

SUCCESSFUL RURAL COMMUNITY COLLEGE STUDENTS: EXAMINING THE
ASSOCIATION OF STUDENT DEMOGRAPHICS, HIGH SCHOOL
ENVIRONMENTAL VARIABLES, AND HIGH SCHOOL OUTCOME VARIABLES
ON COMMUNITY COLLEGE DEGREE ATTAINMENT

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by:
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The undersigned, appointed by the dean of the Graduate School, have examined the dissertation entitled

SUCCESSFUL RURAL COMMUNITY COLLEGE STUDENTS: EXAMINING THE
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presented by Kali Bard,

a candidate for the degree of doctor of education in educational leadership and policy
analysis, and hereby certify that, in their opinion, it is worthy of acceptance.

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DEDICATION

To my husband, Jason Bard, I express my deepest gratitude for your patient support, and encouragement to me through this effort while pursuing my educational dream. Two are better than one, but I am so grateful that you took on so much of our household responsibilities so that I could spend countless hours in class or focused on classwork and writing my dissertation. I am also grateful for my children, Kyler, Brek, Jacie, and Jase for putting up with me during these past several years. I promise that I will be back to “normal” now. I am also deeply indebted to my friends and colleagues, your encouragement has meant more than you’ll ever know. Finally, above all, I thank God for his many blessings and for the strength that he has granted me to achieve this lifelong dream.

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ABSTRACT

Traditionally known for their open-door admission policies, low tuition, and convenience, community college enrollment has grown drastically in the last decade. This increased enrollment; however, has not brought about an increase in degree attainment. In fact, only 29.9% of full-time degree- or certificate-seeking students at community colleges graduate in three years or less. Based on Astin's (2001) modified input-environment-outcome (I-E-O) model, this study investigated the relationship between college readiness measures taken in high school and the successful completion of a community college associate degree. The high school transcripts of 443 first-time, full-time students who graduated high school in May 2011 and enrolled at the community college in fall 2011 with a declared associate degree major were examined. The final and complete binary logistic regression model included all independent variables simultaneously, including demographics. Regression results indicated that the overall model was statistically reliable in distinguishing between successful and unsuccessful community college students. Taken together, among first-time, full-time, traditional age, degree-seeking community college students, the likelihood of attaining an associate degree within three years with a 2.0 or higher GPA was significantly associated with high school GPA, total high school credits earned, senior year math, and college credits earned in high school.

CHAPTER ONE:
INTRODUCTION TO DISSERTATION

Background

Although a record number of students are attending college, too few actually graduate (Porter & Polikoff, 2011; United States Department of Education, 2006a). In 2012-13, there were 1,045 community colleges in the United States (AACC, 2014a), representing 45% of all undergraduates, or over 7.1 million students nationwide (CCRC, n.d.). As of 2010, only 42% of 25 to 34 year-olds have an associate degree or higher in the United States, and only 29.9% of full-time degree or certificate seeking students at community colleges graduate in three years or less (AACC, 2010; College Board Advocacy & Policy Center, 2012). Only 20% of these students complete an associate's degree within two years (College Board Advocacy & Policy Center, 2012).

Many community college students enroll with underdeveloped basic skills in reading, writing, and mathematics (Crews & Aragon, 2007), making it difficult to retain and graduate more students. Only 24% of seniors who took the ACT in 2010 (Habley, Valiga, McClanahan, & Burkum, 2010), and 26% of all 2014 ACT tested seniors (ACT, 2014a) met the college-ready benchmarks in all four subject areas. In order for students to be college ready, they must acquire the necessary knowledge and skills while in high school (Conley, 2007; Kuh, 2007; Porter & Polikoff, 2011; Roderick, Nagaoka, & Coca, 2009).

National Context

For the United States, having a well-educated workforce is vital for local and state economies, and the national economy (MDHE, n.d.a). According to the United States Department of Education (2011) College Completion Tool Kit, "more than half of all new jobs in the next decade will require a postsecondary certificate or degree" (p. 1).

Statistics prove the average college graduate earns twice as much as a worker with a high school diploma (The White House, n.d.). In 2012, the average income for a bachelor's degree holder was \$46,900, \$30,000 for a high school graduate, and just \$22,900 for a high school non-completer (Kena et al., 2014). Moreover, the United States economy is dependent on a well-educated workforce (MDHE, n.d.a), and with the rising cost of living, students need to be well educated in order to obtain adequate employment. Nevertheless, the United States now ranks 14th among industrialized countries in higher education attainment (College Board Advocacy & Policy Center, 2012).

President Obama has acknowledged the importance of a college education, reiterating that American workers can no longer rely on a high school education. More than half of the 30 fastest growing occupations require postsecondary education (The White House, n.d.). The average college graduate earns twice as much as a worker with a high school diploma (United States Department of Education, 2014; Wiley, Wyatt, & Camara, 2010). In addition, college graduates experience lower unemployment rates (Clinedinst, & Hawkins, 2011; Kena et al, 2014; MDHE, n.d.a; Perna, 2000; United States Department of Education, 2014), better health (Clinedinst, & Hawkins, 2011; MDHE, n.d.a), a longer life (MDHE, n.d.a), greater civic responsibility (Clinedinst, & Hawkins, 2011; MDHE, n.d.a; Wiley, Wyatt, & Camara, 2010), and a more fulfilling work environment (Perna, 2000; Wiley, Wyatt, & Camara, 2010). Based on the proven benefits of obtaining a postsecondary degree, President Obama set the following goal for our country: "by 2020, America would once again have the highest proportion of college graduates in the world" (The White House, n.d., para. 3).

Community College Students

Horn, Nevill, and Griffith (2006) researched the demographic characteristics of community college students during the 2003-04 school year and discovered the following results. The median age of community college students was 24, while the median age of four-year college students was 21. Nearly 59% of community college students were female, compared with 55% enrolled in four-year colleges. White students made up 60% of the community college students in 2003-04, compared to 69% of four-year college students. Additionally, 15% of community college students were Black and 14% were Hispanic, compared to 11% and 10% respectively of four-year college students. Approximately 29% of dependent community college students came from families with annual household incomes under \$32,000, compared to 21% of four-year college students. Hispanics and those from families in the lowest quarter of socio-economic status are among the high school graduates most likely to attend a community college rather than a four-year college (Provasnik & Planty, 2008). In summary, community college students are more likely to be older, female, from low-income families, and are less likely to be white when compared to students attending four-year colleges and universities (Horn, Nevill, & Griffith, 2006).

Traditionally, community colleges have an open door admittance policy and typically serve a population of students who face “greater social, economic, and academic barriers to their success in college when compared with students in four-year schools” (Bailey, Crosta, & Jenkins, 2006, p. 7). As a result, two-thirds of community college students enroll in at least one developmental education remediation course (CCRC, 2014; Tinto, 2012). In addition, the majority of community college students attend on a part-

time basis (Bailey, Crosta, & Jenkins, 2006), often hold full-time jobs (Calcagno, Crosta, Bailey, & Jenkins, 2007), and 42% are the first-generation in their families to attend college (AACC, 2010). Despite these challenges, many community college students aspire to obtain a four-year degree (Hagedorn, Cypers, & Lester, 2008). Unfortunately, only 30% of full-time degree-seeking students graduate with an associate's degree within three years (College Board Advocacy & Policy Center, 2012).

Statement of the Problem

While the number of high school graduates enrolling in college has increased, the number of college graduates has failed to grow proportionately (United States Department of Education, 2006a). Less than one-fifth of ninth graders graduate high school within four years, and then go on to earn a bachelor's degree within six years (Kirst & Venezia, 2006). Moreover, degree attainment is even worse for low-income and minority students. While 40% of whites have obtained a bachelor's degree by ages 25–29, just 20% of Blacks and 16% of Hispanics in the same age cohort earned degrees by that time (Kena et al., 2014). According to Roderick, Nagaoka, and Coca (2009), “addressing the gap between rising aspirations and college completion is one of the most vexing problems in education today” (p. 188).

Problem of Practice

Students who are considered ready for college are generally expected to be academically prepared for entry-level college coursework. Unfortunately, many students are entering college unprepared (Bailey, Jeong, & Cho, 2010; CCRC, 2014; Conley, 2007; Greene & Forster, 2003; Herzog, 2008; Roderick, Nagaoka, & Coca, 2009; Tinto, 2012; United States Department of Education, 2006a; Venezia & Kirst, 2005). The

National Assessment of Educational Progress (NAEP) 2013 survey, consisting of a nationally representative sample of 92,000 twelfth graders in thirteen states, found that only 26% of twelfth graders are at or above proficient in mathematics, and only 38% are at or above proficient in reading (NCES, 2015b).

Inadequate and inequitable preparation for college affects community college remediation and degree attainment rates (Venezia & Kirst, 2005). Students who enter community college unprepared and incapable of enrolling in college level coursework are generally required to complete developmental education coursework (Provasnik & Planty, 2008). Over 68% of community college students will enroll in at least one developmental education course (CCRC, 2014), at a cost of one billion dollars annually (Provasnik & Planty, 2008; United States Department of Education, 2006b).

Developmental coursework is most often offered in mathematics, English, and writing.

A large number of students who enroll in developmental coursework will spend a significant amount of time and money completing courses that will not contribute toward their degree program (Bailey, Crosta, & Jenkins, 2006). This could account for a single developmental course, or up to a full semester or more worth of developmental coursework. Developmental coursework is costly and lengthens time to degree completion. According to Complete College America (2011), of the students required to take developmental coursework, only 13% finish a one-year certificate within eighteen months, compared to 23% of all students; 9.5% complete an associate's degree within three years, compared to 14% of all students; and 35% complete a bachelor's degree within six years, compared to 56% of all students.

Crowder College Problem of Practice. By 2018, an estimated 60% of all Missouri jobs will require some type of postsecondary education (MDHE, n.d.a). Currently, approximately 49% of Missourian's have a college degree or certificate, and Missouri has set a goal to increase it to 60% by 2025 (MDHE, n.d.a). In order to increase degree attainment, the Missouri Department of Higher Education (MDHE) is updating the state's *Blueprint for Higher Education* to focus on four areas: (a) accessibility, improving college readiness and making higher education available to all students across the state; (b) affordability, keeping costs affordable for all students; (c) quality, ensuring all students obtain the knowledge and skills necessary for a rapidly changing world; and (d) completion, helping student obtain a certificate or degree (MDHE, n.d.a).

Crowder College determines readiness for college-level coursework by a student's ACT or Compass placement score. Students who do not score at the appropriate level are required to complete developmental coursework in Math or English, or both. In 2015, the MDHE created a new *Policy on Basic Skills Assessment and Placement* requiring institutions to use multiple measures to assess the basic mathematics, English, and reading skills of all incoming certificate and degree-seeking students (MDHE, n.d.b). Presumably, the use of multiple placement measures is a more precise measurement of a student's ability to succeed in college. The unfair use of a single, high-stakes assessment score for placement provide further rationale for this new policy. Furthermore, students who enter college unprepared and required to enroll in developmental coursework are less likely to succeed (Calcagno, Crosta, Bailey, & Jenkins, 2007; MDHE, n.d.b).

Crowder College had 5,590 students enrolled during the fall 2012 semester and 41% were enrolled in at least one developmental education course. Furthermore, 45% were low-income students, 47% were first-generation college students, and 33% were non-traditional students age 25 or older. Of those students who were taking classes in fall 2012, 67% enrolled in the Spring 2013 semester. Unfortunately, less than half, 44% of those students who enrolled in the fall 2012 semester were retained the following year, and only 29% graduated within three years (Crowder College, internal database, personal communication, October 29, 2015).

Existing Gap in the Literature

According to Roderick, Nagaoka, and Coca (2009), the most common college readiness policies focus on aligning high school curriculum and graduation requirements to college readiness standards, requiring more rigorous graduation requirements, and increasing state examinations. Evaluating the outcomes of such policies requires data linking high school and postsecondary performance indicators. Unfortunately, only a few states have linked high school indicators to college performance. For this reason, college readiness researchers have been limited to investigating data sets provided by the Department of Education. Gándara and Bial (2001) validated these concerns, “although thousands of early intervention programs exist across the nation, data about whether they work, or for whom and under what circumstances, are generally sparse” (p. vii).

In addition, community college leaders are being confronted to make data-driven decisions (Hagedorn & Kress, 2008). Although community colleges contain a wealth of data, it is often undermined or not mined at all. Similarly, Petrides (2003) argued that

institutions often fail to share and use data effectively. Likewise, Marsh, Pane, and Hamilton (2006) found lack of easy access to be an obstacle in data-driven decisions.

According to Adelman (1999), few studies have investigated the impact of high school variables on degree completion, and even fewer employ high school transcript analysis (Trusty, 2004). Moreover, Williford (2009) argued the lack of empirical research linking high school course performance to college success. Scott-Clayton, Crosta, and Belfield (2014) found that utilizing high school transcripts in the admissions process could significantly reduce placement errors. Zwick (2007) argued the need for college degree attainment prediction models based on high school variables. Maruyama (2012) called for future research to examine in greater detail whether high school grades are, in fact, a contributing factor in college readiness. Furthermore, the majority of recent empirical research on the topic of college readiness employed the use of only one dependent variable. Researchers have found that college outcomes based on multiple factors are the best predictor of college success (Camara, 2013; Conley, 2010; Conley, McGaughy, Kirtner, van der Valk, & Martinez-Wenzl, 2010; Maruyama, 2012; Porchea, Allen, Robbins, & Phelps, 2010; Wiley, Wyatt, & Camara, 2010; Zwick, 2007). In addition, institutions rarely disaggregate student outcomes by gender and ethnicity (Bensimon, 2004).

Purpose of the Study

College readiness, defined as “being able to meet the expectations they encounter in entry-level college courses” (Conley, 2007, p. xi), is a key factor in college success and completion. Furthermore, Camara (2013) argued “placement into college credit courses, and the associated exemption from taking developmental courses, is a principal

objective of college and career readiness” (p. 18). This provides strong rationale for adequately preparing high school graduates for college.

The purpose of this study is to investigate the relationship between college readiness measures taken in high school and the successful completion of a community college associate degree. More specifically, the study aims to identify which high school factors best predict success at Crowder College. Based on Astin’s (2001) modified input-environment-outcome (I-E-O) model, the inputs, or control variables, include student demographics. The environment, or independent variables, consists of the high school college readiness measures. The high school outcome/community college input, or independent variables, consists of the college placement exam scores (ACT or Compass). The output, or dependent variable, is defined as completing an associate degree within three years while maintaining a cumulative GPA of 2.0 or higher.

Through the examination of undermined high school transcripts of community college students who have successfully completed a degree within three years, the current study will expand college readiness research by evaluating multiple measures or predictors of future college success, including student demographics. The ability to predict which college readiness measures best prepare students for college success will enable school districts to increase preparation for and access to such measures. This study will also help community college administrators make better placement decisions for incoming freshmen, and offer support to students who enter college underprepared. Ultimately, such data will foster communication between community colleges and school districts, in an effort to better prepare students for college success.

Research Questions

For the purpose of this study, community college degree attainment is determined by earning an associate degree within three years with a cumulative GPA of 2.0 or higher. Students were considered successful if they were able to obtain an associate degree within three years with a cumulative GPA of 2.0 or higher. Students were considered unsuccessful if they were unable to complete an associate degree within three years with a cumulative GPA of 2.0 or higher. These unsuccessful students could still be enrolled or have dropped out of the community college. In order to better understand the impact college readiness has on community college degree attainment, the following research questions were addressed:

1. What are the differences in the student demographic variables of successful and unsuccessful community college students?
2. What are the differences in high school environmental variables for successful and unsuccessful community college students?
3. What are the differences in high school outcome variables for successful and unsuccessful community college students?
4. In a combined model, what demographic, high school environmental, and high school outcome variables predict community college degree attainment?

Conceptual Framework

The conceptual framework guiding this study was constructed from Astin's (2001) input-environment-outcome (I-E-O) model for studying student outcomes. The I-E-O model has been utilized by many researchers to evaluate the relationship between

student inputs, college environmental factors, and outcomes (Astin, 1977; Astin, 2001; Astin & Sax, 1998; Campbell & Blakey, 1996; Herzog, 2008; Kim & Bragg, 2008; Long & Amey, 1993; Prion, 2008; Thurmond, Wambach, Connors, & Frey, 2002; Zhao, 1999). Although most commonly utilized to research the college environmental factors on student success, the modified model allows for analysis of high school college readiness measures.

The focus of this research is on the high school college preparation measures; however, the community college environment’s impact on college degree attainment cannot be overlooked. For this reason, Astin’s (2001) framework was modified to include three input blocks, two environmental blocks, and two outcome blocks resulting in an I_1 - E_1 - O_1 / I_2 - E_2 - O_2 / I_3 model (see Figure 1). Similarly, Buzynski (2011) modified

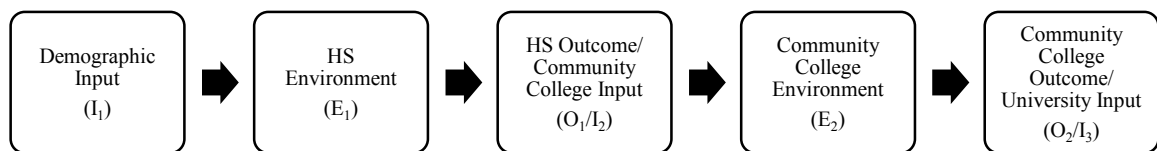


Figure 1. Astin’s (2001) I-E-O Model modified for this study resulting in I_1 - E_1 - O_1 / I_2 - E_2 - O_2 / I_3

Astin’s framework to include two environmental blocks resulting in I - E_1 - E_2 - O . The first block focused on college credit earned while in high school, and the second environmental block examined the college environment. The current study will focus on blocks I_1 , E_1 , O_1 / I_2 , and O_2 / I_3 . The E_2 block will not be analyzed and is recommended for future research.

According to Astin (2001), “inputs refer to the characteristics of the student at the time of initial entry to the institution” (p. 7). The inputs analyzed in this study include

student demographics (I_1) and post high school and pre-college assessment scores (O_1/I_2). The environment “refers to the various programs, policies, faculty, peers, and educational experiences to which the student is exposed” (p. 7). The high school environment variables in this study will include academic measures taken by the student to ensure college readiness (E_1). The outcomes refer to “the student’s characteristics after exposure to the environment” (p. 7). The outcome variable investigated by this study is whether the student successfully completed an associate degree within three years or less while maintaining a 2.0 or higher GPA (O_2/I_3).

The modified I_1 - E_1 - O_1/I_2 - E_2 - O_2/I_3 model will allow for enhanced analysis between the input demographic variables (I_1) and the outcome of community college degree attainment (O_2/I_3), between the high school college readiness measures (E_1) and community college degree attainment (O_2/I_3), and between the high school outcome assessment scores (O_1/I_2) and the outcome of community college degree attainment (O_2/I_3). This modified model will provide K-16 educators a better understanding of how to achieve the educational outcome of college degree attainment.

Design of the Study

Setting

The research will be conducted at Crowder College, a public community college located in a rural area of the Midwest with approximately 5,500 students (see Appendix A). Established in 1963, Crowder College is a two-year state community college located in southwest Missouri. In addition to the main campus located in Neosho, Missouri, four instructional centers are located in Webb City, Cassville, Nevada, and Jane. While the tax base for the college comes from the rural counties of Newton and McDonald, the

service region is comprised of nine counties. There are five high schools, referred to as sending schools, located within Crowder College's service region. These school districts include the Diamond R-IV School District, East Newton R-VI School District, McDonald County R-I School District, Neosho R-V School District, and Seneca R-VII School District.

Of the 5,584 students enrolled at Crowder College during the fall 2015 semester, 63% were female and 81% were white (Crowder College, internal database, personal communication, February 21, 2016). Furthermore, 74% were under 25, 49% were first-generation college students, 32% were low-income, and 62% attended full-time taking at least 15 credit hours per semester. Only 29% of the fall 2012 cohort of first-time, full-time degree seeking students graduated within three years.

Participants

This study will utilize a purposive sampling method. Purposive sampling is a non-random sampling method that allows researchers to determine the characteristics of the sample they wish to analyze and select study participants based on those characteristics (Gay, Mills, & Airasian, 2006). Secondary data will be collected for the fall 2011 cohort of Crowder College first-time, full-time students enrolled in an associate degree program ($n=816$). Participants will be further limited to first-time, full-time students who graduated from an United States high school with a diploma in May 2011 ($n=626$). Because this study involves the detailed analysis of high school transcripts, International students ($n=1$), students earning a high school equivalency diploma ($n=37$), and those of which incomplete or no high school transcript were available ($n=18$) will also be excluded from this study. Additionally, students who transferred to a four-year

institution ($n=68$), a two-year institution ($n=54$), earned a certificate ($n=4$), or died ($n=1$) prior to associate degree attainment will be excluded from the study. This results in 443 first-time, full-time students who graduated high school in May 2011 and enrolled at Crowder College in fall 2011 with a declared associate degree major. The successful graduates ($n=162$) achieved associate degree attainment within two years ($n=128$) or three years ($n=34$) with a cumulative GPA of 2.0 or higher. The unsuccessful students ($n=281$) were unable to complete an associate degree within three years with at least a 2.0 GPA and are still enrolled ($n=48$) or have dropped out ($n=233$).

Research Design

The design of this nonexperimental quantitative study is causal-comparative in nature (Fraenkel & Wallen, 2009). According to Gay, Mills, and Airasian (2006), causal-comparative research “attempts to determine the cause, or reason, for existing differences in the behavior or status of groups of individuals” (p. 217). Furthermore, causal-comparative studies seek to explore relationships among variables, compare two or more groups, typically involve at least one categorical variable, and often compare averages or use crossbreak tables (Fraenkel & Wallen, 2009). Multiple and logistic regression are very common methods used in causal-comparative research, specifically when accounting for extraneous variables. Common weaknesses of causal-comparative research are lack of randomization and the ability to control an independent variable (Fraenkel & Wallen, 2009). In this causal-comparative research study, successful and unsuccessful community college students will be compared to see if their characteristics (input variables I_1), high school variables (E_1), or high school outcome variables (O_1/I_2)

differ in ways that might account for their successful degree attainment (Fraenkel & Wallen, 2009).

Data Collection Tools

The current study will draw on Adelman's (2006) high school transcript analysis research, and Hagedorn and Kress's (2008) community college transcript analysis research. Hagedorn and Kress (2008) defined transcript analysis "as the coding and use of enrollment files, college enrollment files, college application data, financial aid records, and other data that community colleges must routinely collect to comply with state and federal reporting mandates" (p. 7).

While Adelman's (2006) study followed students from ninth grade through eight years of college, the current study is limited to the fall 2011 cohort of Crowder College associate degree seeking students. The researcher will examine the individual high school transcript for each participant. At the time of this study, the only information recorded by Crowder College from a student's high school transcript is the graduation date, class rank, and cumulative GPA. Additionally, college transcripts will be analyzed to look for developmental coursework, first semester GPA, cumulative GPA, and years to degree completion. Hagedorn and Kress (2008) likened this methodology to that of qualitative in-depth analysis, revealing transcript stories.

