.0	257.0
	Expected	532.5	144.5
Waiver	Observed	94.0	40.0
	Expected	105.4	28.6

**RQ10.** To what extent is the relationship between how a student meets the reading placement requirement for English Composition I (COL101) and student success affected by age?

**H10.** The relationship between how a student meets the reading placement requirement for English Composition I (COL101) and student success is affected by age.

Before conducting the two  $\chi^2$  tests of independence used to address RQ10, the sample was disaggregated by student age (traditional, non-traditional). For the first test, using the traditional student data, the observed frequencies were compared to those expected by chance. The level of significance was set at .05. The results of the test

indicated a statistically significant difference between the observed and expected values,  $\chi^2 = 398.936$ ,  $df = 4$ ,  $p = .000$ . See Table 34 for the observed and expected frequencies. The observed frequency ( $n = 2246.0$ ) was higher than the expected frequency ( $n = 2183.6$ ) for traditional students who were placed using an ACT reading score and were successful. The observed frequency ( $n = 2046.0$ ) was higher than the expected frequency ( $n = 1822.5$ ) for traditional students who were placed using an ASSET reading score and were successful. The observed frequency ( $n = 480.0$ ) was higher than the expected frequency ( $n = 312.6$ ) for traditional students who were placed using a COMPASS reading score and were unsuccessful. The observed frequency ( $n = 210.0$ ) was higher than the expected frequency ( $n = 104.8$ ) for traditional students who were placed using a prerequisite reading course and were unsuccessful. The observed frequency ( $n = 31.0$ ) was higher than the expected frequency ( $n = 17.6$ ) for traditional students who were placed using a reading waiver and were unsuccessful. Traditional students who were placed using the ACT and ASSET for reading placement tended to be successful in English Composition I (COL101) at Allen Community College. Traditional students who were placed using the COMPASS, prerequisite course, and waiver for reading placement tended to be unsuccessful in English Composition I (COL101) at Allen Community College.



Table 34

*Observed and Expected Frequencies for H10 - Traditional Students*

Placement Method		Course Results	
		Successful	Unsuccessful
ACT	Observed	2,246.0	517.0
	Expected	2,183.6	579.4
ASSET	Observed	2,046.0	260.0
	Expected	1,822.5	483.5
COMPASS	Observed	1,011.0	480.0
	Expected	1,178.4	312.6
Prerequisite	Observed	290.0	210.0
	Expected	395.2	104.8
Waiver	Observed	53.0	31.0
	Expected	66.4	17.6

For the second test, using the non-traditional student data, the observed frequencies were compared to those expected by chance. The level of significance was set at .05. The results of the test indicated no statistically significant difference between the observed and expected values,  $\chi^2 = 6.073$ ,  $df = 4$ ,  $p = .194$ . See Table 35 for the observed and expected frequencies.

The hypothesis that the relationship between how a student meets the reading placement requirement for English Composition I (COL101) and student success is affected by age was supported. For traditional students, the results of the test indicated a

statistically significant relationship. For non-traditional students, no relationship was indicated.

Table 35

*Observed and Expected Frequencies for H10 - Non-traditional Students*

Placement Method		Course Results	
		Successful	Unsuccessful
ACT	Observed	38.0	18.0
	Expected	43.1	12.9
ASSET	Observed	320.0	102.0
	Expected	324.9	97.1
COMPASS	Observed	7.0	202.0
	Expected	722.2	215.8
Prerequisite	Observed	130.0	47.0
	Expected	136.3	40.7
Waiver	Observed	41.0	9.0
	Expected	38.5	11.5

**RQ11.** To what extent is the relationship between how a student meets the reading placement requirement for English Composition I (COL101) and student success affected by gender?

**H11.** The relationship between how a student meets the reading placement requirement for English Composition I (COL101) and student success is affected by gender.

Before conducting the two  $\chi^2$  tests of independence used to address RQ11, the sample was disaggregated by student gender (male/female). For the first test, using the male student data, the observed frequencies were compared to those expected by chance. The level of significance was set at .05. The results of the test indicated a statistically significant difference between the observed and expected values,  $\chi^2 = 158.966$ ,  $df = 4$ ,  $p = .000$ . See Table 36 for the observed and expected frequencies. The observed frequency ( $n = 1003.0$ ) was higher than the expected frequency ( $n = 969.1$ ) for male students who were placed using an ACT reading score and were successful. The observed frequency ( $n = 904.0$ ) was higher than the expected frequency ( $n = 795.0$ ) for male students who were placed using an ASSET reading score and were successful. The observed frequency ( $n = 323.0$ ) was higher than the expected frequency ( $n = 243.7$ ) for male students who were placed using a COMPASS reading score and were unsuccessful. The observed frequency ( $n = 130.0$ ) was higher than the expected frequency ( $n = 74.6$ ) for male students who were placed using a prerequisite reading course and were unsuccessful. The observed frequency ( $n = 25.0$ ) was higher than the expected frequency ( $n = 16.7$ ) for male students who were placed using a reading waiver and were unsuccessful. Male students who were placed using the ACT and ASSET for reading placement tended to be successful in English Composition I (COL101) at Allen Community College. Male students who were placed using the COMPASS, prerequisite course, and waiver for reading placement tended to be unsuccessful in English Composition I (COL101) at Allen Community College.

Table 36

*Observed and Expected Frequencies for H11 - Male Students*

Placement Method		Course Results	
		Successful	Unsuccessful
ACT	Observed	1,003.0	294.0
	Expected	969.1	327.9
ASSET	Observed	904.0	160.0
	Expected	795.0	269.0
COMPASS	Observed	641.0	323.0
	Expected	720.3	243.7
Prerequisite	Observed	165.0	130.0
	Expected	220.4	74.6
Waiver	Observed	41.0	25.0
	Expected	49.3	16.7

For the second test, using the female student data, the observed frequencies were compared to those expected by chance. The level of significance was set at .05. The results of the test indicated a statistically significant difference between the observed and expected values,  $\chi^2 = 142.487$ ,  $df = 4$ ,  $p = .000$ . See Table 37 for the observed and expected frequencies. The observed frequency ( $n = 1281.0$ ) was higher than the expected frequency ( $n = 1240.3$ ) for female students who were placed using an ACT reading score and were successful. The observed frequency ( $n = 1462.0$ ) was higher than the expected frequency ( $n = 1356.1$ ) for female students who were placed using an ASSET reading score and were successful. The observed frequency ( $n = 359.0$ ) was higher than the

expected frequency ( $n = 271.1$ ) for female students who were placed using a COMPASS reading score and were unsuccessful. The observed frequency ( $n = 127.0$ ) was higher than the expected frequency ( $n = 70.7$ ) for female students who were placed using a prerequisite reading course and were unsuccessful. The observed frequency ( $n = 15.0$ ) was higher than the expected frequency ( $n = 12.6$ ) for female students who were placed using a reading waiver and were unsuccessful. Female students who were placed using the ACT and ASSET reading tests for reading placement tended to be successful in English Composition I (COL101) at Allen Community College. Students who were placed using the COMPASS, prerequisite course, and waiver for reading placement tended to be unsuccessful in English Composition I (COL101) at Allen Community College.

The hypothesis that the relationship between how a student meets the reading placement requirement for English Composition I (COL101) and student success is affected by gender (male/female) was not supported. Male students who were placed using the ACT and ASSET for reading placement tended to be successful in English Composition I (COL101) at Allen Community College. Male students who were placed using the COMPASS, prerequisite course, and waiver for reading placement tended to be unsuccessful in English Composition I (COL101) at Allen Community College. Female students who were placed using the ACT and ASSET reading tests for reading placement tended to be successful in English Composition I (COL101) at Allen Community College. Students who were placed using the COMPASS, prerequisite course, and waiver for reading placement tended to be unsuccessful in English Composition I (COL101) at Allen Community College.

Table 37

*Observed and Expected Frequencies for H11 - Female Students*

Placement Method		Course Results	
		Successful	Unsuccessful
ACT	Observed	1,281.0	241.0
	Expected	1,240.3	281.7
ASSET	Observed	1,462.0	202.0
	Expected	1,356.1	307.9
COMPASS	Observed	1,106.0	359.0
	Expected	1,193.9	271.1
Prerequisite	Observed	255.0	127.0
	Expected	311.3	70.7
Waiver	Observed	53.0	15.0
	Expected	55.4	12.6

**RQ12.** To what extent is the relationship between how a student meets the reading placement requirement for English Composition I (COL101) and student success affected by course delivery mode?

**H12.** The relationship between how a student meets the reading placement requirement for English Composition I (COL101) and student success is affected by delivery mode.

Before conducting the four  $\chi^2$  tests of independence used to address RQ12, the sample was disaggregated by delivery mode (Burlingame/Outreach, Iola, online, concurrent). For the first test, using the Burlingame/Outreach data, the observed