All new students are required to complete an admissions application, and submit high school and college transcripts prior to being accepted at Crowder College. Such data will be instrumental for this study. The data for this study will be collected directly from students' registration files, admission records, financial aid records, and high school

and college transcript records. Some data, such as ethnicity and first-generation status, will be collected from students' self-reports on their admission application.

Data Analysis

This quantitative study was designed utilizing Astin's (2001) modified I-E-O model to research high school variables that impact community college success. This model was originally designed to compensate for non-random sampling in non-experimental design studies (Astin & Sax, 1998). IBM SPSS Statistical Software version 23 will be utilized to employ a range of descriptive and inferential analyses. Descriptive statistics will be used to describe student demographics. Furthermore, independent samples *t*-tests and non-parametric chi-square tests will be utilized to describe the proportion of successful and unsuccessful college students in regard to demographic, high school environmental, and high school outcome variables. Independent samples *t*-tests will be used for the continuous variables and chi-square for categorical variables. This data will be utilized to answer research questions one (RQ1), two (RQ2), and three (RQ3).

To answer research question four (RQ4), an empirical investigation of quantitative variables, as well as the relationships between the *input*, *environmental*, and *outcome* variables will be conducted utilizing binary logistic regression. According to Mertler and Vannatta (2009), "logistic regression tests the ability of a model or group of variables to predict group membership as defined by some categorical DV [dependent variable]" (p. 304). In this study, binary logistic regression will be used to predict the probability of attaining an associate degree within three years, the dichotomous or categorical outcome for this study. Although similar to discriminant analysis and

multiple regression, logistic regression provides several advantages. First, the independent variables do not have to be normally distributed, linearly related, or have equal variances within each group (Mertler & Vannatta, 2009). Secondly, logistic regression will not produce negative predictive probabilities, unlike multiple regression involving categorical outcomes. Thirdly, continuous, discrete, and categorical predictor variables can be analyzed. Finally, logistic regression can produce nonlinear models, making it a more versatile model and well suited for this study.

Although logistic regression offers greater flexibility, assumptions must first be tested. Logistic regression is sensitive to high correlation among predictor variables and highly sensitive to outliers (Mertler & Vannatta, 2009). Before running the logistic regression model, correlations will first be explored to eliminate multicollinear relationships and standardized residuals will be examined to detect outliers.

Additionally, a preliminary multiple regression will be conducted to calculate Mahalanobis' distance to identify outliers and examine multicollinearity among the predictor variables (2009). After highly correlated variables have been eliminated from the model and outliers have been addressed using standard methods, binary logistic regression will be performed using the hierarchical (blockwise entry) method. In hierarchical regression, predictors are selected and entered in blocks based on past research (Field, 2009). Step one will include student demographic variables (I_1), step two will add the high school environmental variables (E_1), and step three will add the high school outcome variables (O_1/I_2).

To address the goodness-of-fit of the model, the -2 Log Likelihood and Chi-Square with degree of freedom and level of significance will be interpreted. A results

table will report the *B*, *Wald*, *df*, level of significance, and odds ratio. For the purpose of this study, the variables described in the next section will be analyzed. The remaining variables established in the modified I₁-E₁-O₁/I₂-E₂-O₂/I₃ model utilized in this study are detailed in Appendix B.

Student demographic input variables. The input variables (I₁) consist of student demographics (see Table 1). As discussed in the literature review, research has shown that pre-college preparation and college success are influenced by ethnicity, household income, and first-generation student status. Unfortunately, institutions rarely disaggregate student outcomes by gender and ethnicity (Bensimon, 2004). The descriptive demographic information that will be analyzed in this study include: gender, race, Pell eligibility, and first-generation student status. Due to the small number of cases, all other races besides white were combined into a category labeled other.

Table 1

Name and Type of Student Demographic Input Variable

Demographic Input Variables (I ₁)	Description	Coding
GENDER	Gender	Categorical (male=0, female=1)
RACE	Race/Ethnicity	Categorical (white=0, other=1)
PELL	Pell eligibility	Categorical (Yes=1; No=0)
FIRSTGEN	First-generation college student	Categorical (Yes=1; No=0)

High school environmental variables. Pre-college input characteristics were selected based on previous college readiness empirical studies as discussed in the literature review of this study. The high school transcript predictor variables (E₁) that will be analyzed include (see Table 2): Missouri A+ scholarship recipient, cumulative

Table 2

Name and Type of High School Environmental Variable

HS Environmental Variables (E ₁)	Description	Coding
APLUS	Missouri A+ Scholarship	Categorical (Yes=1; No=0)
HSRANK	High school class rank	Continuous
HSGPA	High school cumulative GPA	Continuous
TOTALHSCR	Total high school credits earned	Continuous
TOTALAC	Total number of academic core credits. Includes passing core credits	Continuous
COREGPA	Academic core GPA. Only includes core credits with a letter grade	Continuous
TOTALMATH	Total math credits	Continuous
MATHGPA	Total math GPA	Continuous
TOTALENG	Total English credits	Continuous
ENGGPA	Total English GPA	Continuous
TOTALSCI	Total science credits	Continuous
SCIGPA	Total science GPA	Continuous
TOTALSS	Total social studies credits	Continuous
SSGPA	Total social studies GPA	Continuous
TOTALFL	Foreign language credits earned	Continuous
TOTALDC	Total number of dual credit (DC) courses	Continuous
TOTALAP	Total number of advanced placement (AP) courses	Continuous

TRANHOURS	Total college credits transferred to Crowder College (college credits earned while in high school)	Continuous
TRANSGPA	Transfer credit GPA (for courses taken while in high school)	Continuous
ACTCORE	ACT recommended core curriculum (English, 4 years; math, 3 years; sciences, 3 years; social studies, 3 years)	Categorical (Yes=1; No=0)
MATHINT	Credits in five intensive math courses—algebra 2, algebra 3, trigonometry, pre-calculus, and calculus—were added together to create the math intensity variable	Continuous
HIGHMATH	Highest level of math	Categorical (Calculus, Pre-Calculus, College Algebra DC, or AP course=5; Algebra 3 or Trigonometry=4; Algebra 2=3; Geometry=2; Algebra I or Pre-algebra=1)
HIGHENG	Highest level of English	Categorical (English IV, College Prep English, DC, or AP=4; English III=3; English II=2; English I=1)
HIGHSCI	Highest level of science	Categorical (Physics, DC, or AP=5; Anatomy and Physiology=4, Chemistry or Biology II=3; Biology I=2; Life Science=1)
SRYMATH	Senior year math (both semesters)	Categorical (Yes=1; No=0)
SRYENG	Senior year English (both semesters)	Categorical (Yes=1; No=0)
SRYSCI	Senior year science (both semesters)	Categorical (Yes=1; No=0)
SRYSS	Senior year social studies (both semesters)	Categorical (Yes=1; No=0)
MATHALGII	Math beyond algebra II	Categorical (Yes=1; No=0)

GPA, total credits earned, total academic core credits earned, academic core GPA, total math credits earned, math GPA, total English credits earned, English GPA, total science credits earned, science GPA, total social studies credits earned, social studies GPA, total foreign language credits earned, total number of dual credit (DC) courses, total number of advance placement (AP) courses, whether student met the ACT recommended core curriculum, math intensity level, highest level of math, highest level of English, highest level of science, senior year academic core coursework (math, English, science, and social studies), and whether student completed math beyond Algebra II.

High school outcome variables. When students graduate high school, they enter college with various inputs. The high school outcomes and community college inputs (O₁/I₂) analyzed in this study include: ACT composite, ACT English, ACT math, ACT reading, and the English, writing, and mathematics Compass scores for those students who did not take the ACT, or took the Compass test in hopes of placing into college-level coursework (see Table 3). At Crowder College, students are placed into English, mathematics, and reading courses either by their ACT score, COMPASS score, or successful completion of the prerequisite course. Generally, if incoming students did not take the ACT or are not satisfied with their overall score in a particular area, they are encouraged to take the Compass placement test.

Table 3

Name and Type of High School Outcome Variable

HS Outcome/ Community College Input (O ₁ /I ₂)	Description	Coding
ACTCOMP	Highest ACT composite score	Continuous
ACTENG	Highest ACT English score	Continuous
ACTMATH	Highest ACT math score	Continuous
ACTREADING	Highest ACT reading score	Continuous
COMP MATH	Compass mathematics score	Continuous
COMPWRITE	Compass writing score	Continuous
COMPREAD	Compass reading score	Continuous

Community college outcome (dependent) variable. The outcome variable employed by this study is whether the student successfully completed an associate degree within three years or less while maintaining a 2.0 or higher GPA (O₂/I₃) (see Table 4). Unsuccessful students were unable to complete an associate degree within three years. These students are either still enrolled or have dropped out.

Table 4

Name and Type of Community College Outcome Variable

Community College Outcome/ University Input (O ₂ /I ₃)	Description	Coding
DEGREE	Associate degree attainment within three years with cumulative GPA of 2.0 or higher	Categorical (Successful=1; Not Successful=0)

Limitations, Assumptions, and Design Controls

The findings of this study should not be generalized to all community college students. Instead, this study was limited to the first-time, full-time students attending Crowder College during the fall 2011. Crowder College is a mid-sized community college located in rural, Southwest Missouri. The student population lacks diversity, with the majority of students being white. Additionally, the sample was limited to traditional-age students who graduated with a high school diploma in May 2011, and who were seeking an associate degree. The sample did not include students who transferred to another two- or four-year institution, as they are not recognized by Integrated Postsecondary Education Data System (IPEDS) as successful degree completers. This purposeful sampling procedure decreased the generalizability of the study.

Another limitation of this study was that some demographic data, ethnicity and first-generation status, was based upon self-reported responses by students on the college admission form. As such, the accuracy of these responses cannot be verified. Also, this research was limited to data reported on student high school transcripts, which limited the number of available research variables. Furthermore, other than Pell grant eligibility, there was no data available regarding the socioeconomic status of the students and their family.

Additionally, no data was available regarding the characteristics of the high schools themselves such as size of the high school, average teacher experience, average teacher educational level, average class size, and average ACT score. The rigor of the high school curriculum taken by the students in this study varies, which could affect the accuracy of the results. A student's high school grades may be affected by the rigor of a

student's curriculum; however, such factors were not captured and therefore could not be considered in this study.

The design of this nonexperimental quantitative study is causal-comparative in nature which typically lacks randomization and the ability to control an independent variable (Fraenkel & Wallen, 2009). Furthermore, logistic regression is sensitive to high correlation among predictor variables and highly sensitive to outliers (Mertler & Vannatta, 2009). Another limit in scope is that the current research is only looking at variables a student brought with them to predict community college success, rather than including types of support they received at Crowder College which may have contributed to degree attainment.

Definitions of Key Terms

Advanced Placement Courses (AP)

Advance placement courses utilize curriculum designed by College Board, and students may take an exam to determine if their performance is deemed eligible for college credit. Colleges have the discretion to determine whether the student may receive college credit for the course (College Board, 2015a).

College Readiness

College readiness is defined by Conley (2007) as "being able to meet the expectations they [students] encounter in entry-level college courses" (p. xi). Additionally, it is the level of preparation needed for a student to be ready for college-level course work without remediation. "Students who are college-ready should be able to succeed in entry-level, credit-bearing college courses without the need for remediation" (Wiley, Wyatt, & Camara, 2010, p. 3).

Developmental or Remedial Courses

Developmental or remedial courses, typically math, English, and reading, are designed to prepare students for the demands of college-level course work (Hughes, Karp, Fermin, & Bailey, 2005).

Fall Cohort

A fall cohort is the group of students entering in the fall term established for tracking purposes.

First-Generation Student

A first-generation student is one whose parents never attended college (Adelman, 2006; Ishitani, 2006).

First-Time Student (undergraduate)

A student with no prior postsecondary experience attending any institution for the first time at the undergraduate level is considered a first-time student. This includes students enrolled in academic or occupational programs. It also includes students enrolled in the fall term who attended college for the first time in the prior summer term, as well as students who entered with college credits earned before graduation from high school (Knapp, Kelly-Reid, & Ginder, 2012).

Full-time Student (undergraduate)

A full-time student is enrolled for 12 or more semester credits, or 12 or more quarter credits, or 24 or more contact hours a week each term (Knapp et al., 2012).

Graduation Rate

The graduation rate is calculated as the total number of students who complete their degree within 150% of normal time divided by the revised cohort minus any allowable exclusions (Knapp et al., 2012).

Retention Rate

Retention rate is a “measure of the rate at which students persist in their educational program at an institution, expressed as a percentage. For four-year institutions, this is the percentage of first-time bachelors (or equivalent) degree-seeking undergraduates from the previous fall who are again enrolled in the current fall. For all other institutions this is the percentage of first-time degree/certificate-seeking students from the previous fall who either re-enrolled or successfully completed their program by the current fall” (NCES, 2015a, p. 27).

Traditional Student

A traditional student is a college-age student who is younger than 24 (Horn, Nevill, & Griffith, 2006).

Transcript Analysis

Transcript analysis is “the coding and use of enrollment files, college application data, financial aid records, and other data that community colleges must routinely collect to comply with state and federal reporting mandates” (Hagedorn & Kress, 2008, p. 7).

Significance of the Study

Scholarship

The growing pressure to increase the number of college graduates has placed greater emphasis on better preparation of high school graduates for college. The

perceived lack of college readiness by the majority of incoming college freshmen has placed eminence on college readiness empirical research in an effort to increase the number of successful college graduates. Educators, researchers, and policymakers have focused on college access, yet little research has concentrated on degree attainment (United States Department of Education, 2006a). According to Hagedorn and Kress (2008), “transcript analysis has been employed productively in higher education to help shape policy and practice” (p. 8). High school transcripts can be used to determine if students enter college with a “deficit in academic capital” (p. 8). Furthermore, Scott-Clayton, Crosta, and Belfield (2014) found high school transcript data to be just as useful, if not better than placement exam scores when determining student placement. Likewise, Williford (2009) found performance in high school coursework to be a strong predictor of college success and failure. The current high school transcript analysis study will help researchers and policy makers determine which college readiness skills and practices lead to college success, and how to measure those skills (Roderick, Nagaoka, & Coca, 2009).

Practice

The office of institutional research collects and compiles data in most colleges, often resulting in very few people on campus seeing the results or discussing the implications (Bensimon, 2004). When data is shared, it can act as a catalyst for change by altering perceptions and mindsets. Bensimon posited that college administrators should first spend time analyzing existing data and become “devoted to really understanding the problem of inequities in educational outcomes, instead of looking for techniques, special programs, or best practices to solve them” (p. 48).

The current study will analyze untapped high school transcript data in an effort to understand why some students enter college more prepared than others. Once the data is analyzed, school district administrators and teachers can reflect on how their practices might be contributing to the college preparedness of their students, and community college administrators and faculty can look for special programs to increase the preparedness of those who lack it. If school districts have data indicating how prepared their students are for college, they will have the information necessary to modify curricular, instruction, and graduation requirements (Kirst & Venezia, 2006).

Furthermore, the current study will assist Crowder College in determining which high school measures are the best predictors of successful degree attainment. Such information can be utilized to implement the MDHE placement policy (MDHE, n.d.b) requiring institutions to use multiple measures when placing students in college-level coursework. Due to the unfairness of single, high-stake assessment scores, additional high school measures such as GPA and end-of-course examination scores are being recommended to place students in college-level or developmental mathematics, English, and reading coursework. The use of multiple placement measures will expectantly result in the better placement of students in college-level coursework, reducing the number of developmental non-credit courses (Scott-Clayton, Crosta, & Belfield, 2014) thereby leading to better retention and increased degree attainment.

Hirschorn and Geelan (2008) postulated that in order for practitioners to value empirical research, it must be applicable in their school districts. The current study will be useful for both Crowder College administrators and area school district personnel. The ability to predict which students are at greatest risk of not being prepared for college-

level coursework will help community college administrators offer support to these students before it is too late. The use of successful multiple high school measures will lead to better college course placement, resulting in increased degree attainment. Additionally, the current study will provide school district leaders with data to support programs that are making a difference for all students, regardless of demographics, in preparing them for college success and degree attainment.

Summary

Colleges and universities are facing local, state, and national pressure to improve student success, and increase the number of college graduates (Missouri Department of Higher Education, 2012; The White House, n.d.). The College Board Advocacy and Policy Center (2012) has established the goal to “increase the proportion of 25- to 34-year-olds who hold an associate degree or higher to 55 percent by the year 2025 in order to make America the leader in education attainment in the world” (p. 2). In 2013, 90% of young adults age 25 to 29 had a high school diploma or equivalent, yet only 34% had obtained a bachelor’s or higher degree (United States Department of Education, 2006a). Earning a post-secondary degree is a must-have in today’s global economy (Mangan, 2013). Unfortunately, an unprecedented number of students are graduating high school unprepared for college level coursework (Conley, 2007; Herzog, 2008; Roderick, Nagaoka, & Coca, 2009; Tinto, 2012; United States Department of Education, 2006a).

This study will offer critical information for school district administrators, higher education administrators, and policy makers on the high school programs and practices being used to increase the readiness of community college students. By more clearly articulating the relationship between students’ high school preparation and their

successful completion of an associate degree, it should be possible to increase their readiness for college, as well as their likelihood of degree attainment. In addition, factors that contributed to and helped predict students' persistence to degree attainment will be reported. This data provides information that could leverage future data-driven decision making for high schools and community colleges, and possibly even influence state and national policy decisions. As a result, an exploration of the relationship between high school coursework and community college degree attainment should produce information that would add to current literature and practice.

CHAPTER TWO:
PRACTITIONER SETTING FOR THE STUDY

Introduction

Community colleges have relatively low tuition costs, maintain open-door admission policies, and are often conveniently located (Bailey, 2007), making them a viable option for many students who would otherwise have little opportunity to further their education beyond high school. Nearly half of all undergraduates attend a community college (Bailey, 2007). Furthermore, students of color, low-income status, first-generation status, and immigrant status are concentrated in community colleges (Bailey, 2007). Because of their open-door policies, a large proportion of students enter unprepared for college level coursework (Goldrick-Rab, 2010). These students are less likely to have completed gateway courses such as college English and college mathematics during high school than those students attending a four-year university (Porchea et al., 2010).

One of the primary explanations for the low college completion rates is that many high school graduates lack the basic academic skills required for college success (Bailey, Jeong, & Cho, 2010; Greene & Winters, 2005). More than 50% of all incoming college students will take remedial courses (Venezia & Kirst, 2005). “Inadequate and inequitable preparation for college affects remediation and persistence rates – major problems in postsecondary institutions throughout the country” (p. 284). Remediation rates are highest in community colleges and other open access institutions that admit almost every student who applies (2005). According to Greene and Winters (2005), those students who are able to apply to college are already attending, so the “only way to substantially increase participation in college is to increase the number of students who exit the K-12 system with the qualifications necessary to apply” (p. 9). Increasing college participation

and degree attainment requires increasing the number of students who are college ready and prepared for postsecondary success (Greene & Winters, 2005).

Enrollment at Crowder College has exploded over the last decade with 240% enrollment growth since the fall of 2000, and 100% enrollment growth since 2006 (Crowder College, 2014). Despite a significant increase in student enrollment, only 29% of the first-time, full-time students who started in the fall 2012 semester completed a degree within three years (Crowder College, internal database, personal communication, October 29, 2015). Furthermore, of the first-time, full-time degree-seeking fall 2012 cohort, 55% were enrolled in a developmental math course, 29% were enrolled in a developmental English course, and 17% were enrolled in a developmental reading course (Crowder College, internal database, personal communication, October 29, 2015).

Throughout this section, the practitioner setting in which the current research took place will be analyzed. First, a brief history of Crowder College and an overview of the current student body population is described. Secondly, an organizational analysis as it relates to college readiness initiatives is presented. Thirdly, the Crowder College leadership style and strategic planning models are discussed. Finally, implications for research in the practitioner setting are examined.

History of the Organization

Established in 1963, Crowder College is a two-year state community college located in southwest Missouri. While the tax base for the college comes from the rural counties of Newton and McDonald, the service region is comprised of nine counties including: Newton, McDonald, Barry, Jasper, Lawrence, Barton, Vernon, Cedar, and Dade. In addition to the main campus located in Neosho, Missouri, four full-service

campus centers are located in Cassville, Jane, Nevada, and Webb City. Over 27% of students attending Crowder College are low-income, first-generation college students. According to the United States Census Bureau website (2015), approximately 19.6% of the population in our service region lives in poverty.

Crowder College employs 100 full-time faculty, 159 full-time employees, and 400 adjunct faculty. The culture at Crowder College cultivates a family environment and operates under the core values of (a) caring, (b) the pursuit of learning, (c) fostering creativity and innovation, (d) ethical behavior, (e) collaboration, and (f) serving others (Crowder College, 2015, para. 5). The mission of Crowder College is to build a “civil, serving, literate, learning community of responsible citizens” (Crowder College, 2015, para. 4).

Crowder College is accredited by the Missouri Department of Higher Education (MDHE), and The Higher Learning Commission (HLC) of the North Central Association (Crowder College, 2014). The college offers over 80 Associate of Art, Associate of Science, and Associate of Applied Science degrees, and several one-year and short-term certificate programs, giving students the opportunity to complete a degree, enter the workforce, or transfer to a four-year university. The college also operates a technical school for secondary students attending area high schools. In addition to traditional day and evening courses, the college provides a wide range of convenient online and hybrid courses to meet student demand.

There were 5,710 total students enrolled during the fall 2014. Of those, 46% attended full-time, while 54% attended part-time and were enrolled in less than 12 credit hours (Crowder College, internal database, personal communication, October 29, 2015).

Furthermore, 64% of the students enrolled during the fall 2014 semester were female, and 83% were white, 8% were Hispanic/Latino, 1% were Black, 1% were Asian, 2% were American Indian/Alaskan, 1% were non-residential students, and 4% were unknown or two or more ethnicities. Nearly 51% were first-generation college students; 44% were low-income, Pell-eligible; and 28% were both first-generation and low-income. When broken down by age, 14% were under 18, 29% were 18-19, 18% were 20-21, 9% were 22-24, 10% were 25-29, 6% were 30-34, 5% were 35-39, 6% were 40-49, and 3% were 50-64. Of the first-time, full-time degree-seeking students who started in the fall 2014 semester, 68.6% were retained the following spring 2015 semester, 41.4% were retained the following fall 2015 semester, and 46.6% successfully completed 24 or more credit hours within those two semesters. In that same cohort, 54% of the first-time, full-time degree-seeking students were enrolled in a developmental math course, 25% were enrolled in a developmental English course, and 17% were enrolled in a developmental reading course.

Organizational Analysis

Colleges and universities are loosely coupled (Birnbaum, 1988, as cited in Bolman & Gallos, 2011; Weick, 1976), open systems (Birnbaum, 1988, as cited Bolman & Gallos, 2011; Perrow, 1973) with permeable boundaries and numerous departments that often work independently (Bolman & Gallos, 2011). Institutions of higher education are often divided into sectors including student affairs, business affairs, and academic affairs. Furthermore, Bolman and Deal (2008) characterized organizations as complex, surprising, deceptive, and ambiguous. In order to manage and influence change effectively, leaders must adopt a systems thinking approach. “Without communities of

people genuinely committed, there is no real chance of going forward” (Kofman & Senge, 1993, p. 6).

Bolman and Deal (2008) offered a four-frame approach to enhance a leader’s ability to accurately assess any given situation. “Reframing requires an ability to think about situations in more than one way” (p. 6). The four frames are termed *structural*, *human resource*, *political*, and *symbolic*. The structural frame is focused on analysis and design, the human resource frame is concerned with supporting and empowering employees, the political frame reminds leaders to form coalitions and advocate for a shared vision and goals, and the symbolic frame inspires meaning. At Crowder College, the structural and political frames, in particular, are impacted by the lack of college readiness of incoming freshman students and will be discussed in detail.

Structural Frame

When analyzing an organization from the structural frame, a leader will design and implement a process or structure appropriate to the problem or circumstance (Bolman & Deal, 2008). The structural frame is concerned with rules and roles (Bolman & Gallos, 2011). In this frame, college leaders “. . . are institutional architects and systems designers who develop the rules, roles, policies, reporting relationships, and procedures that align efforts with campus goals” (p. 51).

At the top of the Crowder College organization chart is the publicly elected Board of Trustees, followed by the college President. To the left of the President is the institutional advancement department, and to the right are the public information and institutional research departments. Directly below the President are Crowder College’s three main educational areas: (a) Finance, led by the Chief Financial Officer/Vice

President of Finance; (b) Academic Affairs, led by the Chief Academic Officer/Vice President of Academic Affairs; and (c) Student Affairs, led by the Chief Student Affairs Officer/Vice President of Student Services.

As part of its system of participatory government, Crowder College has developed a committee structure designed to include input from a majority of employees. The structure involves the use of leadership, division, and standing committees, as well as the establishment of action teams. The College Council denotes the college's leadership committee. There are three division leadership committees: (a) Finance Division Leadership Team, (b) Instructional Council, and (c) Student Affairs Leadership Team. There are nine standing committees: (a) Academic Quality Improvement Program (AQIP) Steering Committee, (b) Curriculum Committee, (c) Facilities Committee, (d) Graduation Committee, (e) Safety Committee, (f) Scholarship Committee, (g) Staff Development Committee, (h) Student Success Council, and (i) Suspension and Appeals Committee. Action teams are formed as needed to work on specific assignments. The college expects all employees to participate in this process, serving on committees when asked and needed.

The current research findings will interest a large number of people at Crowder College; however, the research findings will be presented to the following three councils: (a) College Council, (b) Instructional Council, and (c) Student Success Council.

College Council. The College Council reviews all matters pertaining to policy and programs at Crowder College and makes recommendations on policy and operating procedures to the Crowder College Board of Trustees through the President. Members are responsible for communicating information back to their respective areas and

appropriate committees. The College Council is chaired by the President and consists of the following positions: (a) college president, (b) administrative assistant to the president, (c) vice president of academic affairs, (d) vice president of finance, (e) vice president of student affairs, (f) associate vice president of academic affairs, (g) associate vice president of career & technical education, (h) associate vice president of information services, (i) director, Cassville campus, (j) director, Jane campus, (k) director, Nevada campus, (l) director, Webb City campus, (m) director of regional centers and dual credit institutional monitor, (n) director of admissions, (o) director of financial aid, (p) director of human resources, (q) director of information technology, (r) director of institutional advancement, (s) director of institutional research, (t) director of public information, (u) director of trio programs, and (v) two division chairs.

Instructional Council. The Instructional Council reviews all matters pertaining to policy and programs in the Academic Affairs Division and makes recommendations on policy and operating procedures to the College Council through the Vice President of Academic Affairs. Members are responsible for communicating information back to their respective departments and appropriate committees. The Instructional Council is chaired by the Vice President of Academic Affairs and consists of the following positions: (a) associate vice president of academic affairs, (b) associate vice president of career and technical education, (c) 12 academic division chairs, (d) four instructional center directors, (e) director of regional services, (f) nursing program executive coordinator, (g) nursing program coordinators, (h) lee library director, (i) director of physical education, (j) director of transport training, (k) dual credit coordinator, (l) education technology specialist, (m) representative from student affairs division, (n)

representative from finance division, and (o) administrative assistant to the vice president of academic affairs.

Student Success Council. The Student Success Council seeks to review matters pertaining to operating procedures, practices/processes, programming, and policy related to recruitment, enrollment, retention, and graduation. The objective is to improve student satisfaction, retention, and success. Members of the team may be asked to seek and provide information to this group after conferring with their respective department or working group. The team makes recommendations to College Council through the Vice President of Student Affairs. Members are responsible for communicating information to their respective departments and appropriate committees. Actions are also communicated campus-wide through the Vice President of Student Affairs. The Student Success Council is chaired by the Vice President of Student Affairs and consists of the following positions: (a) associate vice president of information services, (b) admissions recruiter, (c) director of admissions, (d) director of public relations/marketing, (e) student success center coordinator, (f) director of financial aid, (g) three advisors (at least one from the suspension appeal committee and one from an instructional center), (h) representative from the data team, (i) two instructional center directors, (j) two faculty, (k) dual credit coordinator, (l) records manager/graduation coordinator, (m) cashier, (n) bookstore manager, and (o) administrative assistant to the vice president of student affairs.

Political Frame

The political frame allows leaders to understand the political reality of the organization, how important interest groups are, and how conflict and limited resources are negotiated (Bolman & Deal, 2008). “Sophisticated political leaders know that

influence begins with understanding others' concerns and interests" (p. 366). Good political leaders (a) clarify what they want and what they can get, (b) assess the distribution of power and interest by asking key questions, (c) build linkage to key stakeholders, and (d) persuade first, negotiate second, and coerce only when necessary (Bolman & Deal, 2008).

"The key to organizational survival is the ability to acquire and maintain resources" (Pfeffer & Salancik, 1978/2005, p. 521). According to Bolman and Deal (2008), political pressures are a result of (a) resource constraints, (b) fluctuating priorities, (c) lack of an agreed vision, (d) inaccurate data, (e) political agenda within the organization, and (f) difference sources of power (French & Raven, 1959/2005; Lopez, 2003). Political leaders must build coalitions, trust, legitimacy, alliances and networks, and an overbound system (Bolman & Deal, 2008). Furthermore, a leader as a politician should exercise four key skills: (a) agenda setting, (b) mapping the political terrain, (c) networking and building coalitions, and (d) bargaining and negotiating; all while using moral judgment.

President Obama has encouraged governors to increase the number of college graduates (The White House, 2013). In an effort to increase Missouri community college completion rates, Governor Jay Nixon created an equitable performance-based funding model (MDHE, 2012). One of the five performance-based standards addresses the three-year completion rate for first-time, full-time students who successfully complete a certificate or degree of at least one year or successfully transfer to a four-year institution. Crowder College met the 41.87% completion benchmark with 44.7% of 814 fall 2008 first-time, full-time students graduating or transferring within three years (Crowder

College, internal database, personal communication, October 29, 2015). Increasing the college readiness of incoming freshmen will likely decrease the number of developmental education courses taken by students and increase their completion rates.

In addition to performance funding, students' readiness for college impacts their enrollment in college level coursework. Students who enter unprepared according to their ACT or Compass scores, are placed in math, English, and reading developmental coursework, decreasing their chance of college completion (Calcagno, Crosta, Bailey, & Jenkins, 2007; MDHE, n.d.b). In 2015, the Missouri Department of Higher Education (MDHE) created a new Policy on Basic Skills Assessment and Placement requiring institutions to use multiple measures to assess the basic mathematics, English, and reading skills of all incoming certificate and degree-seeking students (MDHE, n.d.b). This policy aims to increase the accuracy of course placement by broadening the assessment of a student's readiness for gateway courses. The current study will analyze multiple high school readiness variables, assisting Crowder College with meeting this MDHE multiple measures policy.

Leadership Analysis

Mihelic, Lipicnik, and Tekavcic (2010) defined leadership as "the art of persuading a follower to want to do the things, activities, that the leader sets as goals. The role of leaders is therefore in the process of directing the individual's behavior towards a desired goal" (p. 32). Leaders vary in style depending on their personality, and are characterized by their values, attitudes, beliefs, conduct, and performance (Mihelic et al., 2010).

The Crowder College Board of Trustees and President of the college are guided by servant leadership principles. A servant leader is simply a person who loves serving others and wants to help them. Keith (2008) believed the mission of the servant leader was to “identify and meet the needs of others” (p. 9). Anyone can practice servant leadership. Servant leaders perform the same tasks as any other leader. They create visions, motivate, manage, communicate, and so forth. “What sets servant-leaders apart from other leaders is that they are focused on others, not just themselves, and they are motivated to make life better for others, not just for themselves” (p. 9). Above all, true servant leaders feel leadership is only worthwhile if it allows them to serve others. In addition to servant leadership, the Crowder College President is implementing the appreciative inquiry planning process, which focuses on strengths and how to build upon those strengths. Both servant leadership principles and appreciative inquiry strategic planning methods play an important role in how Crowder College administrators espouse college readiness.

Servant Leadership

Servant leadership originated in the writings of Robert Greenleaf (as cited in Northouse, 2013). According to Northouse, “servant leaders put followers first, empower them, and help them develop their full personal capacities” (p. 219). Greenleaf (1991) defined servant leadership as:

The servant-leader is servant first. . . . It begins with the natural feeling that one wants to serve, to serve first. Then the conscious choice brings one to aspire to lead. . . . The difference manifests itself in the case taken by the servant - first to make sure that other people’s highest priority needs are being served. (p. 7)

Robert Greenleaf was also concerned with the impact that leadership would have on the less privileged. He believed that “service makes a difference in the lives of both those who serve and those who are served” (p. 5), and offers both meaning and hope. Ten characterizes of a servant leader include (a) listening, (b) empathy, (c) healing, (d) awareness, (e) persuasion, (f) conceptualization, (g) foresight, (h) stewardship, (i) commitment to the growth of people, and (j) building community (Northouse, 2013).

According to Kofman and Senge (1993), servant leaders lead learning organizations. “Learning organizations are spaces for generative conversations and concerted action” (p. 16). Learning leadership requires a leader who is focused on listening, and being open to the contributions and ideas of others. Preskill and Brookfield (2009) described openness as “the willingness to entertain a variety of alternative perspectives, be receptive to contributions from everyone regardless of previous attainment or current status, and create dialogic open spaces – multiple opportunities for diverse voices and opinions to be heard” (p. 21).

Furthermore, servant leaders strive to shift power from themselves to those being led (Northouse, 2013). According to Bensimon (2004), “the best hope for institutional change lies in the possibility that individual members of a campus community will transfer their learning to other contexts within the institution. By doing so, they will enable their colleagues to learn and change as well” (p. 52). To bring about real change, employees must work together to help each other excel rather than being insecure about someone else looking better than they do. Change agents serve others and take the time to develop emerging leaders within the organization.

Northouse (2013) created a servant leadership model based on the work of Liden, Wayne, Zhao, and Henderson and Liden, Panaccio, Hu, and Meuser (as cited in Northouse, 2013). The model consisted of three components: (a) antecedent conditions, (b) servant leader behaviors, and (c) outcomes. Each of these will be described in the following paragraphs.

Antecedent conditions. The three existing conditions that are likely to influence and have an impact on servant leadership are (a) context and culture, (b) leader attributes, and (c) follower receptivity. Organizational norms and culture will dictate the way servant leadership is executed. The qualities, traits, disposition, and ideas of the leader also influence the servant leadership process. In addition, not all employees are open and receptive to servant leadership. They may not allow their leader the opportunity to get to know them, preventing them from helping and guiding them.

Servant leader behaviors. There are seven behaviors making up the core of the servant leadership model: (a) conceptualizing – servant leaders have a thorough understanding of the organization; (b) emotional healing – servant leaders are concerned with the well-being of others, are sensitive to their personal concerns, and take the time to address them; (c) putting followers first, the defining character of a servant leader – servant leaders place the interests and success of their followers ahead of their own; (d) helping followers grow and succeed – servant leaders know the professional and personal goals of their followers, help them accomplish them, and help them become self-actualized by reaching their fullest potential; (e) behaving ethically – servant leaders do the right thing in the right way and maintain high ethical standards by being fair, open, and honest with followers; (f) empowering – servant leaders share their power by giving

followers the freedom to make their own decisions and to be self-sufficient; and (g) creating value for the community – servant leaders volunteer, give back to their community, and encourage followers to do the same.

Outcomes. There are three potential outcomes of servant leadership: (a) follower performance and growth, (b) organizational performance, and (c) societal impact. Under a servant leader, followers will have greater self-actualization, realize their full capabilities, perform duties, and may become servant leaders (Northouse, 2013). Northouse stated that “in addition to positively affecting followers and their performance, initial research has shown that servant leadership has an influence on organizational performance” (p. 231). In addition, team effectiveness, clarity, and process is improved under servant leadership. Lastly, servant leadership is likely to have a positive impact on society.

Appreciative Inquiry

According to Gill (2010), “the focus of appreciative inquiry is on what is right and how we can learn from and build on these strengths” (p. 119). Presently, the Crowder College President is using appreciative inquiry to establish a strategic plan by first learning the strengths and what is being done well, prior to trying to solve the problem. Four statements guide the appreciative inquiry strategy: (a) appreciate what is, (b) imagine what might be, (c) determine what should be, and (d) create what will be (Gill, 2010).

In addition, a dashboard has been put into place to share student outcome data with employees. While making data-driven decisions is crucial, gaining access to valuable data can be difficult. Furthermore, data is often undermined or not mined at all

(Hagedorn & Kress, 2008). Petrides (2003) argued that institutions often fail to share and use data effectively, and Marsh, Pane, and Hamilton (2006) found lack of easy access to be an obstacle in data-driven decisions. Utilizing appreciative inquiry and data-driven decision making will be key factors in identifying and improving the preparedness of incoming freshman students at Crowder College.

Implications for Research in the Practitioner Setting

Unfortunately, many high school graduates find themselves unprepared for the academic rigor and expectations of college (Conley, 2007). In fact, “practitioners often attribute poor completion rates to the numerous *deficiencies* that students bring to community college” (Goldrick-Rab, 2010, p. 438). Only 26% of high school graduates who took the ACT in 2014 tested college ready in all four areas (ACT, 2014a). Given the current global economy, improving the college readiness of high school students is crucial.

Boote and Beile (2005) emphasized the importance of “. . . linking research and practice in the field of education” (p. 9). Moreover, Porchea, Allen, Robbins, and Phelps (2010) described the need for empirical research studying a comprehensive set of predictors and their relationship with community college degree attainment. The current study will build upon and contribute to current scholarly college readiness literature, and provide data to high schools about their graduates’ performance in college. Such practitioner-based data can be utilized to improve curriculum, instruction, and graduation requirements.

Furthermore, Crowder College can utilize this research to identify incoming at-risk freshman students in order to provide preemptive services that might provide these

students with necessary services and tutoring before it is too late. In addition, high-achieving incoming freshmen can be targeted for achievement scholarships, fast-track programs, and peer-tutoring opportunities. In 2015, the Missouri Department of Higher Education (MDHE) created a new *Policy on Basic Skills Assessment and Placement* requiring institutions to use multiple measures to assess the basic mathematics, English, and reading skills of all incoming certificate and degree-seeking students (MDHE, n.d.b). The results of this research can assist Crowder College in determining which high school college readiness measures are the best predictors of college success.

Summary

Community colleges play a significant role in preparing students for the workforce. According to Georgetown University (2012), by 2020, nearly two out of every three U.S. jobs will require some form of skilled training or certification. In many cases, this training is only available at a community college. For example, community colleges train and certify nearly 80% of firefighters, police officers, and emergency medical technicians, and 59% of nurses (AACC, 2014b). Unfortunately, more than two thirds, or 68%, of all community college students take at least one development education course (AACC, 2014b).

“Students who required remediation are at great risk for dropping out of college” (Wiley, Wyatt, & Camara, 2010, p. 2). Exemption from taking remedial coursework is a principle outcome of college readiness (Camara, 2013); however, the majority of community college students enter academically unprepared for college-level coursework (Attewell, Lavin, Domina, & Levey, 2006; Bailey, Jeong, & Cho, 2010; CCRC, 2014; Scott-Clayton, Crosta, & Belfied, 2014; Wiley, Wyatt, & Camara, 2010). As a result,

less than one-third of all community college students earn an associate degree or certificate from their initial institution within six years (Tinto, 2012).

Much of the attention centered on college readiness is a direct result of high remediation and low college completion rates (Camara, 2013). Crowder College must find ways to improve student success and completion. The purpose of this study is to determine the extent to which high school students were prepared to graduate with a Crowder College associate degree within two to three years. The current organizational structure and leadership at Crowder College is supportive of practitioner-based research. By analyzing multiple college readiness measures, the current study will fill a void in current empirical college readiness research (Maruyama, 2012). In addition, the findings will assist school districts in identifying which measures are preparing students for college success, along with providing Crowder College with data needed to implement the new MDHE multiple measures placement policy (MDHE, n.d.b).

CHAPTER THREE:
SCHOLARLY REVIEW FOR THE STUDY

Introduction

Traditionally known for their open-door admission policies, low tuition, and convenience, community college enrollment has grown drastically in the last decade (AACC, 2014a; Bailey, 2007; Jenkins, 2011; Jenkins & Cho, 2012; Kim & Bragg, 2008). In fact, the American Association of Community Colleges (AACC) reports that nearly half of all undergraduates attend a community college (AACC, 2014a). This increased enrollment; however, has not brought about an increase in degree attainment. In fact, only 29.9% of full-time degree- or certificate-seeking students at community colleges graduate in three years or less (AACC, 2010; College Board Advocacy & Policy Center, 2012).

In addition to dismal community college completion rates, an increase in the number of incoming freshmen required to take developmental education coursework (CCRC, 2014; Kim & Bragg, 2008) has educators, researchers, and policy makers looking for answers. Federal data indicated that 68% of community college students, and 40% of public college students take at least one developmental education courses (CCRC, 2014). Such courses essentially reteach middle school and high school coursework in math, English, and reading. As pressure mounts for institutions of higher education to increase student success and degree completion, blame has been placed, in part, on inadequate high school preparation for college.

In 2006, the Commission on the Future of Higher Education found inadequate high school preparation, along with a lack of college and financial aid information, to be a major factor in lower post-secondary degree attainment (United States Department of Education, 2006a). That same year, Secretary Margaret Spellings's Action Plan for

Higher Education called for the strengthening of K-12 preparation, along with the alignment of high school standards with higher education expectations (United States Department of Education, 2006b). This policy direction recognized the importance of a strong high school preparation on college degree attainment, individual economic prosperity, and the national economy. Most recently, 46 states have implemented the rigorous Common Core State Standards (CCSS), a milestone in United States education reform (College Board Advocacy & Policy Reform, 2012). These high standards attempt to void the knowledge and skills gap between high school and college.

Such reforms have challenged high schools to adopt more rigorous coursework, higher graduation standards, and access to advanced placement and dual credit offerings. Unfortunately, many states are failing to hold high schools accountable for preparing students for college and career success (Adelman, 2010). This is evident in the 2014 ACT results. Fifty-seven percent of the United States 2014 graduating class took the ACT (2014a). Of those students, 86% indicated they planned to pursue a postsecondary education; however, it is likely a significant number of those might not actually enroll. Each year, ACT reports the college readiness progress of the graduating class. The 2014 ACT results were discouraging. Only 26% of all 2014 ACT-tested high school graduates demonstrated academic readiness for first-year, college level courses in English composition, college algebra, biology, and the social sciences (ACT, 2014a). Furthermore, 16% met only one ACT College Readiness Benchmark, and 31% met none.

The purpose of this study is to investigate the relationship between college readiness measures taken in high school, and the successful completion of a community college associate degree. In the simplest form, this study seeks to discover why so many

first-time, full-time, traditional age community college students fail to attain an associate degree within three years. Moreover, for those first-time, full-time, traditional age students who were able to successfully graduate with an associate degree within three years, what courses did they take in high school that prepared them for college-level coursework?

In order to identify measures that effectively improve the college readiness of high school students, it is important to understand what contributes to being college ready and how it is assessed. Therefore, in the following analysis of literature, the researcher carefully examined the relevant literature with regard to which high school variables most likely influence college degree completion. To that end, this literature review brings together three areas of research: (a) definitions and dimensions of college readiness, (b) key predictors of academic readiness, and (c) assessing community college readiness. First, the theoretical framework and conceptual underpinning guiding this study shall be examined.

Conceptual Framework

The conceptual framework for this study is based on the work of two scholars. First, the work of Alexander Astin (2001) provided a conceptual guide for this study. In his original *Four Critical Years* study, Astin (1977) conducted multi-institutional, longitudinal research aimed at determining how undergraduate students were affected by various types of institutions and different educational experiences. This work served as a theoretical base for student involvement research (Astin, 2001). Later, in a new study titled *What Matters in College? Four Critical Years Revisited*, his college impact research was expanded in size and scope. In both studies, the input-environment-

outcome (I-E-O) model served as a conceptual guide (Astin, 2001). It is the I-E-O model, in particular, that provided a conceptual and methodological guide for this study.

The basic purpose of the I-E-O model is to “assess the impact of various environmental experiences by determining which students grow or change differently under varying environmental conditions” (Astin, 2001, p. 7). *Inputs* include student demographics and characteristics upon entry to the institution. The *environment* refers to the various programs, staff, and experiences that a student is exposed to at the institution. The student’s growth after exposure to the environment comprises the *outcomes*. Comparing outcome characteristics with input characteristics can determine student change or growth (Astin, 2001). According to Astin (2001), “studying student development with the I-E-O model provides educators, students, and policy makers with a better basis for knowing how to achieve desired educational outcomes” (p. 7). Furthermore, the I-E-O model controls for input differences, allowing for better analysis of the environmental influence over student outcomes (Kim & Bragg, 2008), making it a well-suited model to guide college readiness research.

There are numerous empirical research studies utilizing the I-E-O model to analyze student involvement in the college environment (see Astin, 1977; Astin, 2001; Astin & Sax, 1998; Campbell & Blakey, 1996; Herzog, 2008; Long & Amey, 1993; Pascarella & Terenzini, 2005; Prion, 2008; Thurmond, Wambach, Connors, & Frey, 2002; Zhao, 1999). Long and Amey (1993) applied the I-E-O model to identify differences between successful and unsuccessful community college students. Reading placement scores and high school GPA were the two input variables that separated the two groups, first-term credit hours was the only environmental variable separating the

two groups, and the highest developmental English course completed and nondevelopmental GPA were two significant outcomes separating the two groups. After controlling for student demographics (inputs), Astin and Sax's (1998) longitudinal study of 3,450 undergraduate students found community service participation (environment) greatly enhanced academic development, life skills, and civic responsibility (outcomes). Pascarella and Terenzini (2005) focused on the relationship between two precollege characteristics (inputs), high school grades and standardized test scores, and the outcome of persistence to sophomore year and four-year graduation. Herzog (2008) investigated the effects of high school attributes, part-time university instructors, and college classroom ethnic diversity on first-year college student preparation and persistence. Thurmond et al. (2002) utilized the I-E-O method to control for student characteristics while examining the impact of online coursework on student satisfaction.