frequencies were compared to those expected by chance. The level of significance was set at .05. The results of the test indicated a statistically significant difference between the observed and expected values,  $\chi^2 = 37.315$ ,  $df = 4$ ,  $p = .000$ . See Table 38 for the observed and expected frequencies. The observed frequency ( $n = 529.0$ ) was higher than the expected frequency ( $n = 509.3$ ) for Burlingame/Outreach students who were placed using an ACT reading score and were successful. The observed frequency ( $n = 523.0$ ) was higher than the expected frequency ( $n = 496.5$ ) for Burlingame/Outreach students who were placed using an ASSET reading score and were successful. The observed frequency ( $n = 211.0$ ) was higher than the expected frequency ( $n = 194.9$ ) for Burlingame/Outreach students who were placed using a COMPASS reading score and were unsuccessful. The observed frequency ( $n = 93.0$ ) was higher than the expected frequency ( $n = 59.5$ ) for Burlingame/Outreach students who were placed using a prerequisite reading course and were unsuccessful. The observed frequency ( $n = 34.0$ ) was higher than the expected frequency ( $n = 30.6$ ) for Burlingame/Outreach students who were placed using a reading waiver and were successful. Burlingame/Outreach students who were placed using the ACT, ASSET, and waiver for reading placement tended to be successful in English Composition I (COL101) at Allen Community College. Burlingame/Outreach students who were placed using the COMPASS and prerequisite for reading placement tended to be unsuccessful in English Composition I (COL101) at Allen Community College.

Table 38

*Observed and Expected Frequencies for H12 - Burlingame/Outreach Students*

Placement Method		Course Results	
		Successful	Unsuccessful
ACT	Observed	529.0	187.0
	Expected	509.3	206.7
ASSET	Observed	523.0	175.0
	Expected	496.5	201.5
COMPASS	Observed	464.0	211.0
	Expected	480.1	194.9
Prerequisite	Observed	113.0	93.0
	Expected	146.5	59.5
Waiver	Observed	34.0	9.0
	Expected	30.6	12.4

For the Iola students, the observed frequencies were compared to those expected by chance. The level of significance was set at .05. The results of the test indicated a statistically significant difference between the observed and expected values,  $\chi^2 = 79.331$ ,  $df = 4$ ,  $p = .000$ . See Table 39 for the observed and expected frequencies. The observed frequency ( $n = 823.0$ ) was higher than the expected frequency ( $n = 737.4$ ) for Iola students who were placed using an ACT reading score and were successful. The observed frequency ( $n = 185.0$ ) was higher than the expected frequency ( $n = 174.7$ ) for Iola students who were placed using an ASSET reading score and were successful. The observed frequency ( $n = 274.0$ ) was higher than the expected frequency ( $n = 201.4$ ) for



Iola students who were placed using a COMPASS reading score and were unsuccessful. The observed frequency ( $n = 120.0$ ) was higher than the expected frequency ( $n = 100.5$ ) for Iola students who were placed using a prerequisite reading course and were unsuccessful. The observed frequency ( $n = 19.0$ ) was higher than the expected frequency ( $n = 15.2$ ) for Iola students who were placed using a reading waiver and were unsuccessful. Iola students who were placed using the ACT and ASSET for reading placement tended to be successful in English Composition I (COL101) at Allen Community College. Iola students who were placed using the COMPASS, prerequisite, and waiver for reading placement tended to be unsuccessful in English Composition I (COL101) at Allen Community College.

Table 39

*Observed and Expected Frequencies for H12 - Iola Students*

Placement Method		Course Results	
		Successful	Unsuccessful
ACT	Observed	823.0	228.0
	Expected	737.4	313.6
ASSET	Observed	185.0	64.0
	Expected	174.7	74.3
COMPASS	Observed	401.0	274.0
	Expected	473.6	201.4
Prerequisite	Observed	217.0	120.0
	Expected	236.5	100.5
Waiver	Observed	32.0	19.0
	Expected	35.8	15.2

For the online students, the observed frequencies were compared to those expected by chance. The level of significance was set at .05. The results of the test indicated no statistically significant difference between the observed and expected values,  $\chi^2 = 8.055$ ,  $df = 4$ ,  $p = .09$ . See Table 40 for the observed and expected frequencies. The hypothesis was not supported because a relationship did not exist.

Table 40

*Observed and Expected Frequencies for H12 - Online Students*

Placement Method		Course Results	
		Successful	Unsuccessful
ACT	Observed	317.0	103.0
	Expected	311.2	108.8
ASSET	Observed	222.0	90.0
	Expected	231.2	80.8
COMPASS	Observed	610.0	192.0
	Expected	594.3	207.7
Prerequisite	Observed	88.0	44.0
	Expected	97.8	34.2
Waiver	Observed	25.0	12.0
	Expected	27.4	9.6

For the concurrent students, the observed frequencies were compared to those expected by chance. The level of significance was set at .05. The results of the test indicated no statistically significant difference between the observed and expected values,

$\chi^2 = .862$ ,  $df = 4$ ,  $p = .93$ . See Table 41 for the observed and expected frequencies.

Relationships and success varied based on the method of delivery.