Although most commonly used to analyze the impact of the college environment on degree completion and other factors of college success, the modified I₁-E₁-O₁/I₂-E₂-O₂/I₃ model utilized in this study allows for analysis of the impact of the high school environment on community college success. A search for relevant literature revealed one empirical study, Kim and Bragg (2008), which used the I-E-O model to research the high school environment on college readiness. Kim and Bragg (2008) found a significant effect on the amount of dual credit and articulated credits earned (environment) on the total number of community college credits earned (outcome), while controlling for gender and high school rank (inputs).

Secondly, this study draws upon the high school transcript analysis work of Clifford Adelman. Transcript analysis was defined by Hagedorn and Kress (2008) "as

the coding and use of enrollment files, college enrollment files, college application data, financial aid records, and other data that community colleges must routinely collect to comply with state and federal reporting mandates” (p. 7). High school transcripts are submitted as part of the college application process and are readily accessible, yet they are often undermined (Trusty, 2004). According to Scott-Clayton, Crosta, and Belfield (2014), high school transcripts “may yield a wealth of information on cognitive skills, subject-specific knowledge, as well as student effort and motivation” (p. 376). Effort can be determined by the number of courses taken and credits earned, and college readiness can be linked to the proficiency in college-level and honors courses completed (Belfield & Crosta, 2012). In addition, failing grades may indicate deficiencies in a particular subject.

In his seminal work for the U.S. Department of Education, Clifford Adelman (1999) analyzed the “High School and Beyond” (HSB) data set to examine factors that contributed to bachelor degree completion. This longitudinal degree completion study followed high school sophomores in 1980 until they were approximately 30 years old in 1993. Although some variables were high school variables (e.g., coursework, demographics), the majority were college related. Adelman (1999) discovered that 43% of the variability of bachelor degree attainment was explained by all of the high school and college variables combined. Adelman (1999) found that two variables had the largest predictive value on degree completion: (a) the rigor of high school coursework, and (b) immediate enrollment in college upon high school graduation. When analyzing the high school transcript, credits in intensive math courses were totaled to create a math intensity variable. Of all high school variables, this math intensity variable was found to have the

strongest predictive value on degree completion. Furthermore, finishing one additional math course beyond Algebra 2 more than doubled the likelihood of degree completion.

In a follow-up study, Adelman (2006) analyzed student high school and college transcript data from the National Education Longitudinal Study (NELS) of 1988 and discovered similar results. The study began with a national sample of eighth graders in 1988 and followed them through December 2000. The academic intensity of a student's high school curriculum was still the most important precollegiate factor on degree completion. Specifically, the highest math class completed in high school continued to be key factor in degree completion.

College Readiness

Despite the importance being placed on improving college readiness, there remains debate on defining and assessing it (Maruyama, 2012). A variety of college readiness definitions exist (Maruyama, 2012; Porter & Polikoff, 2011). High school preparation has been measured by graduation, test scores, GPA, class rank, course rigor, and course performance (Maruyama, 2012). College success is also measured in a multitude of ways, from avoidance of developmental education coursework and first-semester GPA, to degree attainment.

College Readiness Definitions

College readiness definitions vary on multiple dimensions. Some definitions include non-cognitive facets such as motivation, socioeconomic status (SES), personality, and work ethic (Porter & Polikoff, 2011). Others focus on high school academic performance and outcomes (e.g., test scores, GPA, class rank). For example, the Green Method (as cited in Greene & Winters, 2005) calculated college readiness rates designed

to reproduce the minimum standards of the least selective universities. To do this, students must (a) graduate high school with a regular diploma; (b) have taken four years of English, three years of math, two years each of science, social science, and foreign language; and (c) be literate and able to score at the basic level or above on the National Assessment of Educational Progress (NAEP) reading assessment (Greene & Winters, 2005). Some researchers simply defined college readiness as acceptance to college (Greene & Forster, 2003), while others defined it as being able to succeed in college (Porter & Polikoff, 2011).

More recent definitions of college readiness focus on dependent variables (Maruyama, 2012). According to Wiley, Wyatt, and Camara (2010), “students who are college-ready should be able to succeed in entry-level, credit-bearing college courses without the need for remediation” (p. 3). Similarly, Conley (2007) defined college readiness “operationally as the level of preparation a student needs to enroll and succeed – without remediation – in a credit-bearing general education course at a postsecondary institution” (p. 5). Conley (2010) further suggested that college readiness has four facets in which high schools must be responsible for preparing students for college or a career. This model called for a more comprehensive approach to analyzing a students’ college readiness. Conley’s (2010) four dimensions of college and career readiness included (a) key cognitive strategies, (b) key content knowledge, (c) academic behaviors, and (d) contextual skills and awareness.

Key cognitive strategies include a student’s ability to process, analyze, and complete a complicated task. Unfortunately, high schools often focus on preparing students for exit examinations and state assessments, rather than problem solving and

critical thinking skills. Conley's (2010) research found problem formulation, research, interpretation, communication, and precision and accuracy to be key cognitive strategies ingrained in all entry-level college courses. Without the ability to think and to problem solve in this manner, entering college students will struggle to succeed.

Key content knowledge includes a student's ability to proficiently read and write, along with core academic subject knowledge and skills. College reading is much broader, expansive, and more difficult than high school. In addition, college students are expected to write, error-free, more frequently and in a shorter period than high school. In fact, student thinking is most frequently assessed through writing. Moreover, college students are expected to meet core competencies in English, math, science, social sciences, world languages, and the arts.

Academic behaviors, Conley's third facet, consists of a student's ability to reflect upon one's learning and self-management. "Research on the thinking of effective learners has shown these individuals tend to monitor actively, regulate, evaluate, and direct their own thinking" (Conley, 2010, p. 39). Included in this broad category are study skills, time management, persistence, goal setting, and self-awareness. College students are required to spend significant amounts of time outside of class devoted to learning and comprehending material on their own.

Contextual skills and awareness (college knowledge) includes knowledge about the college admission and financial aid process, along with the ability to navigate the college system and interact with faculty. Students with lower levels of information about college, particularly focused on cost and financial aid, are less likely to expect to attend

college (Horn, Chen, & Chapman, 2003), apply for college (Cabrera & LaNasa, 2000), or enroll in college (Plank & Jordan, 2001).

College Readiness Benchmarks

Due to the various college readiness definitions, researchers are calling for a national definition (Maruyama, 2012) or indicator (Porter & Polikoff, 2011). Maruyama (2012) suggested seven principles aimed at making such a definition more accurate and meaningful: (a) be logical and consequential; (b) recognize and acknowledge their limitations; (c) include a readiness definition that considers a range of different approaches, assessments, and formats – ideally using multiple measures; (d) include probability and likelihoods of success; (e) include measures that are already being collected, such as high school course taking and performance, test scores, and state graduation test scores; (f) be tied to behaviors that students can act upon, such as taking a particular class or earning a certain grade; and (g) employ a process that engages stakeholders.

Drawing on the work Conley (2007), The John Gardner Center at Stanford University and the Annenberg Institute for School Reform at Brown University have collaborated together to create a college readiness indicator system (CRIS) made up of three distinct, yet interdependent dimensions (Annenberg Institute, 2014). Academic preparedness (AP) includes the academic knowledge and skills, and key cognitive strategies necessary to succeed in college-level courses. Academic tenacity (AT) includes the behaviors of active participation and perseverance through adversity, and the beliefs, attitudes, and values that prioritize success in school and drive student

engagement and work. College knowledge (CK) is the knowledge, skills, and behaviors apart from academic content that allow students to access and to succeed in college.

Assessing College Readiness

First-year grade point average (FYGPA) has historically been a primary indicator of college readiness because freshmen success is critical for overall college success, it is easy to measure, is readily available, and only requires one year of longitudinal tracking (Porter & Polikoff, 2011). Limitations to using FYGPA as an indicator of college readiness include the lack of common grading standards among faculty and courses in an institution, and the differences in grading policies among institutions.

A second indicator of readiness for college is the avoidance of remedial coursework (Porter & Polikoff, 2011). Remedial course placement typically means a student is not prepared for college-level coursework in a particular subject, leading to longer time to degree completion, increased costs, and decreased likelihood of degree attainment (CCRC, 2014; Jaggars & Hodara, 2011; Porter & Polikoff, 2011). Limitations to using avoidance of remediation as an indicator of readiness include the lack of a common definition of remedial education courses across institutions, and the fact that many students fail to complete a degree regardless of remediation enrollment (Porter & Polikoff, 2011).

A more long-term indicator of readiness includes degree completion, degree completion within a specified period, or cumulative GPA (Porter & Polikoff, 2011). Such indicators take into account the actual college success of degree attainment. Nevertheless, they also present methodological challenges. Rather than accounting for

the preparedness a student entered college with, they account for the entire college experience.

Predictors of College Readiness

“The effectiveness of postsecondary education increases when students aspiring to attend college have developed academic skills preparing them to succeed” (Maruyama, 2012, p. 252). However, across the United States, students are increasingly entering college unprepared (Choy, Horn, Nuñez, & Chen, 2000). Wimberly and Noeth (2004) estimated that only 10% of eighth graders are on target to graduate high school without the need for remediation in college.

Ensuring that all high school students are college and career ready has become a focal point of American education policy reform (Adelman, 2010). One of the major obstacles to college degree attainment is lack of academic preparation (Gershenfeld, Hood, & Zhan, 2015). However, very few studies research the impact of high school variables on college degree completion (Adelman, 1999, Trusty, 2004). “High school preparation and performance are key predictors of postsecondary persistence and credential attainment” (Jacobson & Mokher, 2009, p. 1). Furthermore, Adelman (2006) found the rigor of the high school curriculum to be the largest predictor of postsecondary degree attainment. However, Tinto (1993) contended that pre-college background may be overstated as an explanation for non-degree completion. “Though the issue of academic preparation is far from trivial, academic dismissal still represents a small proportion of the total leaving of students from institutions of higher education” (p. 49). Attewell, Heil, and Reisel (2011) found that high school preparation does not predict community college degree attainment; however, it was the single strongest predictor of

graduation for four-year colleges, regardless of selectivity. “We speculate that community colleges have adjusted their curricula and teaching so that students with weaker academic preparation in high school are nevertheless able to progress toward a degree” (p. 553)

According to Clinedinst and Hawkins (2011), the top factors in the college admission decision are based on high school achievement: (a) grades in college preparatory courses, (b) strength of curriculum, and (c) standardized admission test scores. Similarly, the three most common college readiness indicators recognized by colleges are pre-requisite coursework, placement test scores, and high school grade point average (HSGPA) (Roderick, Nagaoka, & Coca, 2009). A review of literature will further expand on the current research in these three areas, as well as the impact of student demographics on college readiness and degree attainment.

High School Coursework

Over the past fifty years, policy makers have expressed dissatisfaction with U.S. high school courses (Attewell & Domina, 2008), calling for more rigor and increased graduation requirements (Dougherty, Mellor, & Jian, 2006). “Academic rigor is increasingly being recognized as an essential component of college readiness” (Wyatt, Wiley, Camara, & Proestler, 2012, p. 10). Transcript studies show that high school students are taking more core classes and more advanced math and science courses (Adelman, 2006).

Adelman (2006) recognized a high school graduate’s academic preparedness for college as a strong predictor of college success. Using student transcript data from NELS of 1988, he found that high school coursework positively influenced college degree

completion. More specifically, intensive math courses had the largest impact. Similarly, in a sample of over 3,000 U.S. eighth grade students who showed high achievement and an interest in college in the eighth grade, Trusty and Niles (2004) found that four intensive math courses, Algebra 2, trigonometry, pre-calculus, and calculus, had the largest impact on degree completion. Although Trusty and Niles (2004) did not disaggregate data by ethnicity, Aldeman's (1999) findings were consistent across racial ethnicities.

Also utilizing NELS 1988 data, Trusty (2004) limited his research to high school variables and their impact on degree completion within eight years of high school graduation. The research was also restricted to students with an expectation of bachelor's degree attainment and who entered college within two years of high school graduation. The variables with the strongest correlations to bachelor's degree completion were the high school course-taking variables, math intensity, and science intensity. In fact, one high school unit in intensive science increased the probability of earning a bachelor's degree by 45%. An additional high school unit of intensive math increased the odds of a degree by 73%. These course taking factors were independent of all other high school and demographic variables.

College preparatory courses typically include Advanced Placement (AP), International Baccalaureate (IB), dual credit (DC), and other advanced college-level courses (Clinedinst & Hawkins, 2011). Typically AP and IB courses are considered rigorous because there is a national standard of measurement for test takers (Cook, 2013). Unfortunately, not all students have access to college preparatory courses (Attewell & Domina, 2008; Clinedinst & Hawkins, 2011). According to results of the National

Association for College Admission Counseling (NACAC) 2007 Counseling Trends Survey, public school were less likely than private schools to offer AP or advanced preparatory curricula (Clinedinst & Hawkins, 2011). The offerings were even less in rural public school districts, and those with high percentages of students eligible for the free and reduced price lunch program. Using NELS data, Adelman (2006) observed fewer math courses beyond Algebra 2 in schools with low SES students and high Hispanic enrollment. Using the same data, Attewell & Domina (2008) discovered a statistically significant disparity among low SES students and their access to demanding courses.

College preparatory curriculum. Based on the work of Adelman (1999, 2006) and Horn, Kojaku, & Carroll (2001), core curriculum or below includes four years of English, three years of math, three years of science, and three years of social studies. Mid-level curriculum exceeds core curriculum by the addition of one year of a foreign language, two of the math courses must include algebra I and geometry, and the science courses must have included two of the following: (a) biology, (b) chemistry, or (c) physics. A rigorous college preparatory curriculum includes at least four years of English; three years of a foreign language; three years of social studies; four years of math including pre-calculus; three years of science including biology, chemistry, and physics; and at least one honors or advanced placement course.

Completing an advanced or college preparatory curriculum has been shown to positively predict year-to-year college persistence (Adelman, 1999, 2006; Horn et al., 2001; Ishitani, 2006; Nora, Barlow, Crisp, 2005; Perna, 2005). Curricular intensity also predicted four-year college entry and degree completion (Attewell & Domina, 2008). In

a 1995-96 longitudinal study of beginning students attending a four-year college, Horn et al. (2001) found the level of selectivity increased as did the high school curriculum rigor. For those completing a rigorous high school curriculum, 71% enrolled in a selective university or college, compared to 40% who completed a mid-level curricula, and 32% who completed core or lower curricula. College persistence also increased, as did the first-year GPA.

In a 1995 study, the Montgomery County school district discovered that virtually all students who completed math through at least pre-calculus and honors English required no college remediation (Nunley, Sharle-Galotto, & Smith, 2000). One in three students who completed intermediate algebra or trigonometry as their highest math course and non-honors twelfth grade English required remediation, and nearly all students whose highest math class was geometry and whose senior year English class was below grade level required remediation (Nunley et al., 2000). Likewise, based on their analysis of three successful college preparatory programs in California, Hagedorn and Fogel (2002) found enrollment in advanced coursework to be the most important predictor of college enrollment. Completing a rigorous high school curricular program can be a better predictor of college persistence than test scores (Horn et al., 2001), particularly for Black and Hispanic students (Adelman, 1999). High school intensity also had significant predictive value on college persistence for first-generation students (Ishitani, 2006). Unfortunately, not all students have equal access to high-quality schools (Zwick, 2007).

Dual credit (DC) courses. Dual credit courses are college-level courses offered in conjunction with a college and are taught by qualified high school teachers. When

students are awarded both high school and college credit, this is referred to as dual credit. “Unlike in other programs such as Advanced Placement and International Baccalaureate, dual enrollment students take actual college courses with a college syllabus, often on a college campus, rather than a college-level course intended to be taken by high school students” (Karp, Calcagno, Hughes, Jeong, & Bailey, 2007, p. 1). During the 2002-03 12-month school year, 71% of public high schools offered dual credit (Waits, Setzer, & Lewis, 2005). Positive outcomes of DC courses include: (a) increased academic rigor of curriculum (Boswell, 2001; Martinez & Bray, 2002), (b) helped low-achieving students meet high academic standards and lower college remediation (Martinez & Bray, 2002), (c) provided additional academic opportunities for small or rural school students (Venezia, Kirst, & Antonio, 2003), (d) reduced high school dropout rates (Boswell, 2001; Karp et al., 2007), (e) assisted with college transition and assimilation (Martinez & Bray, 2002; Venezia et al., 2003), and (f) reduced the cost of college (Boswell, 2001; Martinez & Bray, 2002).

Dual credit courses have shown promise as a way to help students transition into college (Kim & Bragg, 2008), although little is known about their effectiveness for increasing degree attainment (Karp et al., 2007). Karp, Calcagno, Hughes, Jeong, and Bailey (2007) conducted a longitudinal study of dual credit students in Florida. Students taking DC classes were more likely to graduate high school and enroll in college, and were significantly more likely to persist to a second semester and to be enrolled two years after graduation. Additionally, DC students had a statistically significant higher GPA one, two, and three years after high school graduation, and had earned 15.1 more credits three years after graduation than non-participating peers.

Criticisms of dual credit courses. Although many research studies have claimed positive outcomes for dual credit, several issues have emerged. Among these are limited access to DC courses for lower achieving and low SES students, and inconsistent dual credit funding practices (Hughes, Karp, Fermin, & Bailey, 2005; Kim & Bragg, 2008). Many programs impose eligibility requirements for participation in DC courses, such as a minimum GPA or minimum scores on standardized exams (Waits et al., 2005). Furthermore, DC classes may not be publicized or promoted, leaving students to find out about them via word of mouth (Hughes et al., 2005). If students are required to pay college tuition for dual credit courses, this also limits access for low-income students. Finally, Kim and Bragg (2008) argued that the majority of dual credit research failed to control for prior academic performance.

Advanced placement (AP) program. “The Advanced Placement Program (AP) offers high school students the opportunity to take advanced-level course work while still in high school and to demonstrate proficiency by taking the corresponding end-of-course AP Examination” (Ewing, 2006, p. 1). As of 2006, there were 37 AP exams in 22 subject areas. If a student scores a 3 or higher on the AP exam, most U.S. colleges and universities will grant college credit for the equivalent course (College Board, 2015a) or award placement into higher level courses (Ewing, 2006); however, some require a 4 or 5. During the 2002-03 12-month school year, 67% of public high schools offered AP courses and two percent offered IB courses (Waits et al., 2005). In 2006, more than 1.3 million students took 2.3 million AP exams worldwide (Ewing, 2006). According to College Board (2015b), students who take AP courses and exams are more likely to be admitted to a selective universities, earn a scholarship, and earn a bachelor’s degree

within four years rather than the typical six years it takes most graduates. Over the past decade, a number of studies have found a predictive relationship between taking AP courses and the likelihood of college degree attainment (Adelman, 1999, 2006; Dougherty et al., 2006). As a result, high schools have increased the number of AP courses as a way to increase the college readiness of students (Dougherty et al., 2006).

Dougherty, Mellor, and Jian (2006) conducted a longitudinal statewide study following 67,412 Texas eighth graders who graduated high school in 1998, enrolled in a Texas public college or university within twelve months after graduation, and then graduated college within five years in May 2003. Of the students who passed at least one AP exam, 64% graduated college within five years, whereas only 17% of students who did not take an AP course graduated college within five years. Passing at least one AP exam increased the college graduation rate for low-income students by 39% (46% vs. 7%), 43% for Black students (53% vs. 10%), 46% for Hispanic students (54% vs. 8%), and 44% for white students (65% vs. 21%). Using hierarchical linear modeling to control for income and prior academic preparation, the probability of college graduation within five years for those taking at least one AP exams drops to 28% for Blacks, 28% for Hispanics, 33% for whites, 26% for low-income, and 34% for non-low-income students. Finally, the study found a statistically significant relationship between AP exam passing and college graduation for all groups except African-Americans (Dougherty et al., 2006). Adelman (1999) contended that mere exposure to the AP curriculum, even without passing the exam, is beneficial to the student and increases college success.

Criticisms of advanced placement courses. Although AP coursework has been shown to predict college success, some researchers have argued that those students would

have succeeded regardless of AP coursework (Attewell & Domina, 2008; Dougherty et al., 2006). According to Dougherty et al. (2006), students who take AP courses and pass the exams are less disadvantaged, better prepared, more motivated, and have stronger parental support than their peers not participating AP courses. Furthermore, AP courses are more likely to be offered at high schools with more advantaged and academic-minded students. Dougherty et al. (2006) argued that even when controlling for academic preparedness and income, it is difficult to determine if passing an AP exam is directly linked to college degree attainment. Such schools may be better equipped in other ways to prepare students for college success. For example, if schools with high AP exam pass rates also have strong AP preparatory courses or better extracurricular activities, statistical models will associate higher graduation rates with AP exam rates. Additionally, simply increasing the number of AP courses, or the number of students enrolling in AP courses will not drastically affect college success (Dougherty et al., 2006). Conversely, increasing the number of students who pass AP exams may have a statistically significant impact on college degree attainment.

Standardized Admission Test Scores

According to Clinedinst and Hawkins (2011), “standardized admission tests (SAT and ACT) have gained increased prominence in secondary schools as both assessment and accountability tools” (p. vii). Standardized tests are usually depicted as demonstrating greater methodological rigor and reliability than high school grades (Geiser & Santelices, 2007). Furthermore, the importance of these exam scores for college and university admission and course placement decisions has increased over the past 15 years (Clinedinst & Hawkins, 2011). This growth in usage has brought about

discussion regarding the validity and fairness of standardized admission tests. The two most common standardized tests used today U.S. colleges are the SAT and ACT (Zwick, 2007). The SAT consists of three tests in critical reading, math, and writing, with scores ranging from 200 to 800. The ACT is comprised of four tests in English, math, reading and science with scores ranging from 1 to 36 (ACT, 2014b). An optional writing component was added in 2005 (ACT, 2014b). Most colleges and universities place students in credit-bearing or remedial coursework based on their placement test score (Camara, 2013; Clinedinst & Hawkins, 2011). According to Camara (2013), assessment exam scores help colleges identify deficiencies in student preparation, broadly certify a student's preparedness for college-level coursework, and determine in which course, credit bearing or developmental, a student should enroll.