Table 41

*Observed and Expected Frequencies for H12 - Concurrent Students*

Placement Method		Course Results	
		Successful	Unsuccessful
ACT	Observed	615.0	17.0
	Expected	617.4	14.6
ASSET	Observed	1,436.0	33.0
	Expected	1,435.1	33.9
COMPASS	Observed	272.0	5.0
	Expected	270.6	6.4
Prerequisite	Observed	2.0	0
	Expected	2.0	0
Waiver	Observed	3.0	0
	Expected	2.9	.1

The hypothesis that method of delivery affected success was supported.

Burlingame/Outreach students who were placed using the ACT, ASSET, and waiver for reading placement tended to be successful in English Composition I (COL101) at Allen Community College. Burlingame/Outreach students who were placed using the COMPASS and prerequisite for reading placement tended to be unsuccessful in English Composition I (COL101) at Allen Community College. Iola students who were placed using the ACT and ASSET for reading placement tended to be successful in English

Composition I (COL101) at Allen Community College. Iola students who were placed using the COMPASS, prerequisite, and waiver for reading placement tended to be unsuccessful in English Composition I (COL101) at Allen Community College. For online and concurrent students, no statistically significant relationship existed.

### **Summary**

Descriptive statistics were presented. The hypotheses presented in Chapter three of this study were tested using multiple  $\chi^2$  tests of independence. The significance level for each test was set at .05. Chapter five includes interpretation of the research findings and recommendations for further study. The study summary includes a review of the overview of the problem, purpose statement and research questions, review of methodology, and major findings. Findings related to the literature are discussed. The conclusion includes implications for action, recommendations for future research, and concluding remarks.

## **Chapter Five**

### **Interpretation and Recommendations**

The community college is the open door to education in that these institutions welcome a variety of students. Each year, as part of the admissions process, millions of students take placement tests in two-year colleges across the United States. Colleges use the results of the placement tests to determine student preparedness for college-level coursework. Students who are placed into developmental courses often struggle to complete a degree or certificate at the community college (Strong American Schools, 2008). Completion has become a subject of national interest, and the efficacy of placement testing is a popular topic for discussion. In this chapter, a summary of the study, an overview of the research problem, the purpose statement and research questions used in the study, the methodology used in the study, and major findings are provided. This chapter also includes a discussion of the findings related to literature, conclusions, implications for action, recommendations for further research, and concluding remarks.

#### **Study Summary**

Colleges often employ mandatory placement policies because accurately placing students affects student ability to succeed in coursework. Colleges are under great pressure to increase certificate and degree completion. A variety of methods is used to place students. This study provides evidence that there is a relationship between student success and method of placement.

**Overview of the problem.** Each year students take placement tests as part of the admissions process at community colleges. The results of placement tests have caused both the under and over placement of students. Students who are placed in courses that are too difficult may fail the course or fail to persist. Students who are placed in developmental courses often fail to complete their college goals. Delayed completion is also costly for students. Allen Community College is considering placement policy changes. Information about the ability of each test to predict student success is an important consideration for the college and its students.

**Purpose statement and research questions.** The purpose of this study was to determine whether a relationship exists between methods of placement and student success in College Algebra (MAT105) and English Composition I (COL101) at Allen Community College. The second purpose of the study was to investigate the relationship between method of placement and success with regard to age, gender, and course delivery mode. Twelve research questions were addressed in this study.

**Review of the methodology.** This quantitative research study involved a sample of students who earned a grade in College Algebra (MAT105) or English Composition I (COL101) for the first time at Allen Community College between Spring 2003 and Summer 2013. Placement methods in the study included the ACT math, writing, and reading tests; the ASSET intermediate algebra, writing, and reading tests; the COMPASS algebra, writing, and reading tests; prerequisite courses in Intermediate Algebra, Pre-Composition, and Intermediate Reading; and waivers for math, writing, and reading. Using  $\chi^2$  tests of independence, each method of placement was analyzed for a relationship with student success. Also, multiple  $\chi^2$  tests of independence were used to

determine if a statistically significant relationship existed between age, gender, and method of delivery and student success for each method of placement.

**Major findings.** A statistically significant relationship existed between the method used to place a student in College Algebra (MAT105) and success in the math dataset. A statistically significant relationship also existed between the method used to place a student in English Composition I (COL101) for both reading and writing and student success in the composition dataset. Demographics such as age, gender and the method of course delivery affected some of the relationships.

In the math dataset, students who were placed in College Algebra (MAT105) using the ACT tended to be successful, and most students who were placed in College Algebra (MAT105) using the ASSET tended to be successful. Students who were placed in College Algebra (MAT105) using the COMPASS, prerequisite course, or waiver tended to be unsuccessful. Some exceptions occurred when the data was disaggregated by age and method of course delivery. No relationship existed between the method of course placement and success for non-traditional students. The method of course delivery affected the relationship. No relationship existed between the method of placement and success for Burlingame/Outreach students. Online students who were placed in College Algebra (MAT105) using the ASSET tended to be unsuccessful. Concurrent students who were placed in College Algebra (MAT105) using the ASSET tended to be unsuccessful. Online students who were placed in College Algebra (MAT105) using the COMPASS tended to be successful. Concurrent students who were placed in College Algebra (MAT105) using the COMPASS tended to be

successful. Gender did not affect the relationship. The same methods of placement tended to lead to student success regardless of gender.

In the composition dataset, a statistically significant relationship existed between the method of placement and student success. Students who were placed in English Composition I (COL101) using the ACT for writing tended to be successful and most students who were placed in English Composition I (COL101) using the ASSET writing test tended to be successful. Students who were placed in English Composition I (COL101) using the COMPASS writing test, prerequisite course, or waiver tended to be unsuccessful. Some exceptions occurred when the data was disaggregated by age and method of course delivery. No relationship existed between the method of course placement and success for non-traditional students. The method of course delivery also affected the relationship. No relationship existed between the method of placement and success for concurrent students. Online students who were placed in English Composition I (COL101) using the ASSET writing test tended to be unsuccessful. Online students who were placed in English Composition I (COL101) using the COMPASS writing test tended to be successful. Gender did not affect the relationship except for female students who were placed in English Composition I (COL101) using a waiver who tended to be successful. Burlingame/Outreach students and online students who were placed in English Composition I (COL101) for writing using a waiver also tended to be successful whereas most Iola students and all students did not tend to be successful when placed in English Composition I (COL101) using a writing waiver.



In the composition dataset, a statistically significant relationship existed between the method of placement for reading and student success. Students who were placed in English Composition I (COL101) using the ACT reading test tended to be successful, and most students who were placed in English Composition I (COL101) using the ASSET reading test tended to be successful. Students who were placed in English Composition I (COL101) using the COMPASS reading test, prerequisite course, or waiver tended to be unsuccessful. Some exceptions occurred when the data was disaggregated by age and method of course delivery. No relationship existed between the method of course placement and success for non-traditional students. The method of course delivery also affected the relationship. No relationship existed between the method of placement and success for online or concurrent students. No students who were placed in English Composition I (COL101) using the COMPASS reading test tended to be successful. No students who were placed in English Composition I (COL101) using the prerequisite course tended to be successful. Of those students receiving waivers, only Burlingame/Outreach students placed using a waiver for the reading test tended to be successful. Gender did not affect the relationship. The same methods of placement tended to lead to student success regardless of gender.

### **Findings Related to the Literature**

Placement testing is controversial but can predict success. Ledermen, Ribaud, and Ryzewic (1985) reported that most schools used placement testing and few used other measures. Armstrong (2001) found a significant relationship between course grades in math and English and placement tests. The results of this study discovered a significant relationship existed between success in math and English and method of

placement. Jenkins et al. (2009) found that while placement tests in reading and writing did not predict success, math placement tests did predict success. The results of this study partially support Jenkins et al. (2009) in that the method of placement for math did predict success. The results of this study disagree with Jenkins et al. (2009) in that method of placement in reading and writing predicted success at Allen Community College. Jenkins et al. (2009) found that placement tests did not predict success in reading and writing. Wattenbarger and McLeod (1989) found a low correlation between math course grades and test scores. This study supports Wattenbarger and McLeod (1989) in that a relationship existed between the method of placement and success; however, this study did not look at specific course grades. Michael and Shaffer (1978) determined placement did not predict grades. The results of this study indicated a statistically significant relationship existed between success, which was based on course grades, and method of placement in College Algebra (MAT105) and English Composition I (COL101).

The ACT, which is used by many institutions for placement, has mixed results for student success. Fowler and Ross (1982) found that the ACT was a predictor of success. Sawyer (1996) found the ACT math test was a stronger predictor of student success than a locally created test but results varied depending on the definition of success. Naumann et al. (2003) found the ACT was a valid predictor of success. Hutson (1999) also found a relationship, although weak, between ACT and course grades. The results of this study supported Fowler and Ross (1982), Sawyer (1996), Naumann et al. (2003), and Hutson (1999) in that students who were placed using the ACT math test tended to be successful in College Algebra (MAT105) at Allen Community College. Long (2003) reported no

relationship between the ACT and success in math. The results of this study disagree with Long (2003). Donovan and Wheland (2008) found a relationship between the ACT and success in Intermediate Algebra. They also found that the ACT was a stronger predictor for males than females. In this study, when analyzing success in College Algebra, a relationship was found between the method of course placement using the ACT math score and student success. At Allen Community College, no difference existed when the data was disaggregated by gender for placement using the ACT.