While many researchers have found assessment scores, such as ACT and SAT, to be a good predictor of college success (Mattern, Patterson, & Kobrin, 2012; Noble & Sawyer, 2002; Wiley et al., 2010), others have not (Conley, 2007; Geiser & Santelices, 2007; Maruyama, 2012; Zwick, 2007). Wyatt et al. (2012) found that students earning a higher SAT score were more likely to enroll in college. SAT scores were also found to predict GPA (Astin, 2001) and four-year degree completion rates (Astin & Oseguera, 2005). For students taking the SAT in 2006, Mattern et al. (2012) found that performance on the three sections of the SAT was a meaningful predictor of first-year math and English grades. Among the three SAT sections, Kobrin, Patterson, Barbuti, Mattern, and Shaw (2008) found the SAT writing (SAT-W) section to have the highest correlation with FYGPA. Noble and Sawyer (2002) found ACT scores to be a strong predictor of college success.

Criticisms of standardized admission tests. “Current measures used to gauge college readiness, such as ACT/entrance exam scores, may not be a good measure of college preparedness” (Conley, 2007, p. 9). In short, low test scores may be due to low academic preparedness (Conley, 2007; Zwick, 2007), lack of motivation (Kennedy & Monrad, 2007), biases for certain populations (Geiser & Santelices, 2007; Zwick, 2007), low-quality education (Zwick, 2007), or insufficient course offerings (Conley, 2007). Likewise, Geiser and Santelices (2007) argued that scores on standardized admissions tests are much more closely correlated with a student’s socioeconomic and demographic characteristics. According to Zwick (2007), “college admission test results often reveal substantial average score differences among ethnic, gender, and socioeconomic groups” (p. 20).

Critics have questioned whether such tests are intended to measure academic achievement or to assess intellectual aptitude (Zwick, 2007). The ACT is constructed on material taught in grades seven through twelve in English, math, reading, and science; however, the SAT has not been linked to particular high school courses. In addition, test scores are most often used to predict first-year college GPA, rather than cumulative GPA or degree attainment. In a review of literature, Zwick discovered the predictive value of test scores on graduation within a particular school to be quite small. Furthermore, Zwick (2007) identified validity studies that found better measures of college success than test scores.

ACT has created threshold scores, or benchmarks, that report the number of test takers who are college ready (Maruyama, 2012). Upon a review of literature, Maruyama argued that these ACT threshold scores do not adequately gauge college readiness.

Furthermore, an analysis of the Minnesota P-16 Education Partnership report indicated that the ACT scores are not a good predictor of college success as defined by ACT as getting a college grade of C or better (Maruyama, 2012). Despite these arguments, SAT and ACT scores remain a key factor in most university admission decisions (Zwick, 2007).

Placement tests. Colleges use placement tests to determine if a student is ready for college-level coursework or in need of remediation (Porter & Polikoff, 2011). Two common placement tests include Compass by ACT and Accuplacer by SAT. According to Porter and Polikoff (2011), there are three problems with using placement tests as indicators of college readiness. First, there is no universal cut point as these are set by each institution. Second, many universities have created their own placement tests. Third, the validity of these unique placement tests and their cut scores are unknown, as few institutions have conducted validity research.

High School Performance

High school curriculum plays an important part in college success. Course taking and performance are both good predictors of college success (Adelman, 2006; Maruyama, 2012), and strong measures of college readiness (Maruyama, 2012). When analyzing high school variables on bachelor degree completion, Adelman (1999) discovered that high school curriculum reflects 41% of the academic resources students bring to college, test scores represent 30%, and class rank/HSGPA represents 29% percent. In a longitudinal study of students attending 21 community colleges, Porchea, Allen, Robbins, and Phelps (2010) found that higher levels of high school academic preparation predicted community college degree attainment and four-year transfer.

Furthermore, students who take a college preparatory curriculum, especially math courses, are much more likely to earn a bachelor's degree than students who do not (Adelman, 2006; Porter & Polikoff, 2011). Common indicators of high school performance include grades, HSGPA, and class rank.

HS course grades. “A student's grades are probably the single most revealing indicator of his or her successful adjustment to the intellectual demands of a particular college's course of study” (Pascarella & Terenzini, 1991, p. 388). Research has consistently shown that high school grades, especially poor performance (Noble & Sawyer, 2002), are highly predictive of first-year college performance (Adelman, 2006), college grades (Camara, 2013; Williford, 2009), and graduation rates (Atkinson & Geiser, 2009; Geiser & Santelices, 2007). According to Clinedinst and Hawkins (2011), grades in college preparatory courses are a better indicator of college success than high school GPA. Bowen, Chingos, and McPherson (2009) found high school grades to be a substantially better predictor of college degree attainment than ACT or SAT test scores. In 2007, earning poor senior year grades was the number one reason colleges revoked an offer of admission (Clinedinst & Hawkins, 2011). For these reasons, high school grades are the most often used measured in college admission decisions.

Although research has shown the influence high school course taking can have on degree completion, these studies typically do not address how well the student performed in these courses (Williford, 2009). Furthermore, performance in high school courses has not been sufficiently studied to determine its value in predicting college success. Williford analyzed high school transcript data, and found a strong positive relationship between student's performance in high school and college courses. He discovered a

strong relationship between poor performance in high school courses and lesser success in college as measured by first-term college GPA and first-year retention. High school students with one to five D or F grades are two to five times more likely to earn a first semester college GPA less than 2.0. In addition, as the number of Ds and Fs increased, first-year college retention decreased.

Criticisms of high school grades. In a review of college attainment literature, Maruyama (2012) discovered that although high school grades are an important indicator of first-year college performance, they diminish over time. Nora and Cabrera (1996) found high school performance to have little impact on college persistence. Furthermore, utilizing high school grades to predict freshman GPA tends to hurt some ethnic groups (Zwick, 2007).

High school GPA (HSGPA). A student's GPA often measures high school performance. Most high school performance research is focused on GPA as a predictor for college success (Williford, 2009). According to Geiser and Santelices (2007), "high-school grades in college-preparatory subjects are consistently the best indicator of how students are likely to perform in college" (p. 24). Studies have shown a strong correlation between HSGPA and freshman GPA (Geiser & Santelices, 2007), as well as college enrollment (Attewell & Domina, 2008). Others argued against the use of HSGPA in admission decisions due to the differences in grading standards across high schools (Geiser & Santelices, 2007). Nevertheless, HSGPA may be less biased for underrepresented groups of students. In a study of 80,000 University of California freshmen, Geiser and Santelices found HSGPA to have less adverse impact than standard admission tests on minority and low SES students. In addition, standardized admission

tests reflect a student's ability at a single point in time, while HSGPA reflects a student's performance and motivation over four-years in a variety of subjects.

At the University of California, HSGPA was the strongest predictor of four-year college outcomes for all academic disciplines, yet the predictive weight increased after the freshman year and was greater in the fourth year (Geiser & Santelices, 2007). Furthermore, the combination of HSGPA and test scores was a statistically significant predictor of freshman grades, but HSGPA accounted for the largest predicted variation share. In a statewide community college study, Belfield and Crosta (2012) found HSGPA to be an extremely good and reliable predictor of college performance. Due to severe errors with placement test scores, Belfield and Crosta argued for colleges to use HSGPA for course placement decisions.

Class rank. Approximately 81% of high schools report classifying students in order of rank; however, only 68% report supplying colleges with this information (Clinedinst & Hawkins, 2011). Using the NELS 1988 longitudinal transcript study data, Ishitani (2006) found that high school rank showed a positive effect on the fourth, fifth, and sixth year graduation behavior of first-generation students. Kobrin et al. (2008) found HSGPA and class rank to be as predictive of freshman GPA as aptitude tests designed for that purpose.

Criticisms of high school GPA and class rank. There are limitations to using HSGPA and class rank for admission and placement decisions. According to Porter and Polikoff (2011), the obvious problem with both HSGPA and class rank is that they lack a “common metric and meaning across high schools” (p. 399), and influence over

curriculum reform. Furthermore, many schools do not report class rank (Clinedinst & Hawkins, 2011).

Multiple Predictors

According to Williford, (2009), the majority of studies researching pre-college characteristics focused solely on HSGPA or ACT scores. Using one measure of success or placement is easy and convenient (Wiley et al., 2010); however, thousands of students who scored well on the ACT or SAT or earned good grades in high school failed to complete their first year of college (Mattern, Shaw, & Kobrin, 2010). Likewise, thousands of students who did poorly on the ACT or SAT or earned poor grades in high school succeed each year in college (Wiley et al., 2010). College outcomes based on only one predictor (e.g., ACT score or HSGPA) have proven inferior to prediction models employing multiple predictors (Maruyama, 2012; Zwick, 2007). For this reason, researchers have found that multiple factors are the best predictor of college success (Camara, 2013; Conley, 2010; Maruyama, 2012; Porchea, Allen, Robbins, & Phelps, 2010; Wiley et al., 2010; Zwick, 2007). Wiley et al. (2010) concurred stating the use of benchmarks based on multiple measures could “improve the accuracy of predictions concerning college readiness” (p. 6).

In a review of literature, Zwick (2007) found that high school grades were more predictive of college grades than admission test scores alone; however, adding test scores to prior grades improved the prediction. Furthermore, combining high school grades with test scores is less likely to discriminate against various ethnic groups. Similarly, Kobrin, Patterson, Barbuti, Mattern, and Shaw (2008) found that the combination of HSGPA and SAT scores was the best predictor of FYGPA.

Wiley et al. (2010) designed and validated a multidimensional index of college readiness that combined SAT score, high school GPA, and the rigor of high school coursework. In this study, college readiness was defined as having at least a 65% probability of obtaining a B- or higher for each of the three indicators. In a sample of students who entered college in 2009, had taken the SAT, and entered one of the 110 participating institutions, 31.9% met all three benchmarks and were deemed college ready, 23.1% met none, 23.6% met one criteria, and 21.4% met two criteria.

Better indicators of college readiness are needed and could be improved by incorporating a number of high school measures (Maruyama, 2012). “Incorporating multiple measures to determine readiness should increase the accuracy of judgments about readings” (p. 259). High school course taking and performance are often the best indicator of early college success (Adelman, 2006), and strong indicators of college success and should be included (Maruyama, 2012). In addition, readiness measures should also include ACT, and state graduation test scores. Maruyama called for future research to “examine in greater detail whether or not grades can be made a stronger determinant of college readiness as well as the role of content mastery and other components of grades (motivation, skills) in determining college readiness” (p. 259).

Student Demographics

Of the 3.1 million 2012 high school graduates, 66% enrolled immediately in college, up from 60% in 1990 (Kena et al., 2014). Discrepancy exists, however, when broken down by ethnicity (Clinedinst & Hawkins, 2011). In 2012, 84% of Asian students immediately enrolled in college, more than Hispanic (69%), white (67%), and Black (62%) students (Kena et al., 2014). Discrepancy also exists among those who

immediately enroll in college based on family income (Clinedinst & Hawkins, 2011). For students from high-income families, 81% immediately enrolled in college, while only 52% of low-income and 65% of middle-income students immediately enrolled in college (Kena et al., 2014). First-generation and low-income students often have difficulty selecting a college, applying, and enrolling (Clinedinst & Hawkins, 2011). Furthermore, a disproportionate number of low-income students and students of color enroll in community colleges (Couturier & Cullinane, 2015).

Research suggests that the “groups students who are underrepresented in college enrollment are also less likely to be academically prepared for college” (Perna, 2005, p. 120). Readiness for college varies based on individual characteristics such as ethnicity, socioeconomic status, family income, parental educational attainment, and educational expectations. School district characteristics, such as fewer college preparatory and less rigorous courses, are more likely to affect low-income, Black, and Hispanic students’ preparedness for college. Furthermore, many of these traditionally underserved students will enter higher education having completed a less rigorous curriculum (Horn et al., 2001).

Approximately one third of today’s undergraduates enter with a weak high school academic preparation (Horn et al., 2001) and face a much higher risk of dropping out (Adelman, 1999, 2006; Horn et al., 2001). According to Greene and Winters (2005), the percentage of students who graduated high school with the skills and qualifications necessary to attend college increased from 25% in 1991 to a mere 34% in 2002. For 2002 public high school graduates, only 40% of white students, 23% of Black students, and 20% of Hispanic students graduated college-ready. College professors estimated that

42% of students are not prepared for college, and 70% acknowledged devoting some time in their first-year courses to reviewing material that students should have learned in high school (Achieve, 2005). Only 28% of college professors felt public high school graduates are adequately prepared for college-level coursework.

In addition, first-generation college students, many students of color, and economically disadvantaged students are less likely to receive adequate college preparation information (Perna, 2005; Venezia & Kirst, 2005). Many of these students are unaware of college admission requirements, or mistakenly believe that nonselective community colleges do not have academic standards (Venezia & Kirst, 2005). Hanushek and Rivkin (2006) suggested the achievement gap was due to difference in school quality. Factors contributing to Black student underperformance included higher mobility rates, higher percentage of beginning teachers, and a racial imbalance of students and teachers. “Achievement gaps by race, ethnicity, home language or culture, SES, or other variables are not just an educational problem; they are a problem for our entire society” (Skrla, Scheurich, Garcia, & Nolly, 2004, p. 156).

“Differences in pre-college preparation clearly play a sizable role in explaining differences in college outcomes by SES” (Bowen, Chingos, & McPherson, 2009, p. 25). When comparing SES, students from families in the top income quartile have high school graduation rates that are 23 percentage points higher, college enrollment rates that are 38 percentage points higher, and college graduation rates that are 32 points higher than those students born in families at the bottom income quartile. When comparing 12th grade average reading and math scores, low-SES students who enrolled in college are less well prepared than their high-SES peers. Students from families in the top income quartile

scored at the 73rd percentile, while students from the bottom income quartile scored at the 52nd percentile.

Pre-college preparation also differs among first-generation students. Students from families with highly educated parents have high school graduation rates that are 17 percentage points higher, college enrollment rates that are 46 percentage points higher, and college graduation rates that are 33 points higher than those students born in families with the least educated parents (Bowen et al., 2009). When comparing 12th grade average reading and math scores, students of parents with at least a college degree scored at the 73rd percentile, while students whose parents did not graduate college scored at the 59th percentile.

Completing a rigorous high school curriculum can improve college persistence, yet ethnicity, parents' education level, and SES all impact rigor (Horn et al., 2001; Nora et al, 2005). In fact, Adelman (1999) argued that differential access to rigorous high school courses is the main factor behind inequalities in college success and degree attainment among minorities and low-income students. Low-income, first-generation, and students attending a high school with a 25% or higher free and reduced lunch count are less likely to complete a rigorous high school curriculum (Horn et al., 2001). Black students were less likely (8%) to complete a rigorous high school curriculum than white (20%) and Asian (31%) students, yet more likely than Hispanic (16%) students. Furthermore, students of color and students from low-income homes typically do not perform as well as white students from middle- to upper-income homes on standardized assessments such as the ACT, SAT, and AP examinations (Clinedinst & Hawkins, 2011; Skrla et al., 2004). In addition, when they do enroll in AP courses, they often receive

inflated grades due to performing poorly on exams or do not take the examination. In sum, minority and low-income high school students are more likely to receive a vocational track rather than academic track, take fewer math and science courses, attend schools with fewer resources, have less-qualified teachers, and have a shortage of college prep coursework (Goldrick-Rab, 2010).

Assessing Community College Student Success

Community colleges are open-access, meaning students enter with a wide range of goals and expectations, making assessment of their outcomes complex (Goldrick-Rab, 2010). For this reason, postsecondary student success has been defined or measured by researchers in a variety of ways (Camera, 2013; Maruyama, 2012): (a) fall to spring or fall to fall retention (Horn, Kojaku & Carroll, 2001; Williford, 2009), (b) completion of an associate's degree or certificate program (Adelman, 1999, 2006; Astin, & Oseguera, 2005; Attewell, Heil, & Reisel, 2012; Maruyama, 2012), (c) time to degree or certificate completion (e.g., 6-year graduation for a bachelor's degree, 3-year graduation for an associate's degree; Adelman, 1999, 2006; Attewell et al., 2012; Geiser & Santelices, 2007), (d) placement into college-level courses (Conley, 2007), (e) exemption from developmental education courses (Conley, 2007; Maruyama, 2012), (f) grades in specific gateway college-level courses (e.g., College Algebra, English Composition; Congos & Schoeps, 1993; Conley, 2010; Jones, 2013; Maruyama, 2012; Pascarella & Terenzini, 1991; Scott-Clayton et al. 2014), and (g) college GPA or first-semester GPA (Belfield & Crosta, 2012; Geiser & Santelices, 2007; Gershensfeld, Hood, & Zhan, 2015; Nora et al., 2005; Williford, 2009). According to Astin and Oseguera (2005), "degree completion is one of the few student outcomes in higher education in which virtually all constituencies

have a stake” (p. 119). For the purpose of this paper, student success is determined by associate degree attainment within three years with a cumulative GPA of 2.0 or higher.

Nonacademic Factors

In addition to inadequate high school preparation, there are multiple factors that researchers have found impact degree attainment. Persistence, graduation, and time to degree are often employed in studies of college success, yet are heavily influenced by several nonacademic factors (Camara, 2013). Black, Hispanic, American Indian, first-generation, and low-income students continue to be underrepresented in college enrollment, and degree recipients (Attewell, Heil, & Reisel, 2012; Bell, Rowan-Kenyon, & Perna, 2009; Perna, 2005). The nonacademic factors explored in this study and literature review include (a) financial factors, (b) first-generation student status, (c) ethnicity, and (d) developmental education placement.

Financial factors. A student’s ability to pay for educational and living expenses has declined over the past decade (Perna & Li, 2006), making SES highly related to postsecondary student success (Attewell et al., 2011; Camara, 2013; Nora et al., 2005; Trusty, 2004). Despite an increase in overall college enrollment rates among all ethnic groups, gaps between affluent students and those from less privileged backgrounds have persisted (Camara, 2013). In a study utilizing the NELS 1988 dataset, Attewell, Lavin, Domina, and Levey (2006) found 50% of low-income students enrolled in at least one developmental education course compared to only 32% of high-SES students. Due to insurmountable financial barriers, gaps in time to degree (Bowen et al., 2009) and degree completion rates are even larger (Bowen et al., 2009; Camara, 2013).

According to Bowen, Chingos, and McPherson (2009), low-SES students are considerably less likely to earn a bachelor's degree by age 26 than high-SES students. For students in the lowest income quartile who started at a community college in 2003-04, only 13% earned an associate degree, 9% earned a certificate, and 8% earned a bachelor's degree within five years (NCES, 2013). In a nationally representative study, Trusty (2004) found a "one-standard-deviation increase in SES resulted in a 62% increase in the likelihood of degree completion, while controlling for all other variables" (p. 24). In this study, high school course taking and SES had the largest predictive effect on bachelor degree completion. In Attewell, Heil, and Reisel's (2011) study, family SES had a statistically significant predictive effect on degree completion for all students, except those attending highly selective colleges.

Federal financial aid. Research on whether financial aid has a positive impact on degree attainment is inconsistent. Several studies have found the amount of financial aid to have none or even a negative predictive value on retention and graduation (Adelman, 2006; Dowd & Coury, 2006; Tinto, 1993). Dowd and Coury (2006) discovered that loans taken out during the first year by community college students had negative relationships with persistence and no predictive effect on degree completion. Conversely, Singell (2004) found a positive relationship between student loans and persistence, and Dynarski (2003) reported as the financial aid award increased, so did college persistence. Likewise, Attewell et al. (2011) found that the dollar amount of financial aid had a statistically significant and positive prediction on community college graduation, yet a significantly smaller predictive value for four-year college students.

Furthermore, the work-study program had shown to have a positive predictive value on retention among first-generation students (Ishitani, 2006).

First-generation students. A student whose parents never attended college is referred to as a first-generation student (Aldeman, 2006; Ishitani, 2006). According to Reid and Moore (2008), there are five areas in which first-generation students differ from those whose parents attended college, thus making them disadvantaged in college preparation. First, these students are unable to receive assistance from their parents in applying to college because most of them have never completed this task (Wimberly & Noeth, 2004). Second, they require college preparation assistance in high school. Third, first-generation students are more likely to be exposed to a less rigorous high school curriculum than their peers whose parents attended college because they do not receive guidance from their parents regarding which college preparatory classes to take (NCES, 2005; Warburton, Bugarin, & Nuñez, 2001). Fourth, first-generation students often attend college close to home, which ends up not being a good fit (Horn, Nevill, & Griffith, 2006). Fifth, first-generation students often have low self-esteem and more often live at home and work part-time while attending college (Horn et al., 2006; Warburton et al., 2001).

Studies have shown that first-generation students are less likely to earn a college degree in a timely manner (Bowen et al., 2009; Ishitani, 2003, 2006), and have lower persistence and completion rates (Ishitani, 2006; Porchea et al., 2010). Only 7.5% of students who are Pell-eligible (low-income) and first-generation students obtain a bachelor's degree within six years from their initial institution, compared to 41.1% of those students who are in neither category (Tinto, 2012). Often, parents who have not

attended college are unaware of how to assist with the college application and financial aid process (Clinedinst & Hawkins, 2011).

Trusty (2004) found parental expectations to have a greater predictive effect on degree attainment than a student's own expectation. "A one-standard-deviation increase in parents' expectations—reported by parents when their children were seniors increased the likelihood of degree completion by 33% for Asian Americans, by 22% for African Americans, by 21% for Latinos, and by 18% for Whites" (Trusty, 2004, p. 29). Parents should be educated on the important role they have in encouraging and expecting their children to complete a college degree or certificate.

According to Ishitani (2006), "the greatest benefits for explaining college success of first-generation students results from thorough examination of both precollege attributes of students and the quality of their interactions with institutions of higher education" (p. 865). Using the NELS 1988 longitudinal data set, Ishitani (2006) found that being a first-generation student reduced the odds of graduating in four years to 51% and five years to 32%. Other variables that strongly predicted degree completion for first-generation students included continuous enrollment, higher high school class rank, and higher academic intensity.

Ethnicity. "Racial/ethnic minorities continue to be under-represented among both high school graduates and college students" (Clinedinst & Hawkins, 2011, p. 1). Although college degree completion rates for Blacks, Hispanics, and whites have increased over the past three decades, disparity still exists between ethnicities. According to the U.S. Department of Education report, *The Condition of Education 2014*, "from 1990 to 2013, the percentage of 25- to 29-year-olds who had attained a bachelor's or

higher degree increased from 26 to 40 percent for Whites, from 13 to 20 percent for Blacks, and from 8 to 16 percent for Hispanics” (Kena et al., 2014, p. 4). During this this time, the attainment rate gap between whites and Blacks increased from 13 to 20 percentage points, and from 18 to 25 percentage points between Whites and Hispanics.

Although research has shown that degree completion varies by race, ethnicity, and SES, there is disagreement whether these gaps are due to inadequate high school preparation, or simply due directly to race, ethnicity, and SES (Attewell, Heil, & Reisel, 2011). Attewell et al. found significantly significant racial and ethnic differences in graduation rates. “Our findings suggest that in community colleges substantial racial/ethnic and gender gaps remain, even after controlling for other factors, suggesting a direct effect” (Attewell et al., 2011, p. 554). Similarly, in a statewide study of the 2006-07 Texas graduating class, Moore, Slate, Edmonson, Combs, Bustamante, and Onwuegbusie (2010) found only one-third to be college-ready in both math and English. Statistically significant differences were found; however, in the college readiness among the various ethnic subgroups. Whites scored higher than Hispanics in math, English, and reading; and Hispanics scored higher than Black students in all subjects (Moore et al., 2010).

Developmental education coursework. Most U.S. colleges and universities offer remedial courses for students lacking math, reading, or writing skills necessary for college-level coursework success (Attewell et al., 2006). According to the Community College Research Center (CCRC; 2014), “recent federal data indicate that 68 percent of community college students and 40 percent of students at public four-year colleges take at least one remedial course” (p. 1). Furthermore, remediation rates are significantly

associated with race and ethnicity, SES, and parental education (Wiley, Wyatt, & Camara, 2010). NCES estimates show that 61.7% of Black students and 63.2% of Hispanic students take at least one developmental education courses, as compared to 34.6% of white students (NCES, 2004). Approximately 54% of first-generation students require at least one developmental education course (NCES, 2005). In a study utilizing the NELS 1988 data, Attewell et al. (2006) investigated remediation and discovered that Black students are significantly more likely than their academically equivalent White peers to enroll in remedial courses.

The majority of developmental education courses are focused on preparing students for college-level math or English, rather than preparing them for college success in general (Jenkins & Cho, 2012). In addition, developmental education courses are often noncredit bearing, increasing the number of credit hours taken and money spent or financial aid used, slowing the progress toward a degree (CCRC, 2014; Jaggars & Hodara, 2011; Porter & Polikoff, 2011). Furthermore, students often become discouraged as they revisit subjects that were likely difficult for them in high school (Douglas & Attewell, 2014). As a result, only 28% of community college students enrolled in a developmental education course complete a degree within eight years, compared to 43% of nonremedial students (Attewell et al., 2006).

Upon admission at most community colleges, students are screened for possible remediation in math, reading, and writing (Scott-Clayton, Crosta, & Belfied, 2014). Two remedial placement exams dominate the community college market: (a) Compass, developed by ACT, is used by at least 61% of community colleges; and (b) Accuplacer, developed by the College Board, is used by at least 39% of community colleges (Fields &

Parsad, 2012). Those students who do not test above a pre-determined score are enrolled in developmental education coursework, rather than college-level coursework (Belfield & Crosta, 2012). Currently, high school performance is not considered for placement into college-level classes.

In general, placement score accuracy rates tend to be higher for math than for reading or writing (Belfield & Crosta, 2012). Jenkins, Jaggars, and Roksa (2009) found no correlation between English and writing placement scores and performance in college-level English courses; however, math placement scores and performance in college-level math were positively associated. In a stateside community college study, Belfield and Crosta (2012) found that Compass and Accuplacer test scores were not a strong predictor of college performance in development education courses.

Research on the influence of remediation on college success is not conclusive. When academic preparation is controlled, Adelman (1999) found that college remediation does not predict degree attainment, implying that inadequate academic preparation is the reason for low completion rates. Similarly, Attewell, Heil, and Reisel (2011) discovered that remediation does not predict degree attainment among community college students. In contrast, Lavin, Albe, and Silberstein (1981) found that community college students who passed at least one remedial course were more likely to persist and graduate or transfer to a four-year college than peers who did not take remedial coursework. McCabe (2000) argued for the useful function of developmental education for disadvantaged groups. Bettinger and Long (2004) concluded that success in remedial math does improve degree completion.

Furthermore, researchers have argued the severe consequences of improperly assigning students to developmental education and college-level coursework (Belfield & Crosta, 2012; Scott-Clayton et al., 2014). Some studies have found less negative and more positive effects from remediation for students who tested low on placement exams (Bettinger & Long, 2009); however, others have found large negative effects (Boatman & Long, 2010). Moreover, for highly underprepared students who are improperly placed in college-level coursework rather than developmental education courses, the consequences can be just as negative (Carrell, Fullerton, & West, 2009; Zimmerman, 2003). For marginal students testing just below or just above the college-level cutoff, many researchers have found a negative impact on college success (Calcagna & Long, 2008; Martorell & McFarlin, 2011; Scott-Clayton & Rodriguez, 2012). According to Belfield and Crosta's (2012) findings:

Placement tests are associated with severe error rates; 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)

Martorell and McFarlin (2011), for example, examined the placement test records for over 250,000 Texas community college and university students, and found that marginal students had significantly lower persistence and accumulated fewer college credits. Suggestions included using high school transcripts instead of, or in addition to, test scores. Similarly, in an effort to improve the accuracy of developmental education placement, Scott-Clayton et al. (2014) analyzed the high school transcripts, remedial test scores, and college grades of more than 10,000 students at two very large community

college systems. Findings indicated that by using high school transcript data, over placement and under placement errors can be reduced, and success rates in college-level courses increased.

Summary

When synthesizing the body of literature and research on college readiness collected for this literature review, several themes emerged. First, few studies looked in-depth at degree completion, and even fewer focused on the impact of high school variables on degree completion (Adelman, 1999). Trusty (2004) argued the need for more studies predicting the value of intensive high school course taking on degree completion, since such courses have been found to have a greater predictive effect than grades and test scores (Adelman, 1999). Williford (2009) concluded that high school course performance has not been sufficiently studied in order to determine its value in predicting college success. Given the importance of a college-educated workforce on society, understanding variables in high school that better prepare students for college success is imperative (Trusty, 2004).

Secondly, Trusty (2004) emphasized the need for more studies that span the K-16 environment. Results from Trusty's (2004) study revealed that "a K-12 perspective or a higher-education perspective on educational development is inadequate for a large and growing majority portion of young people in the U.S., namely, those pursuing the bachelor's degree soon after high school" (p. 36). Porter and Polikoff (2011) argued for a better understanding of what predicts college readiness for various types of higher education institutions. According to Kirst and Venezia (2006), it is impossible for most states to determine if the courses taken in high school have any relationship on their

college degree attainment. Furthering the need to “create data systems to track student progress across educational levels and institutions” (para. 20). The current study will help bridge the gap between high school and college.

Thirdly, there is an urgent need for studies that employ multiple college readiness measures (Conley, 2007; Maruyama, 2012; Porchea, Allen, Robbins, & Phelps, 2010). Research has shown that high school information is predictive of performance in college (Scott-Clayton, Crosta, & Belfied, 2014); however, the majority of studies examined only one predictor of college success such as ACT score, HSGPA, dual credit completion, and financial aid status. Conley et al. (2010) and Maruyama (2012) suggested employing one predictor of success is not sufficient in determining a student’s readiness for college, and recommended employing multiple measures of success. Such research methods are essential in strengthening both empirical research and practitioner focus.

Finally, there is a need for in-depth high school transcript analysis research. High school transcript data have not been “systematically assessed in student success studies” (Williford, 2009, p. 24). The review of literature clearly indicated a need for community colleges to utilize an incoming student’s high school transcript for placement decisions. However, other than Adelman (1999, 2006), Trusty (2004), and Trusty and Neil (2004), very few studies conducted a thorough high school transcript analysis. Adelman’s (1999) transcript study identified the impact of high school coursework, particularly upper-level math courses, on degree completion. However, the majority of his analysis focused on college predictors. Trusty and Nile’s (2004) research had similar findings, but included only high school variables, separately examined each math course, and was limited to students who expected to obtain a college degree, and who had an above average

cognitive ability. Trusty (2004) expanded this research to include school behavior variables, parenting variables, and self-perception.

The analysis of college readiness empirical research supports the contention that students are not being adequately prepared for college success. Furthermore, despite the recent attention on the importance of preparing students for college, several researchers have clearly articulated the need for further study (Alelman, 1999; Trusty, 2004).

Pinpointing the reasons for unprepared incoming college freshmen is difficult, as it is a multifaceted matter that encompasses a variety of circumstances including social forces, ethnicity, SES, and academic preparation. The proposed research study will contribute to the field by supplying a solid foundation on which to make recommendations for improvement, and to promote informed dialogue and partnerships among K-12 school districts and institutions of higher education.

CHAPTER FOUR:
CONTRIBUTION TO PRACTICE

Crowder College
College Readiness White Paper

To be presented to the College Council, Instructional Council, and
Student Success Council
Author: Kali Bard

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CROWDER COLLEGE

COLLEGE READINESS WHITEPAPER EXECUTIVE SUMMARY

Presented to the College Council, Instructional Council, and Student Success Council
Author: Kali Bard

Introduction

Traditionally known for their open-door admission policies, low tuition, and convenience, community college enrollment has grown drastically in the last decade. In fact, the American Association of Community Colleges (AACC) reports that nearly half of all undergraduates attend a community college. This increased enrollment; however, has not brought about an increase in degree attainment. In fact, only 29.9% of full-time degree- or certificate-seeking students at community colleges graduate in three years or less.

Scholarly Context

In addition to dismal community college completion rates, an increase in the number of incoming freshmen required to take developmental education coursework (CCRC, 2014; Kim & Bragg, 2008) has educators, researchers, and policy makers looking for answers. Federal data indicated that 68% of community college students, and 40% of public college students take at least one developmental education courses (CCRC, 2014). Such courses essentially reteach middle school and high school coursework in math, English, and reading. As pressure mounts for institutions of higher education to increase student success and degree completion, blame has been placed, in part, on inadequate high school preparation for college (United States Department of Education, 2006a).

Unfortunately, many states are failing to hold high schools accountable for preparing students for college and career success (Adelman, 2010). This is evident in the 2014 ACT results. Only 26% of all 2014 ACT-tested high school graduates demonstrated academic readiness for first-year, college level courses in English composition, college algebra, biology, and the social sciences (ACT, 2014). Furthermore, 16% met only one ACT College Readiness Benchmark, and 31% met none.

Purpose of the Study

Based on Astin's (2001) modified input-environment-outcome (I-E-O) model, this study investigated the relationship between college readiness measures taken in high school and the successful completion of a community college associate degree. The inputs, or control variables, included student demographics. The environment, or independent variables, consisted of the high school college readiness measures. The high school outcome/community college input, or independent variables, consisted of the college placement exam scores (ACT or Compass). The output, or dependent variable, was defined as completing an associate degree within three years while maintaining a cumulative GPA of 2.0 or higher.

Students were considered successful if they were able to obtain an associate degree within three years with a cumulative GPA of 2.0 or higher. Students were considered unsuccessful if they were unable to complete an associate degree within three years with a cumulative GPA of 2.0 or higher. These unsuccessful students could still be enrolled or have dropped out of Crowder College.

Participants

The participants in this study consisted of 443 first-time, full-time students who graduated high school in May 2011 and enrolled at Crowder College in fall 2011 with a declared associate degree major. The majority of the participants were white (83%), female (56%), Pell eligible (64%), and first-generation college students (57%). The successful graduates ($n=162$) achieved associate degree attainment within two years ($n=128$) or three years ($n=34$) with a cumulative GPA of 2.0 or higher. The unsuccessful students ($n=281$) were unable to complete an associate degree within three years with at least a 2.0 GPA and are still enrolled ($n=48$) or have dropped out ($n=233$).

Research Design

The design of this nonexperimental quantitative study is causal-comparative in nature (Fraenkel & Wallen, 2009). According to Gay, Mills, and Airasian (2006), causal-comparative research "attempts to determine the cause, or reason, for existing differences in the behavior or status of groups of individuals" (p. 217). Furthermore, causal-comparative studies seek to explore relationships among variables, compare two or more groups, and typically involve at least one categorical variable (Fraenkel & Wallen, 2009). An empirical investigation of quantitative variables, as well as the relationships between the *input*, *environmental*, and *outcome* variables was conducted utilizing independent samples *t*-tests, non-parametric chi-square tests, and binary logistic regression.

Findings

RQ1: What are the differences in the student demographic variables of successful and unsuccessful community college students?

The successful student sample consisted primarily of white (85%) female (61%) students, 56% of whom were Pell eligible and 49% of whom were first-generation college students. The unsuccessful student sample consisted primarily of white (82%) female (53%) students who were Pell-eligible (68%) and first-generation college students (61%).

Chi-square analyses revealed a significant relationship between successful community college associate degree attainment and Pell eligibility and first-generation college student status. Students who were not Pell-eligible were 1.68 times more likely to graduate with an associate degree within three years with a GPA of 2.0 or higher than those who were Pell eligible. Furthermore, those who were not first-generation college students were 1.66 times more likely to graduate with an associate degree in three years with at least a 2.0 GPA than those who were first-generation college students.

RQ2: What are the differences in high school environmental variables for successful and unsuccessful community college students?

The majority of participants were eligible for the Missouri A+ scholarship (52%); met the ACT recommended core curriculum (54%); did not take a math (54%), science (59%), or social studies (58%) class their senior year of high school; took an English class their senior year of high school (85%); and did not complete a math class beyond Algebra II (69%)

Chi-square analyses revealed a significant relationship between successful community college associate degree attainment and Missouri A+ Scholarship attainment; ACT recommended core; highest level of math, English, and science; senior year math, English, and science, and taking a math course beyond algebra II.

Those students who were Missouri A+ scholarship recipients were 2.03 times more likely to graduate within three years than those who were not. Similarly, those students who completed the ACT recommended core curriculum in high school were 2.04 times more likely to graduate within three years than those who did not.

Students who completed an upper level pre-calculus, calculus, or a dual credit or advanced placement math course were 2.17 times more likely to graduate than those who stopped with algebra III or trigonometry, 4.5 times more likely to graduate than those who stopped with algebra II, and 13.7 times more likely to graduate than those students who stopped with geometry. Students who completed physics, or a DC or AP science course were 1.39 times more likely to graduate than those who stopped with anatomy and physiology, 2.28 times more likely to graduate than those who stopped with chemistry or biology II, and 5.76 times more likely to graduate than those students who stopped with biology I.

t-test analysis revealed that on average, successful students: (a) had a lower class rank percentage ($M=29.54$), (b) had a higher cumulative HSGPA ($M=3.49$), (c) earned more academic core credits in high school ($M=15.04$), (d) a higher cumulative academic core HSGPA ($M=3.20$), (e) earned more math credits in high school ($M=3.69$), (f) had a higher cumulative high school math GPA ($M=3.03$), (g) had a higher cumulative high school English GPA ($M=3.29$), (h) earned more science credits in high school ($M=3.66$), (i) had a higher cumulative high school science GPA ($M=3.17$), (j) had a higher cumulative high school social studies GPA ($M=3.34$), (k) earned more foreign language credits in high school ($M=1.55$), (l) completed more dual credit courses in high school ($M=.79$), (m) completed more advanced placement courses in high school ($M=.34$), (n) transferred more college credits ($M=2.73$), and (o) earned a higher math intensity score ($M=1.54$), than the unsuccessful community college students.

RQ3: What are the differences in high school outcome variables for successful and unsuccessful community college students?

t-test results revealed that on average, successful students had a: (a) higher ACT composite score ($M=20.28$), (b) higher ACT English score ($M=20.11$), (c) higher ACT math score ($M=19.91$), (d) higher ACT reading score ($M=21.01$), (e) higher Compass math score ($M=119.44$), (f) higher Compass writing score ($M=168.30$), and (g) a higher Compass reading score ($M=179.47$), than the unsuccessful students

A large effect size was revealed for: (a) class rank, (b) cumulative HSGPA, (c) cumulative academic core HSGPA, (d) cumulative high school math GPA, (e) cumulative high school English GPA, (f) cumulative high school science GPA, and (g) cumulative high school social studies GPA

RQ 4: In a combined model, what demographic, high school environmental, and high school outcome variables predict community college degree attainment?

The final and complete logistic regression model included all independent variables simultaneously, including demographics. Regression results indicated that the overall model was statistically reliable in distinguishing between successful and unsuccessful community college students ($-2 \text{ Log Likelihood} = 253.79$, $\chi^2(22) = 66.57$, $p < .001$). The addition of the placement test scores; however, failed to improve the fit of the model by correctly classifying fewer cases than the previous step, 73.7% compared to step 2 at 74.6%. Taken together, among first-time, full-time, traditional age, degree-seeking community college students, the likelihood of attaining an associate degree within three years with a 2.0 or higher GPA was significantly associated with **high school GPA (HSGPA), total high school credits earned, senior year math, and college credits earned in high school**. The odds of attaining an associate degree increased by a factor of 4.44 with a one-point increase in HSGPA, by a factor of .82 with each additional high school credit earned, by a factor of 2.34 with a math class senior year, and by a factor of 1.15 with each additional college credit earned in high school. For each increase in one high school credit earned, the likelihood of community college degree attainment slightly decreased by a factor of .88.

K-12 Recommendations

- Require high school students to take a math course senior year
- Require at least one upper-level math course beyond algebra II
- Increase the number of advanced placement and dual credit course offerings
- Inform incoming freshman students and their parents about the potential benefits of earning good grades and a high cumulative GPA, along with the strong correlation between college preparatory courses and college degree attainment
- Provide teachers with training in instructional strategies that help them develop college readiness skills in their students

Crowder College Recommendations

- Utilize multiple measures to place students in college-level and developmental education courses. Measures should include high school GPA
- Utilize the high school transcript to identify at-risk freshman students in order to provide preemptive services for unprepared students
- Utilize the high school transcript to identify high-achieving incoming freshmen to be targeted for achievement scholarships, fast-track programs, and peer-tutoring opportunities
- Reach out to secondary school administrators in facilitating the college preparedness process, including joint professional development. Emphasis should also be placed on college preparatory dual credit coursework, the importance of high achievement in these courses, and on preparing for college placement exams such as the ACT, SAT, and Compass.

SECTION ONE:

INTRODUCTION TO COLLEGE READINESS STUDY

Background

Although a record number of students are attending college, too few actually graduate (Porter & Polikoff, 2011; United States Department of Education, 2006a). In 2012-13, there were 1,045 community colleges in the United States (AACC, 2014), representing 45% of all undergraduates, or over 7.1 million students nationwide (CCRC, n.d.). As of 2010, only 42% of 25 to 34 year-olds have an associate degree or higher in the United States, and only 29.9% of full-time degree or certificate seeking students at community colleges graduate in three years or less (AACC, 2010; College Board Advocacy & Policy Center, 2012). Only 20% of these students complete an associate's degree within two years (College Board Advocacy & Policy Center, 2012).

Traditionally, community colleges have an open door admittance policy and typically serve a population of students who face “greater social, economic, and academic barriers to their success in college when compared with students in four-year schools” (Bailey, Crosta, & Jenkins, 2006, p. 7). Many of these students enroll with underdeveloped basic skills in reading, writing, and mathematics (Crews & Aragon, 2007), making it difficult to retain and graduate more students. As a result, two-thirds of community college students enroll in at least one developmental education remediation course (CCRC, 2014; Tinto, 2012). In addition, the majority of community college students attend on a part-time basis (Bailey et al., 2006), often hold full-time jobs (Calcagno, Crosta, Bailey, & Jenkins, 2007), and 42% are the first generation in their families to attend college (AACC, 2010). Despite these challenges, many community college students aspire to obtain a four-year degree (Hagedorn, Cypers, & Lester, 2008).

Problem of Practice

Students who are considered ready for college are generally expected to be academically prepared for entry-level college coursework. Unfortunately, many students are entering college unprepared (CCRC, 2014; Conley, 2007; Greene & Forster, 2003; Roderick, Nagaoka, & Coca, 2009; Tinto, 2012; United States Department of Education, 2006a; Venezia & Kirst, 2005). The National Assessment of Educational Progress (NAEP) 2013 survey, consisting of a nationally representative sample of 92,000 twelfth graders in thirteen states, found that only 26% of twelfth graders are at or above proficient in mathematics, and only 38% are at or above proficient in reading (NCES, 2015).

Inadequate and inequitable preparation for college affects community college remediation and degree attainment rates (Venezia & Kirst, 2005). Students who enter community college unprepared and incapable of enrolling in college-level coursework are generally required to complete developmental education coursework (Provasnik & Planty, 2008). Over 68% of community college students will enroll in at least one developmental education course (CCRC, 2014), at a cost of one billion dollars annually (Provasnik & Planty, 2008; United States Department of Education, 2006b). Developmental coursework is most often offered in mathematics, English, and writing. A large number of students who enroll in developmental coursework will spend a significant amount of time and money completing courses that will not contribute toward their degree program (Bailey et al., 2006). This could account for a single developmental course, or up to a full semester or more of developmental coursework. Developmental coursework is costly and lengthens time to degree completion. According to Complete

College America (2011), of the students required to take developmental coursework, only 13% finish a one-year certificate within eighteen months, compared to 23% of all students; 9.5% complete an associate's degree within three years, compared to 14% of all students; and 35% complete a bachelor's degree within six years, compared to 56% of all students.

Crowder College Problem of Practice

By 2018, an estimated 60% of all Missouri jobs will require some type of postsecondary education (Missouri Department of Higher Education, n.d.a). Currently, approximately 49% of Missourians have a college degree or certificate, and Missouri has set a goal to increase it to 60% by 2025. In order to increase degree attainment, the Missouri Department of Higher Education (MDHE) is updating the state's *Blueprint for Higher Education* to focus on four areas: (a) accessibility, improving college readiness and making higher education available to all students across the state; (b) affordability, keeping costs affordable for all students; (c) quality, ensuring all students obtain the knowledge and skills necessary for a rapidly changing world; and (d) completion, helping students obtain a certificate or degree.

Crowder College determines readiness for college-level coursework by a student's ACT or Compass placement score. Students who do not score at the appropriate level are required to complete developmental coursework in math or English, or both. In 2015, the MDHE created the *Policy on Basic Skills Assessment and Placement* requiring institutions to use multiple measures to assess the basic mathematics, English, and reading skills of all incoming certificate and degree-seeking students (MDHE, n.d.b). Presumably, the use of multiple placement measures is a more

precise measurement of a student's ability to succeed in college. The unfair use of a single, high-stakes assessment score for placement provide further rationale for this new policy. Furthermore, students who enter college unprepared and required to enroll in developmental coursework are less likely to succeed (Calcagno et al., 2007; MDHE, n.d.b).

Crowder College had 5,590 students enrolled during the fall 2012 semester and 41% were enrolled in at least one developmental education course. Furthermore, 45% were low-income students, 47% were first-generation college students, and 33% were non-traditional students age 25 or older. Of those students who were taking classes in fall 2012, 67% enrolled in the Spring 2013 semester. Unfortunately, less than half, 44% of those students who enrolled in the fall 2012 semester were retained the following year, and only 29% graduated within three years (Crowder College, internal database, personal communication, October 29, 2015).

Purpose

The purpose of this study was to investigate the relationship between college readiness measures taken in high school and the successful completion of a community college associate degree. Based on Astin's (2001) modified input-environment-outcome (I-E-O) model, the inputs, or control variables, included student demographics. The environment, or independent variables, consisted of the high school college readiness measures. The high school outcome/community college input, or independent variables, consisted of the college placement exam scores (ACT or Compass). The output, or dependent variable, is defined as completing an associate degree within three years while maintaining a cumulative GPA of 2.0 or higher.