The ASSET exam may or may not predict success. Unlike this study, Gabe (1989) determined ASSET was not a predictor of success. Hughes and Nelson (1991) determined that ASSET was a weak predictor of success in English Composition. In this study, students placed using the ASSET tended to be successful in English Composition I (COL101) which supports the results of Hughes and Nelson. Krol (1993) found that ASSET was a predictor of success in English. The results of this study agree with Krol (1993). Shaw (1997) determined that students placed by ASSET had higher success than those self-placed and no difference in placement and success based on gender. The results of this study support that students placed using the ASSET tended to be successful but did not make a comparison to students who self-placed because self-placement is not a part of Allen Community College's placement policy. Hartl (1997) also found a relationship between placement scores and mathematics grades. The results of this study support the results of Hartl (1997) in that a relationship existed between the use of the ASSET for placement and success in mathematics. Waycaster (2004) looked at the ASSET and COMPASS and how they related to success in mathematics. Waycaster found the ASSET was a predictor of success in mathematics, but COMPASS was not a

predictor of success in mathematics. The results of this study support Waycaster (2004) in that students who were placed using the ASSET tended to be successful in College Algebra (MAT105) at Allen Community College and students who were placed using COMPASS, with the exception of online and concurrent students, tended to be unsuccessful.

The COMPASS exam predicted success with mixed results. Colvin (2014) found that the COMPASS did predict success in mathematics. Colvin found that students who completed a prerequisite course were less likely to be successful in math than those placed using an ACT or COMPASS score. Additionally, COMPASS was more accurate in predicting success than the ACT, but both were good indicators. The results of this study support Colvin (2014) in that the COMPASS tended to lead to student success in math for online and concurrent students but completion of the pre-requisite did not tend to lead to success in math. Belfield and Crosta (2012) determined that COMPASS was not a predictor of success. The results of this study partially support the findings of Colvin (2014), Belfield and Crosta (2012), and Barr et al. (2002) because the COMPASS was not generally a predictor of success. Two exceptions for which the COMPASS was a predictor of success were online students and concurrent students. Self (2010) found a relationship between COMPASS and success for students in College Algebra. The results of this study partially support the results found by Self (2010) in that the COMPASS was a predictor of success for online and concurrent students in College Algebra (MAT105). Owens (2005) found that COMPASS was an accurate predictor of success in writing. The results of this study indicated that the COMPASS was a predictor of success in writing but only for online students. Long (2003) found no relationship

between the COMPASS and math success. The results of this study disagree with Long (2003) as online and concurrent students who were placed using COMPASS tended to be successful at Allen Community College. Barr et al. (2002) determined that no relationship existed between test scores and success in reading, writing, and math. This study disagrees with Barr et al. (2002) as a relationship exists between test scores and success for math, writing, and reading at Allen Community College.

Prerequisite courses are not always predictive of student success. Jenkins et al. (2009) determined completion of a prerequisite had no impact on success. Colvin (2014) also found that students completing a prerequisite course were less likely to succeed than those who did not complete a prerequisite course. The results of this study support Jenkins et al. (2009) and Colvin (2014) in that completion of a prerequisite course did not predict success for any student.

## **Conclusions**

Allen Community College has had a mandatory placement policy since 2002. This study utilized  $\chi^2$  tests of independence to determine if a relationship existed between student success and the method of course placement. Students placed using the ACT and the ASSET appeared to be successful; however, these methods of placement did not lead to success for non-traditional and concurrent students. No method of placement tended to lead to success for non-traditional and concurrent students with the exception of concurrent math students who were placed using the COMPASS or ACT. While a statistically significant relationship existed between the method of course placement and success for most students except non-traditional and concurrent students, the method of course placement was generally not predictive of success in that students placed using the

COMPASS, pre-requisite course, and waiver tended to be unsuccessful with some exceptions. These results indicated that the method of placement needs to be revised and strengthened at Allen Community College.

**Implications for action.** The results showed a relationship between the method of placement and student success and the effect of age, gender, and method of course delivery on success. Allen Community College is in the process of revising its placement policy. The results of this study indicated the ACT should continue to be used as a method of placement for math, writing, and reading. Waivers for math and reading placement should rarely be granted. Waivers for writing placement were more likely to lead to student success but should also rarely be granted because students with waivers tended to be unsuccessful. Since the prerequisite course is not as likely to lead to success as chance, the curriculum should be reviewed and aligned so that students learn the skills necessary to succeed in the college-level course in the prerequisite course. Another possible solution might be to require a higher score in the prerequisite course before a student is allowed to take the college-level course. For example, perhaps students should earn a B or higher in Intermediate Algebra (MAT020) before being allowed to take College Algebra (MAT105). Allen Community College would benefit from considering additional methods of placement such as grade point average in high school or college, state assessment test scores, or measures of non-cognitive factors. Non-cognitive factors include motivation, family support, time available for study, self-efficacy, and time management skills. Allen Community College could also change its placement policy to include multiple measures rather than reliance on a single placement test for placement. Morante (1989) advocated the use of multiple measures for placement.