Research Questions

For the purpose of this study, community college degree attainment was determined by earning an associate degree within three years with a cumulative GPA of 2.0 or higher. Students were considered successful if they were able to obtain an associate degree within three years with a cumulative GPA of 2.0 or higher. Students were considered unsuccessful if they were unable to complete an associate degree within three years with a cumulative GPA of 2.0 or higher. These unsuccessful students could still be enrolled or have dropped out of Crowder College. In order to better understand the impact college readiness has on community college degree attainment, the following research questions were addressed:

1. What are the differences in the student demographic variables of successful and unsuccessful community college students?
2. What are the differences in high school environmental variables for successful and unsuccessful community college students?
3. What are the differences in high school outcome variables for successful and unsuccessful community college students?
4. In a combined model, what demographic, high school environmental, and high school outcome variables predict community college degree attainment?

Method

Setting

The research was conducted at Crowder College, a public community college located in a rural area of Southwest Missouri with approximately 5,500 students. Of the 5,584 students enrolled during the fall 2015 semester, 63% were female and 81% were

white. Furthermore, 74% were under 25, 49% were first-generation college students, 32% were low-income students, and 62% attended full-time taking at least 15 credit hours per semester. Only 29% of the fall 2012 cohort of first-time, full-time, degree-seeking students graduated within three years.

Participants

This study utilized a purposive sampling method. Purposive sampling is a non-random sampling method that allows researchers to determine the characteristics of the sample they wish to analyze and select study participants based on those characteristics (Gay, Mills, & Airasian, 2006). The participants in this study consisted of 443 first-time, full-time students who graduated high school in May 2011 and enrolled at the community college in fall 2011 with a declared associate degree major. The majority of the participants were white (83%), female (56%), Pell-eligible (64%), and first-generation college students (57%). The successful graduates ($n=162$) achieved associate degree attainment within two years ($n=128$) or three years ($n=34$) with a cumulative GPA of 2.0 or higher. The unsuccessful students ($n=281$) were unable to complete an associate degree within three years with at least a 2.0 GPA and are still enrolled ($n=48$) or have dropped out ($n=233$).

Data Analyses

This quantitative study was designed utilizing Astin's (2001) modified I-E-O model to research demographic and high school variables that impact community college success. This model was originally designed to compensate for non-random sampling in non-experimental design studies (Astin & Sax, 1998). IBM SPSS Statistical Software version 23 was utilized to employ a range of descriptive and inferential analyses.

Descriptive statistics were used to describe student demographics. Furthermore, independent samples *t*-tests and non-parametric chi-square tests were utilized to describe and analyze the proportion of successful and unsuccessful college students in regard to demographic, high school environmental, and high school outcome variables. The effect size was determined as recommended by Cohen (1998) in which $d = 0.2$ is a small effect size, 0.5 is a medium effect size, and 0.8 is a large effect size. Independent samples *t*-tests were used for the continuous variables and chi-square for categorical variables. This data was utilized to answer research questions one (RQ1), two (RQ2), and three (RQ3).

To answer research question four (RQ4), an empirical investigation of quantitative variables, as well as the relationship between the *input*, *environmental*, and *outcome* variables was conducted utilizing binary logistic regression. According to Mertler and Vannatta (2009), “logistic regression tests the ability of a model or group of variables to predict group membership as defined by some categorical DV [dependent variable]” (p. 304). In this study, binary logistic regression was used to predict the probability of attaining an associate degree within three years, the dichotomous or categorical outcome for this study.

Although logistic regression offers greater flexibility, assumptions must first be tested. Logistic regression is sensitive to high correlation among predictor variables and highly sensitive to outliers (Mertler & Vannatta, 2009). Before running the logistic regression model, correlations were explored to eliminate multicollinear relationships and standardized residuals were examined to detect outliers. Additionally, a preliminary multiple regression was conducted to calculate Mahalanobis’ distance to identify outliers and examine multicollinearity among the predictor variables (2009). After highly

correlated variables were eliminated and outliers addressed using standard methods, binary logistic regression was performed using the hierarchical (blockwise entry) method. In hierarchical regression, predictors are selected and entered in blocks based on past research (Field, 2009). Step one included student demographic variables (I_1), step two added the high school environmental variables (E_1), and step three added the high school outcome variables (O_1/I_2). All tests of statistical significance were conducted at an alpha level of .05.

SECTION TWO:
RESEARCH FINDINGS

Introduction

The purpose of this study was to investigate the relationship between college readiness measures taken in high school and the successful completion of a community college associate degree. More specifically, the study aimed to identify which high school factors best predicted success at Crowder College. Findings for the four research questions guiding the current study are covered here in Section Two. Recommendations for identifying and improving college readiness, along with utilizing multiple measures for college-level course placement decisions are addressed in Section Three.

Initially, descriptive statistics, non-parametric chi-square tests, and independent *t*-tests were run on all of the independent variables considered: (a) demographic, (b) high school environmental, and (c) high school outcome variables. These results were used to answer research questions one (RQ1), two (RQ2), and three (RQ3). Next, binary logistic regression analyses were utilized to answer research question four (RQ4) aimed at determining the influence of all of the independent variables and their ability to predict the successful completion of a community college associate degree within three years with a 2.0 GPA or higher.

Addressing RQ1: Student Demographic Variables

Descriptive summaries and non-parametric chi-square tests were utilized to describe the proportion of successful and unsuccessful college students and to address the first research question:

RQ1: What are the differences in the student demographic variables of successful and unsuccessful community college students?

Table 1 presents the frequencies and chi-square results between the student demographic variables used in this study and community college degree attainment. The successful student sample consisted primarily of white (85%) female (61%) students, 56% of whom were Pell eligible and 49% of whom were first-generation college students. The unsuccessful student sample consisted primarily of white (82%) female (53%) students who were Pell-eligible (68%) and first-generation college students (61%).

Table 1

Results of Chi-square Test for Demographic Variables and Attaining Community College Degree

Variable	Degree attainment		$\chi^2 (1)$	<i>p</i>
	Successful (<i>n</i> =162)	Unsuccessful (<i>n</i> =281)		
Gender			2.11	.164
Female	98	150		
Male	64	131		
Race			0.66	.432
White	138	231		
Other	24	50		
Pell-Eligible*			6.58	.014
Yes	91	192		
No	71	89		
First-Generation*			6.48	.013
Yes	79	172		
No	83	109		

Note. * Significant at alpha of .05.

The chi-square statistic can be distorted when expected counts are very small; therefore, all other races besides white were combined into a category labeled other. Chi-square tests of independence revealed a significant relationship in two areas, Pell eligibility $\chi^2(1) = 6.580, p = .014$, and first-generation college student status $\chi^2(1) = 6.480, p = .013$. No significant proportional differences were revealed between successful community college associate degree attainment and gender $\chi^2(1) = 2.110, p = .164$, or race $\chi^2(1) = .655, p = .432$.

Odds ratios further highlighted differences between successful and unsuccessful community college graduates. Students who were not Pell-eligible were 1.68 times more likely to graduate with an associate degree within three years with a GPA of 2.0 or higher than those who were Pell eligible. Furthermore, those who were not first-generation college students were 1.66 times more likely to graduate with an associate degree in three years with at least a 2.0 GPA than those who were first-generation college students.

Addressing RQ2: High School Environmental Variables

Descriptive summaries, non-parametric chi-square tests, and independent *t*-tests were utilized to describe the high school environmental variables and to address the second research question:

RQ2: What are the differences in high school environmental variables for successful and unsuccessful community college students?

Table 2 provides a breakdown of the participants by the categorical high school environmental variable as well as the chi-square analysis for these comparisons. The majority of the participants were eligible for the Missouri A+ scholarship (52%); met the ACT recommended core curriculum (54%); did not take a math (54%), science (59%), or

Table 2

Results of Chi-square Test for Student High School Environmental Variables and Attaining Community College Degree

Variable	Degree attainment		$\chi^2(1)$	<i>p</i>
	Successful (<i>n</i> =162)	Unsuccessful (<i>n</i> =281)		
MO A+ Scholarship*			12.48	.001
Yes	102	128		
No	60	153		
ACT Core Curriculum*			12.53	.001
Yes	106	135		
No	56	146		
High Math*			61.22	<.001
Alg I or Pre-Alg	91	27		
Geometry	8	53		
Alg II	69	150		
Alg III or Trig	22	23		
Pre-calc, Calculus, College Alg, DC, AP	58	28		
High English*			17.80	<.001
Eng III	24	92		
Eng IV, College-prep, DC, AP	138	185		
High Science*			26.53	<.001
Bio I	18	78		
Chem or Bio II	88	151		
A & P	24	25		
Physics, DC, AP	32	24		
Sr Year Math*			35.61	<.001
Yes	104	98		
No	58	183		
Sr Year English*			6.84	.009
Yes	147	229		
No	15	52		
Sr Year Science*			15.57	<.001
Yes	87	97		
No	75	184		
Sr Year Social Studies			1.26	.273
Yes	74	113		
No	88	168		
Math Beyond Alg II*			47.62	<.001
Yes	82	54		
No	80	227		

Note. * Significant at alpha of .05.

social studies (58%) class their senior year of high school; took an English class their senior year of high school (85%); and did not complete a math class beyond Algebra II (69%). With regard to the highest math course completed in high school, seven percent (7%) completed pre-algebra or algebra I, 14% completed geometry, 50% completed algebra II, 10% completed algebra III or trigonometry, and 19% completed pre-calculus, calculus, college algebra, or an AP or dual credit (DC) math course. Pertaining to the highest English course completed in high school, 26% completed English III, and 73% completed English IV, college-prep English, or an AP or DC English course. Referring to the highest science course completed in high school, 22% completed biology I, 54% completed chemistry or biology II, 11% completed anatomy and physiology, and 13% completed physics or an AP or DC science course.

Chi-square tests of independence were calculated to compare the relationship between the categorical high school environmental variables and successful community college associate degree attainment. There was a significant relationship between successful community college associate degree attainment and nine categorical high school environmental variables: (a) Missouri A+ scholarship attainment $\chi^2(1) = 12.479, p = .001$, (b) ACT recommended core curriculum $\chi^2(1) = 12.526, p = .001$, (c) highest level of math $\chi^2(1) = 61.219, p < .001$, (d) highest level of English $\chi^2(1) = 17.797, p < .001$, (e) highest level of science $\chi^2(3) = 26.532, p < .001$, (f) senior year math $\chi^2(1) = 35.616, p < .001$, (g) senior year English $\chi^2(1) = 6.843, p = .009$, (h) senior year science $\chi^2(1) = 15.574, p < .001$, and (i) math beyond algebra II $\chi^2(1) = 47.623, p < .001$. No significant proportional differences were revealed between successful community college associate degree attainment and senior year social studies $\chi^2(1) = 1.258, p = .273$.

Odds ratios further highlighted differences between successful and unsuccessful community college graduates. Those students who were Missouri A+ scholarship recipients were 2.03 times more likely to graduate within three years than those who were not A+ scholarship recipients. Similarly, those students who completed the ACT recommended core curriculum in high school were 2.04 times more likely to graduate within three years than those who did not. In regard to the highest level of math course completed in high school, students who completed an upper level pre-calculus, calculus, or a dual credit or advanced placement math course were 2.17 times more likely to graduate than those who stopped with algebra III or trigonometry, 4.5 times more likely to graduate than those who stopped with algebra II, and 13.7 times more likely to graduate than those students who stopped with geometry. Pertaining to the highest level of English course completed in high school, students who completed English IV, college-prep English, or a DC or AP English course were 2.86 times more likely to graduate than those who stopped with English II. Regarding the highest level of science course completed in high school, students who completed physics, or a DC or AP science course were 1.39 times more likely to graduate than those who stopped with anatomy and physiology, 2.28 times more likely to graduate than those who stopped with chemistry or biology II, and 5.76 times more likely to graduate than those students who stopped with biology I. Students who completed a math course beyond algebra II were 4.31 times more likely to successfully graduate than those who stopped with algebra II.

Table 3 presents the mean values and *t*-test differences between the continuous high school environmental variables used in this study and community college degree attainment. Statistically significant independent samples *t*-test results revealed that on

average, successful students: (a) had a lower class rank percentage ($M=29.54$, $SD=18.79$, $SE=1.55$), (b) had a higher cumulative HSGPA ($M=3.49$, $SD=.43$, $SE=.03$), (c) earned more academic core credits in high school ($M=15.04$, $SD=1.69$, $SE=.13$), (d) a higher cumulative academic core HSGPA ($M=3.20$, $SD=.51$, $SE=.04$), (e) earned more math credits in high school ($M=3.69$, $SD=.55$, $SE=.04$), (f) had a higher cumulative high school math GPA ($M=3.03$, $SD=.61$, $SE=.05$), (g) had a higher cumulative high school English GPA ($M=3.29$, $SD=.59$, $SE=.05$), (h) earned more science credits in high school ($M=3.66$, $SD=.88$, $SE=.07$), (i) had a higher cumulative high school science GPA ($M=3.17$, $SD=.57$, $SE=.05$), (j) had a higher cumulative high school social studies GPA ($M=3.34$, $SD=.52$, $SE=.04$), (k) earned more foreign language credits in high school ($M=1.55$, $SD=1.04$, $SE=.08$), (l) completed more dual credit courses in high school ($M=.79$, $SD=1.42$, $SE=.11$), (m) completed more advanced placement courses in high school ($M=.34$, $SD=.79$, $SE=.062$), (n) transferred more college credits ($M=2.73$, $SD=4.85$, $SE=.38$), and (o) earned a higher math intensity score ($M=1.54$, $SD=.87$, $SE=.07$), than the unsuccessful community college students. A large effect size was revealed for: (a) class rank, $d=1.11$, (b) cumulative HSGPA, $d=1.08$, (c) cumulative academic core HSGPA, $d=1.00$, (d) cumulative high school math GPA, $d=.896$, (e) cumulative high school English GPA, $d=.847$, (f) cumulative high school science GPA, $d=.914$, and (g) cumulative high school social studies GPA, $d=.945$.

Table 3

Results of t-test for Student High School Environmental Variables and Successful (n=162) and Unsuccessful (n=281) Community College Degree Attainment

Variable	Successful degree attainment		Unsuccessful degree attainment		<i>df</i>	<i>t</i>	<i>p</i>	Cohen's <i>d</i>
	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>				
HS Rank*	29.54	18.79	50.41	22.12	342	10.08	<.001	1.11
HS Cum GPA*	3.49	0.43	3.02	.54	395	9.95	<.001	1.08
Total HS Cr.	28.83	2.26	28.75	2.33	441	0.38	.703	0.04
Total Acac Core Cr*	15.04	1.69	14.15	1.50	441	5.78	<.001	0.53
Acad Core* Cum GPA*	3.20	0.51	2.69	0.58	372	9.62	<.001	1.00
Total Math Cr*	3.69	0.55	3.37	0.56	441	5.84	<.001	0.58
Math GPA*	3.03	0.61	2.48	0.70	374	8.61	<.001	0.90
Total Eng Cr	4.05	0.60	3.97	0.50	441	1.51	.133	0.13
English GPA*	3.29	0.59	2.79	0.65	441	8.06	<.001	0.85
Total Sci Cr*	3.66	0.88	3.34	0.80	441	3.94	<.001	0.37
Science GPA*	3.17	0.57	2.65	0.68	384	8.64	<.001	0.91
Total SS Cr	3.61	0.69	3.48	0.75	441	1.84	.067	0.19
SS GPA*	3.33	0.52	2.85	0.66	400	8.66	<.001	0.94
Total Foreign Language Cr*	1.55	1.04	1.10	1.09	441	4.16	<.001	0.42
Total DC Courses*	0.79	1.42	0.37	1.02	259	3.30	.001	0.30
Total AP Courses*	0.34	0.79	0.17	0.66	290	2.31	.022	0.22
Transfer College Cr*	2.73	4.85	0.89	2.77	223	4.43	<.001	0.38
Transfer College GPA	3.53	0.52	3.50	0.60	88	0.25	.800	0.06
Math Intensity Score*	1.54	0.87	0.93	0.78	310	7.50	<.001	0.71

Note. * Significant at alpha of .05.

Addressing RQ3: High School Outcome Variables

Descriptive summaries and independent *t*-tests were utilized to describe the high school outcome variables and to address the third research question:

RQ3: What high school outcome variables predict community college degree attainment?

Table 4 presents the mean values and *t*-test differences between the high school outcome variables used in this study and community college degree attainment. Students

Table 4

Results of t-test for Student High School Outcome Variables and Successful (n=162) and Unsuccessful (n=281) Community College Degree Attainment

Variable	Successful degree attainment		Unsuccessful degree attainment		<i>df</i>	<i>t</i>	<i>p</i>	Cohen's <i>d</i>
	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>				
High ACT Comp*	20.28	3.61	19.09	3.18	330	3.17	.002	0.33
High ACT Eng*	20.11	5.01	18.35	4.54	332	3.35	.001	0.35
High ACT Math*	19.91	3.56	18.26	2.94	286	4.52	<.001	0.46
High ACT Read*	21.01	4.69	19.98	4.48	331	2.03	.043	0.22
High Compass Math*	119.44	50.09	94.18	55.11	339	4.22	<.001	0.50
High Compass Writing*	168.30	24.55	156.76	33.18	169	3.05	.003	0.47
High Compass Read*	179.47	11.06	173.70	23.08	198	2.53	.012	0.52

Note. * Significant at alpha of .05.

who did not take the ACT, or who were not pleased with their ACT score in any given section, were given the Compass test. Statistically significant independent samples *t*-test results revealed that on average, successful students had a: (a) higher ACT composite score ($M=20.28$, $SD=3.61$, $SE=.296$), (b) higher ACT English score ($M=20.11$, $SD=5.01$, $SE=.409$), (c) higher ACT math score ($M=19.91$, $SD=3.56$, $SE=.292$), (d) higher ACT reading score ($M=21.01$, $SD=4.69$, $SE=.384$), (e) higher Compass math score ($M=119.44$, $SD=50.09$, $SE=4.75$), (f) higher Compass writing score ($M=168.30$, $SD=24.55$, $SE=2.913$), and (g) a higher Compass reading score ($M=179.47$, $SD=11.06$, $SE=1.465$), than the unsuccessful students. A medium effect size was revealed for Compass math score, $d=.504$, Compass writing score, $d=.470$, and Compass reading score, $d=.522$. All other variables revealed a small effect size.

Addressing RQ4: A Combined Model

Logistic regression was employed to investigate the likelihood of community college associate degree attainment within three years with a GPA of 2.0 or higher and to address the fourth research question:

RQ4: In a combined model, what demographic, high school environmental, and high school outcome variables predict community college degree attainment?

Preliminary data screening. Logistic regression is a common research design for predictive validity studies of student persistence and success due to the dichotomous nature of the dependent variable (Geiser & Santelices, 2007; Noble & Sawyer, 2002). Logistic regression is; however, sensitive to multicollinearity, high correlation among predictor variables, and highly sensitive to outliers (Mertler & Vannatta, 2009). Since the presence of multicollinearity creates a problem for logistic regression, correlations were

explored prior to running the logistic regression model to eliminate multicollinear relationships (see Appendix C). Variables with a correlation above .8 were eliminated as recommended by Field (2009). No correlations were found between the four student demographic input variables (I_1). Several correlations were identified among the high school environmental variables (E_1). All of the GPA related variables were highly correlated, as was high school rank. The total academic core credits variable was highly correlated with the individual core subject variables. The math intensity score variable was highly correlated with highest level of math and the math beyond algebra II variable. Therefore, the high school environment variables eliminated from the logistic model due to multicollinearity included: (a) high school rank, (b) academic core GPA, (c) math GPA, (d) English GPA, (e) science GPA, (f) social studies GPA, (g) total math credits, (h) total English credits, (i) total science credits, (j) total social studies credits, (k) math intensity score, and (l) math beyond algebra II. Finally, analysis of the high school outcome variables (O_1/I_2), revealed a high correlation among the ACT composite score and the individual subject ACT scores. The high school outcome variables eliminated from the logistic model due to multicollinearity included: (a) ACT English, (b) ACT math, and (c) ACT reading score.

Additionally, a preliminary multiple regression was conducted with the remaining independent variables to calculate Mahalanobis' distance to identify outliers and to further examine multicollinearity among the predictor variables. No outliers were identified and the collinearity tolerance for all predictor variables was greater than .1, indicating that multicollinearity was no longer a problem (Mertler & Vannatta, 2009).

Furthermore, the average collinearity VIF for each predictor variable was very close to 1, confirming that collinearity is not a problem for this model (Field, 2009).

Finally, the initial logistic regression model failed due to an error related to the ratio of cases to variables included in the analysis ((Mertler & Vannatta, 2009). Investigation into the count of each independent variable revealed several offending variables in which too many cases included no data. Because only 90 of the 443 participants in this study earned college credit while in high school, the variable transfer GPA had a count of 90 and was eliminated from the logistic regression model. Similarly, just over half of the participants took the Compass reading ($n=231$) and Compass writing ($n=261$) placement assessment, further limiting the cases included in the logistic regression model, so they were both eliminated from the model. In summary, data screening led to the elimination of eighteen variables. There were 237 selected cases included in the logistic regression analysis, resulting in 206 missing cases.

Logistic regression results. In examining which demographic, high school environmental, and high school outcome variables predict community college degree attainment, binary logistic analysis was conducted in three steps using the hierarchal (blockwise entry) method. Step 1 included the student demographic variables. As shown in Table 5, Step 1 regression results indicated that the overall model was statistically reliable in distinguishing between successful and unsuccessful community college students ($-2 \text{ Log Likelihood} = 568.67, \chi^2(4) = 13.10, p < .05$). Nevertheless, the model only correctly classified 64.1% of the cases, compared to block 0 (63.4%). Pell eligibility and first-generation college student status were both significantly related to degree attainment. When controlling for other variables in the model, the odds of attaining an

associate degree within three years with a GPA of 2.0 or greater increased by a factor of 1.53 by not being Pell-eligible, and increased by a factor of 1.51 by not being a first-generation college student.

Table 5

Logistic Regression Analysis Predicting Successful Community College Degree Attainment, Step 1

Predictor	<i>B</i>	<i>SE</i>	Odds ratio	Wald statistic	<i>p</i>
Gender	-0.31	0.20	0.73	2.35	.125
Race	0.13	0.28	1.14	0.21	.646
Pell Eligibility*	0.43	0.21	1.53	4.04	.044
First-Generation*	0.41	0.21	1.51	3.88	.049
Constant	-0.87	0.29	0.42	9.21	.002

Note. CI = confidence interval for odds ratio (Exp(*B*)).

* Significant at alpha of .05.