Allen Community College might decide to discontinue the use of placement tests for one or more groups of students. Since placement tests have no relationship with success for non-traditional students, alternate methods might be used instead for this group. Since placement tests are rarely predictive of success for concurrent students, Allen Community College could reduce costs, the workload for staff, and the amount of testing required for high school students by using a state assessment or other criteria for placement.

Allen Community College could follow best practices concerning placement testing. Student Services should provide information to students about placement tests before students test including the repercussions placement can have for students. Allen Community College should also provide a retest procedure as part of its placement policy. Students should be encouraged to prepare for the placement exam and be provided with preparation materials. Allen Community College could encourage students to test over time rather than all on one day to decrease the possible impact of test fatigue.

**Recommendations for future research.** The relationship between the success of students and methods of placement in College Algebra (MAT105) and English Composition I (COL101) at Allen Community College was analyzed in this study. Additionally, whether age, gender, and method of delivery affected success in these two courses at Allen Community College was determined. The results of this study indicated a need for further research to determine methods of placement that will increase the likelihood of student success in College Algebra (MAT105) and English Composition I (COL101) at Allen Community College.

This study examined quantitative data. While a placement test provides a snapshot of student ability in a subject, it does not provide insight into non-cognitive aspects that can affect success (Saxon and Morante, 2014). A study could be conducted using quantitative and qualitative data related to student success. Interviews with students would provide insight into non-cognitive factors such as work requirements, family requirements, and study habits.

Student attitudes toward and preparation for placement testing could be researched by surveying students. Studies conducted by the Community College Research Center at Columbia University found that placement tests are high stakes events, and students do not understand the importance of these tests. Students often do not prepare for these tests and do not exert maximum effort (Hodara et al., 2012).

Allen Community College could conduct a study that compared student success to scores on the placement tests. By comparing grades to cut-scores, the college could determine the ideal cut-score for placement in math and English at Allen Community College. By changing the cut-scores necessary for enrollment, students who are most likely to succeed could be enrolled in college-level coursework while students who needed remediation could be enrolled in development coursework.

A more accurate method of placement for concurrent students could be researched. Studies conducted by the University of Kansas indicate that state assessment test scores can be used for placement. Other methods such as an institutionally developed test could also be considered to place this group of students more effectively. Some studies have also shown high school GPA to be a predictor of success. Data could



be harvested from the high schools and student information system to determine if these methods of placement predict success.

A study could be conducted to determine which skills needed in College Algebra (MAT105) are not being mastered in Intermediate Algebra (MAT020). The curriculum of Intermediate Algebra (MAT020) could be reworked to focus more on the skills needed for success in College Algebra (MAT020). Greater alignment between the skills taught in the prerequisite course should benefit students taking the college-level course.

Multiple measures can be used for placement rather than a single measure. A study could examine the effect of high school grade point average (GPA) or high school preparation on student success when used in combination with placement test scores. Studies have shown that multiple measures are more effective in placing students than a placement test score alone (Lagunoff et al., 2012).

**Concluding remarks.** Community college students struggle to complete programs. According to Snyder and Dillow, (2012), only 27.5% of first-time, full-time degree or certificate-seeking students at community colleges complete their programs within 150% of the time required in 2005. In 2009, President Obama challenged colleges to increase degree and certificate completion to the highest level in the world by 2020 (The White House, 2009). The Kansas Board of Regents, in *Foresight 2020*, have asked colleges to increase the number of Kansas with certificates, associate's degrees, or bachelor's degrees to 60% by 2020 (KBOR, 2015). Earning a degree requires students to complete required courses such as College Algebra (MAT105) and English Composition I (COL101) successfully. Success in these courses is related to accurate placement. Nationwide, 42% of first-time undergraduates in public two-year colleges took at least

one remedial course (U.S. Department of Education, 2011). Placement tests create situations where students are under placed in courses that are too easy and over placed in courses that too difficult. An accurate placement policy is necessary for student success. The results of this study provide evidence that the placement policy at Allen Community College includes elements that predict student success and elements that do not. It is necessary for Allen Community College to revise and strengthen its placement policy so that it more accurately predicts student success. Continued research on placement will benefit the students and higher education.

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## Appendices

**Appendix A: Baker University IRB Request**

SCHOOL OF EDUCATION  
GRADUATE DEPARTMENT



IRB PROTOCOL NUMBER \_\_\_\_\_

Date: 10/14/2015

(IRB USE ONLY)

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

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

Department(s) School of Education Graduate Department

Name	Signature	
1. Dr. Susan Rogers	<u>Susan Rogers</u>	Major Advisor
2. Margaret Waterman	<u>Margaret Waterman</u>	Research Analyst
3. Dr. Marcus Childress		University Committee Member
4. Dr. Amber Anderson		External Committee Member

Principal Investigator:

Regena Aye Regena M. Aye  
Phone: 785-528-0102  
Email: rbaileyaye@embarqmail.com  
Mailing address: 211 Holliday St., Osage City, KS 66523

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

Expected Category of Review:  Exempt  Expedited  Full

**II: Protocol Title**

The Relationship between Method of Placement and Success in College Algebra (MAT105) and English Composition I (COL101) at Allen Community College

**Summary**

The following summary must accompany the proposal. Be specific about exactly what participants will experience, and about the protections that have been included to safeguard participants from harm. Careful attention to the following may help facilitate the review process:

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

The purpose of the study is to determine whether there is a difference in student success, as measured by course grade, in College Algebra (MAT105) of students who met the requirements of the mandatory placement policy by use of COMPASS scores, by use of ASSET scores, by use of ACT scores, by passing the pre-requisite course, or by waiver and the effect of age, gender, and method of delivery on student success. The second purpose of this study is to determine if there is a difference in student success, as measured by course grade, in English Composition I (COL101) of students who met the requirements of the mandatory placement policy by use of COMPASS scores, by use of ASSET scores, by use of ACT scores, by passing the pre-requisite course, or by waiver and the effect of age, gender, and method of delivery on student success. The study will use data from spring 2003 through summer 2013 from Allen Community College. Allen is a rural community college in Kansas.

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

There will be no conditions or manipulations by the researcher included within this study.

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

No questionnaire will be used. Placement test results from the student information system will be used. The placement tests used include the ACT, ASSET, and COMPASS. ACT is a test of college preparedness developed by the American College Testing Program that includes subtests in English, Mathematics, Reading, and Science. The Assessment Skills for Successful Entry and Transfer (ASSET) test is a test of college preparedness developed by the American College Testing Program. This test includes Numerical Skills, Intermediate Algebra, Reading Skills, and English Skills subtests. Computer-adaptive Placement Assessment and Support System (COMPASS) is a placement test developed by the American College Testing Program that includes tests in Reading, Mathematics, and English. Students can also complete pre-requisite courses as a method of placement for College Algebra (MAT105) and English Composition I (COL101). The pre-requisite course for College Algebra (MAT105) is Intermediate Algebra (MAT020). The pre-requisite course for English Composition I (COL101) is Pre-Composition (COL011) and/or Intermediate Reading (COL013). Students may also obtain a waiver.

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

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

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

No stress to subjects will be involved.

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

Subjects will not be deceived or misled in any way.

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

No personal or sensitive information will be requested.

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

Subjects will not be presented with materials that might be considered offensive, threatening, or degrading.

**Approximately how much time will be demanded of each subject?**

No time will be demanded of any subject.

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

Subjects for this study will be students who took English Composition I (COL101) or College Algebra (MAT105) at Allen Community College between spring 2003 and summer 2013. Allen Community College already possesses the data necessary for this research. Therefore, no subjects will be solicited or contacted by the researcher.

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

No inducements will be offered to subjects. Allen Community College already has the data necessary for the study.

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

Allen Community College will provide the data for this study. Subjects will not be contacted.

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

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



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

No, participation by subjects will not be made part of permanent records nor will participation information be provided to supervisors, teachers, or employers.

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

Student ID numbers will be replaced by a number and instructor identities will be replaced by a number to protect anonymity. The data will be protected using the same standards employees of Allen Community College follow to protect the privacy of students. Files will be password protected. Files will not be left open on unattended computers. The files containing the data for the study will be stored on the researcher's computer. The computer is stored in a secure location that is locked when not in use. It will be stored until the study is completed. The data will be deleted once the study is completed.

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

There will be no risks involved in the study.

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

Data will be extracted from the student information system used at Allen. If any holes in the data exist, they will be filled from file information. Incomplete records will be excluded. All data that will be used in this study is archival.

**Appendix B: Baker University IRB Letter of Approval**



*Baker University Institutional Review Board*

Wednesday, October 21, 2015

Dear Regena Aye and Dr. Rogers,

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

Please be aware of the following:

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

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

Sincerely,

*Chris Todden EdD*  
Chair, Baker University IRB

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

**Appendix C: Allen Community College Letter of Approval**



Jon C. Marshall  
Vice President for Academic Affairs  
Allen Community College  
1801 N. Cottonwood St.  
Idola, KS 66749

March 12, 2012

Dr. Rogers:

I write to express Allen Community College's approval for Regina M. Aye to utilize student placement data and student success data, with the identifying student information removed, for her CRS as she works to complete her doctoral program.

Should you have any questions about this approval for data usage, please feel welcome to contact me at 620-365-5116 ext. 212 or [marshall@allenc.edu](mailto:marshall@allenc.edu).

Sincerely,

A handwritten signature in cursive script that reads "Jon C. Marshall".

Jon C. Marshall