When high school environmental variables were entered into the model, high school cumulative GPA, total high school credits earned, highest English course, senior year math, and college credits earned significantly predicted the probability of community college degree attainment. As shown in Table 6, Step 2 regression results indicated that the overall model was statistically reliable in distinguishing between successful and unsuccessful community college students ($-2 \text{ Log Likelihood} = 438.35, \chi^2(20) = 137.90, p < .001$). The model correctly classified 74.6% of the cases, indicating that the block of high school environmental variables significantly improved the fit of the model. After controlling for the high school environmental variables, Pell eligibility and first-generation status variables were no longer statistically significant. When controlling

Table 6

Logistic Regression Analysis Predicting Successful Community College Degree Attainment, Step 2

Predictor	<i>B</i>	<i>SE</i>	Odds ratio	Wald statistic	<i>p</i>
Gender	0.49	0.23	1.63	3.38	.066
Race	0.00	0.33	1.00	0.00	.993
Pell Eligibility	0.08	0.26	1.08	0.09	.762
First-Generation	0.10	0.25	1.10	0.16	.693
A+ Scholarship	0.11	0.26	1.11	0.17	.685
HS GPA*	1.82	0.33	6.14	30.59	<.001
Total HS Credits*	-0.14	0.06	0.87	5.81	.016
Total Academic Core Credits	0.03	0.11	1.04	0.10	.753
Total Foreign Language Credits	0.20	0.12	1.22	2.72	.099
Total DC Credits	-0.11	0.11	0.90	1.06	.302
Total AP Credits	0.03	0.17	1.03	0.03	.853
ACT Core Curriculum	-0.43	0.29	0.65	2.30	.130
Highest Math Class	0.24	0.14	1.27	2.71	.100
Highest English Class*	0.88	0.40	2.40	4.88	.027
Highest Science Class	-0.15	0.17	0.86	0.77	.380
Senior Year Math*	0.81	0.27	2.24	8.99	.003
Senior Year English	0.19	0.51	1.21	0.14	.705
Senior Year Science	0.35	0.29	1.43	1.47	.225
Senior Year Social Studies	-0.09	0.26	0.92	0.12	.730
Transfer Hours Earned*	0.11	0.03	1.11	9.83	.002
Constant	-7.72	2.38	0.00	10.49	.001

Note. CI = confidence interval for odds ratio ($\text{Exp}(B)$).

* Significant at alpha of .05.

for other variables in the model, the odds of attaining an associate degree within three years with a GPA of 2.0 or greater increased by a factor of 6.14 with every one-point increase in HSGPA, increased by a factor of 2.40 by adding an additional English class, increased by a factor of 2.24 by taking a math class senior year, and increased by a factor of 1.11 with every additional college credit earned in high school. For each increase in

one high school credit earned, the likelihood of community college degree attainment slightly decreased by a factor of .88.

When high school outcome/college input variables were added in Step 3, HSGPA, senior year math, and college credits earned were positive and significant predictors of community college degree attainment (see Table 7). The variable high school credits earned was also a significant, yet negative predictor of degree attainment. After controlling for high school outcomes, the highest English course taken was no longer statistically significant. It should be noted that controlling for these variables also slightly decreased the magnitude and level of significance of the effect of HSGPA, yet slightly increased the magnitude and significance level of senior year math and number of college credits earned on degree attainment.

In summary, the final and complete logistic regression model included all independent variables simultaneously. As shown in Table 10, Step 3 regression results indicated that the overall model was statistically reliable in distinguishing between successful and unsuccessful community college students ($-2 \text{ Log Likelihood} = 253.79$, $\chi^2(22) = 66.57$, $p < .001$). The addition of the placement test scores, however, failed to improve the fit of the model by correctly classifying fewer cases than the previous step, 73.7% compared to step 2 at 74.6%. Taken together, among first-time, full-time, traditional age, degree-seeking community college students, the likelihood of attaining an associate degree within three years with a 2.0 or higher GPA was significantly associated with HSGPA, total high school credits earned, senior year math, and college credits earned in high school. The odds of attaining an associate degree increased by a factor of 4.44 with a one-point increase in HSGPA, by a factor of 2.34 by taking a math class

senior year, and by a factor of 1.15 with each additional college credit earned in high school. For each increase in one high school credit earned, the likelihood of community college degree attainment slightly decreased by a factor of .82.

Table 7

Logistic Regression Analysis Predicting Successful Community College Degree Attainment, Step 3

Predictor	<i>B</i>	<i>SE</i>	Odds ratio	Wald statistic	<i>p</i>
Gender	0.52	0.36	1.05	0.02	.886
Race	-0.11	0.44	0.90	0.06	.808
Pell Eligibility	-0.06	0.34	0.94	0.03	.853
First-Generation	-0.01	0.33	0.99	0.00	.968
A+ Scholarship	0.04	0.35	1.04	0.01	.920
HS GPA*	1.49	0.47	4.44	9.99	.002
Total HS Credits*	-0.20	0.08	0.82	6.45	.011
Total Academic Core Credits	-0.04	0.14	0.96	0.07	.788
Total Foreign Language Credits	0.12	0.16	1.13	0.52	.472
Total DC Credits	0.11	0.15	1.12	0.59	.443
Total AP Credits	0.21	0.28	1.23	0.55	.459
ACT Core Curriculum	0.11	0.40	1.11	0.07	.788
Highest Math Class	0.29	0.19	1.33	2.36	.125
Highest English Class	0.45	0.52	1.57	0.74	.388
Highest Science Class	-0.24	0.23	0.79	1.05	.305
Senior Year Math*	0.85	0.37	2.34	5.35	.021
Senior Year English	0.34	0.70	1.41	0.25	.621
Senior Year Science	0.30	0.39	1.35	0.60	.440
Senior Year Social Studies	-0.15	0.34	0.87	0.18	.669
Transfer Hours Earned*	0.14	0.05	1.15	8.09	.004
High ACT Comp	-0.12	0.07	0.89	3.07	.080
High Compass Math	0.01	0.00	1.01	2.04	.153
Constant	-0.48	3.15	0.62	0.02	.879

Note. CI = confidence interval for odds ratio (Exp(*B*)).

* Significant at alpha of .05.

SECTION THREE:
RECOMMENDATIONS

Introduction

The notion behind college readiness is that all students should graduate high school with the capacity to earn a college degree. The purpose of this study was to investigate the relationship between college readiness measures taken in high school and the successful completion of a community college associate degree. Results of the logistic regression analysis indicated that the likelihood of attaining a community college degree within three years with a GPA of 2.0 or higher was uniquely influenced by HSGPA, total high school credits earned, senior year math, and college credits earned in high school. These findings corroborate with existing studies that demonstrate the importance of high school achievement and rigor, especially in the areas of math and dual credit. Recommendations to assist K-12 and community college administrators in identifying and improving college readiness are addressed.

K-12 Recommendations

Overall, high school course-taking variables had significant positive relationships with college readiness in the current study. The variables HSGPA, senior year math, and college level coursework revealed a significant positive relationship with community college degree attainment at the $p < .05$ level. Recommendations for secondary school administrators include requiring students to take a math course senior year, increasing the number of AP and DC offerings, and informing students and their parents about the potential benefits of earning good grades and a high cumulative GPA.

Using student transcript data from the National Education Longitudinal Study (NELS) of 1988, Adelman (2006) found that high school coursework was positively associated with college degree completion. More specifically, students who completed

intensive math courses were significantly more likely to earn a college degree. Similarly, in a sample of over 3,000 U.S. eighth grade students who showed high achievement and an interest in college, Trusty and Niles (2004) found a link between degree completion and four intensive math courses, Algebra II, trigonometry, pre-calculus, and calculus. In fact, one additional high school unit of intensive math increased the odds of a degree by 73%.

College preparatory courses typically include Advanced Placement (AP), International Baccalaureate (IB), dual credit (DC), and other advanced college-level courses (Clinedinst & Hawkins, 2011). Typically AP and IB courses are considered rigorous because there is a national standard of measurement for test takers (Cook, 2013). Unfortunately, not all students have access to college preparatory courses (Attewell & Domina, 2008; Clinedinst & Hawkins, 2011). According to results of the National Association for College Admission Counseling (NACAC) 2007 Counseling Trends Survey, public school were less likely than private schools to offer AP or advanced preparatory curricula (Clinedinst & Hawkins, 2011). The offerings were even less in rural public school districts, and those with high percentages of students eligible for the free and reduced price lunch program. Secondary schools are encouraged to hire teachers qualified to teach AP and DC courses or to collaborate with community colleges to increase the availability of such courses. Students and parents should also be made aware of the strong correlation between college preparatory courses and college degree attainment.

Based on the work of Adelman (1999, 2006) and Horn, Kojaku, and Carroll (2001), core curriculum or below includes four years of English, three years of math,

three years of science, and three years of social studies. Mid-level curriculum exceeds core curriculum by the addition of one year of a foreign language, two of the math courses must include algebra I and geometry, and the science courses must have included two of the following: (a) biology, (b) chemistry, or (c) physics. A rigorous college preparatory curriculum includes at least four years of English; three years of a foreign language; three years of social studies; four years of math including pre-calculus; three years of science including biology, chemistry, and physics; and at least one honors or advanced placement course.

Completing an advanced or college preparatory curriculum has been shown to positively predict year-to-year college persistence (Adelman, 1999, 2006; Horn et al., 2001; Ishitani, 2006; Nora, Barlow, Crisp, 2005; Perna, 2005). Curricular intensity also predicted four-year college entry and degree completion (Attewell & Domina, 2008). In a 1995-96 longitudinal study of beginning students attending a four-year college, Horn et al. (2001) found the level of selectivity increased as did the high school curriculum rigor. For those completing a rigorous high school curriculum, 71% enrolled in a selective university or college, compared to 40% who completed a mid-level curricula, and 32% who completed core or lower curricula. College persistence also increased, as did the first-year GPA. Completing a rigorous high school curricular program can be a better predictor of college persistence than test scores (Horn et al., 2001), particularly for Black and Hispanic students (Adelman, 1999). High school intensity also had significant predictive value on college persistence for first-generation college students (Ishitani, 2006).

Although research has shown the influence high school course taking can have on degree completion, student performance is also important. Williford (2009) analyzed high school transcript data, and found a strong positive relationship between student's performance in high school and college courses. He discovered a strong relationship between poor performance in high school courses and lesser success in college as measured by first-term college GPA and first-year retention. High school students with one to five D or F grades are two to five times more likely to earn a first semester college GPA less than 2.0. In addition, as the number of Ds and Fs increased, first-year college retention decreased. In the current study, successful college students had a mean HSGPA of 3.49 compared to 3.02 for unsuccessful students. In addition, successful students had a mean core HSGPA of 3.20 and average high school rank in the 30th percentile compared to unsuccessful students who had a core HSGPA of 2.69 and average rank in the 50th percentile. Incoming freshman high school students and their parents should be informed about the importance of not only taking upper-level core courses and college preparatory courses, but to strive for high achievement in such courses.

More than half of the jobs of the future will require some postsecondary education (United States Department of Education, 2011). Based on the findings in this study, the majority of recent high school graduates (63%) were not prepared to succeed at Crowder College. Current educational policies need to be re-examined, especially as they affect the college readiness rates of high school students. Empirical college research findings, along with the findings of the current study, make it apparent that taking more rigorous core coursework, especially high-level math and college preparatory courses, better prepares students for college. Furthermore, taking upper-level core classes during the

senior year is key to success, thus indicating that schools should reevaluate their core graduation requirements to include, at the very least, a math course beyond algebra II. Several states (e.g., Texas) are adopting the 4 X 4 plan, requiring prospective students to successfully complete four full-year courses in each of the four basic subjects - English, mathematics, social studies and science (Dallas ISD, 2016). School leaders and state legislators should consider the long-term effects of these higher standards and the potential impact they might have on college completion rates in our state.

In the meantime, school districts can take immediate actions to improve the number of college-ready graduates through focused teacher professional development. Teachers need training in instructional strategies that help them develop college readiness skills in their students. Training might focus on teaching strategies that develop students' critical and analytical thinking, and their ability to draw conclusions, conduct research, and effectively communicate orally and in writing. Furthermore, training that incorporates Conley's (2010) four facets would ensure students are prepared for college or a career. According to Conley, students must be proficient in all four areas in order to be successful in college. In the paragraphs that follow, each of these four dimensions are described in more detail.

Key cognitive strategies include a student's ability to process, analyze, and complete a complicated task. Unfortunately, high schools often focus on preparing students for exit examinations and state assessments, rather than problem solving and critical thinking skills. Conley's (2010) research found problem formulation, research, interpretation, communication, and precision and accuracy to be key cognitive strategies

ingrained in all entry-level college courses. Without the ability to think and to problem solve in this manner, entering college students will struggle to succeed.

Key content knowledge includes a student's ability to proficiently read and write, along with core academic subject knowledge and skills. College reading is much broader, expansive, and more difficult than high school. In addition, college students are expected to write, error-free, more frequently and in a shorter period than high school. In fact, student thinking is most frequently assessed through writing. Moreover, college students are expected to meet core competencies in English, math, science, social sciences, world languages, and the arts.

Academic behaviors, Conley's third facet, consists of a student's ability to reflect upon one's learning and self-management. "Research on the thinking of effective learners has shown these individuals tend to monitor actively, regulate, evaluate, and direct their own thinking" (Conley, 2010, p. 39). Included in this broad category are study skills, time management, persistence, goal setting, and self-awareness. College students are required to spend significant amounts of time outside of class devoted to learning and comprehending material on their own.

Contextual skills and awareness (college knowledge) includes knowledge about the college admission and financial aid process, along with the ability to navigate the college system and interact with faculty. Students with lower levels of information about college, particularly focused on cost and financial aid, are less likely to expect to attend college (Horn, Chen, & Chapman, 2003), apply for college (Cabrera & LaNasa, 2000), or enroll in college (Plank & Jordan, 2001).

Crowder College Recommendations

The current study provides significant evidence of HSGPA in predicting community college success. There are important discussions in the literature around the weak predictive power of college placement tests for purposes of developmental education course placement, as well as policy discussions around the need for multiple measures in college-level course placement decisions. “Current measures used to gauge college readiness, such as ACT/entrance exam scores, may not be a good measure of college preparedness” (Conley, 2007, p. 9). In short, low test scores may be due to low academic preparedness (Conley, 2007; Zwick, 2007), lack of motivation (Kennedy & Monrad, 2007), biases for certain populations (Geiser & Santelices, 2007; Zwick, 2007), low-quality education (Zwick, 2007), or insufficient course offerings (Conley, 2007). Likewise, Geiser and Santelices (2007) argued that scores on standardized admissions tests are much more closely correlated with a student’s socioeconomic and demographic characteristics.

Community colleges use placement tests to determine if a student is ready for college-level coursework or in need of remediation (Porter & Polikoff, 2011). Two common placement tests include Compass by ACT and Accuplacer by SAT. According to Porter and Polikoff (2011), there are three problems with using placement tests as indicators of college readiness. First, there is no universal cut-off point as these are set by each institution. Second, many universities have created their own placement tests. Third, the validity of these unique placement tests and their cut-off scores are unknown, as few institutions have conducted validity research.

According to Williford, (2009), the majority of studies researching pre-college characteristics focused solely on HSGPA or ACT scores. Using one measure of success or placement is easy and convenient (Wiley, Wyatt, & Camara, 2010); however, thousands of students who scored well on the ACT or SAT or earned good grades in high school failed to complete their first year of college (Mattern, Shaw, & Kobrin, 2010). Likewise, thousands of students who did poorly on the ACT or SAT or earned poor grades in high school succeed each year in college (Wiley et al., 2010). College outcomes based on only one predictor (e.g., ACT score or HSGPA) have proven inferior to prediction models employing multiple predictors (Maruyama, 2012; Zwick, 2007). For this reason, researchers have found that multiple factors are the best predictor of college success (Camara, 2013; Conley, 2010; Maruyama, 2012; Porchea, Allen, Robbins, & Phelps, 2010; Wiley et al., 2010; Zwick, 2007). Wiley et al. (2010) concurred stating the use of benchmarks based on multiple measures could “improve the accuracy of predictions concerning college readiness” (p. 6).

At the University of California, HSGPA was the strongest predictor of four-year college outcomes for all academic disciplines, yet the predictive weight increased after the freshman year and was greater in the fourth year (Geiser & Santelices, 2007). Furthermore, the combination of HSGPA and test scores was a statistically significant predictor of freshman grades, but HSGPA accounted for the largest predicted variation share. In a statewide community college study, Belfield and Crosta (2012) found HSGPA to be an extremely good and reliable predictor of college performance. Due to severe errors with placement test scores, Belfield and Crosta argued for colleges to use HSGPA for course placement decisions.

Much of the attention centered on college readiness is a direct result of high remediation and low college completion rates (Camara, 2013). With three-year graduation rates less than 30%, Crowder College must find ways to improve student success and completion. Perhaps placing students in developmental or college-level coursework solely based on their ACT or Compass score is not the best practice. The results of this study determined that certain portions of the high school transcript should be considered when determining college readiness and placement in college-level coursework. For example, if a student has taken a math class beyond Algebra II, and has graduated with an overall HSGPA of 3.5 or better, then perhaps this student is college-ready and developmental courses are not necessary.

In addition, Crowder College can utilize this research to identify incoming at-risk first-year students in order to provide preemptive services that might provide these students with necessary services and tutoring before it is too late. In addition, high-achieving, incoming, first-year students can be targeted for achievement scholarships, fast-track programs, and peer-tutoring opportunities. In 2015, the Missouri Department of Higher Education (MDHE) created a new *Policy on Basic Skills Assessment and Placement* requiring institutions to use multiple measures to assess the basic mathematics, English, and reading skills of all incoming certificate and degree-seeking students (MDHE, n.d.b). The results of this research can assist Crowder College in determining which high school college readiness measures are the best predictors of college success.

Furthermore, Crowder College is encouraged to collaborate with secondary school administrators in facilitating the college preparedness process. More effort is

needed to brief prospective community college students on the economic benefits associated with degree attainment. Emphasis should be placed on college preparatory dual credit coursework, the importance of high achievement in these courses, and on preparing for college placement exams such as the ACT, SAT, and Compass.

Continuous dialogue and joint professional development between high schools and post-secondary institutions may assist schools in meeting the college readiness needs of students.

Summary

Unfortunately, many high school graduates find themselves unprepared for the academic rigor and expectations of college (Conley, 2007). In fact, “practitioners often attribute poor completion rates to the numerous *deficiencies* that students bring to community college” (Goldrick-Rab, 2010, p. 438). Only 26% of high school graduates who took the ACT in 2014 tested college ready in all four areas (ACT, 2014). Given the current global economy, improving the college readiness of high school students is crucial.

The findings from this study reveal significant predictors of community college success. Through the examination of undermined high school transcripts of community college students who have successfully completed a degree within three years, the current study showed that community college degree attainment is associated with HSGPA, total high school credits earned, taking a math course senior year, and earning college credits while in high school. The ability to predict which college readiness measures best prepare students for college success will enable school districts to increase preparation for and access to such measures. This study will also help community college

administrators make better placement decisions for incoming freshmen and offer support to students who enter college underprepared. Furthermore, by evaluating multiple measures or predictors of future college success, including student demographics, the current study will expand college readiness research. Ultimately, such data will foster communication between community colleges and school districts, in an effort to better prepare students for college success.

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CHAPTER FIVE:
CONTRIBUTION TO SCHOLARSHIP

SUCCESSFUL RURAL COMMUNITY COLLEGE STUDENTS: EXAMINING THE
ASSOCIATION OF STUDENT DEMOGRAPHICS, HIGH SCHOOL
ENVIRONMENTAL VARIABLES, AND HIGH SCHOOL OUTCOME VARIABLES
ON COMMUNITY COLLEGE DEGREE ATTAINMENT

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Abstract

Traditionally known for their open-door admission policies, low tuition, and convenience, community college enrollment has grown drastically in the last decade. This increased enrollment; however, has not brought about an increase in degree attainment. In fact, only 29.9% of full-time degree- or certificate-seeking students at community colleges graduate in three years or less. Based on Astin's (2001) modified input-environment-outcome (I-E-O) model, this study investigated the relationship between college readiness measures taken in high school and the successful completion of a community college associate degree. The high school transcripts of 443 first-time, full-time students who graduated high school in May 2011 and enrolled at the community college in fall 2011 with a declared associate degree major were examined. The final and complete binary logistic regression model included all independent variables simultaneously, including demographics. Regression results indicated that the overall model was statistically reliable in distinguishing between successful and unsuccessful community college students. Taken together, among first-time, full-time, traditional age, degree-seeking community college students, the likelihood of attaining an associate degree within three years with a 2.0 or higher GPA was significantly associated with high school GPA, total high school credits earned, senior year math, and college credits earned in high school.

Keywords: college readiness, community college success, community college graduates

Successful Rural Community College Students: Examining the Association of Student Demographics, High School Environmental Variables, and High School Outcome Variables on Community College Degree Attainment

Although a record number of students are attending college, too few actually graduate (Porter & Polikoff, 2011; United States Department of Education, 2006). In 2012-13, there were 1,045 community colleges in the United States (American Association of Community Colleges (AACC), 2014), representing 45% of all undergraduates, or over 7.1 million students nationwide (Community College Research Center (CCRC), n.d.). As of 2010, only 42% of 25 to 34 year-olds have an associate degree or higher in the United States, and only 29.9% of full-time degree or certificate seeking students at community colleges graduate in three years or less (AACC, 2010; College Board Advocacy & Policy Center, 2012). Only 20% of these students complete an associate's degree within two years.

Traditionally, community colleges have an open door admittance policy and typically serve a population of students who face “greater social, economic, and academic barriers to their success in college when compared with students in four-year schools” (Bailey, Crosta, & Jenkins, 2006, p. 7). Many of these students enroll with underdeveloped basic skills in reading, writing, and mathematics (Crews & Aragon, 2007), making it difficult to retain and graduate more students. As a result, two-thirds of community college students enroll in at least one developmental education remediation course (CCRC, 2014; Tinto, 2012). In addition, the majority of community college students attend on a part-time basis (Bailey et al., 2006), often hold full-time jobs (Calcagno, Crosta, Bailey, & Jenkins, 2007), and 42% are the first generation in their

families to attend college (AACC, 2010). Despite these challenges, many community college students aspire to obtain a four-year degree (Hagedorn, Cypers, & Lester, 2008).

Literature Review

Known for their open-door admission policies, low tuition, and convenience, community college enrollment has grown drastically in the last decade (AACC, 2014; Bailey, 2007; Jenkins, 2011; Jenkins & Cho, 2012; Kim & Bragg, 2008). In fact, the AACC (2014) reports that nearly half of all undergraduates attend a community college. This increased enrollment, however, has not brought about an increase in degree attainment. In fact, only 29.9% of full-time, degree- or certificate-seeking students at community colleges graduate in three years or less (AACC, 2010; College Board Advocacy & Policy Center, 2012).

In addition to dismal community college completion rates, an increase in the number of incoming freshmen required to take developmental education coursework (CCRC, 2014; Kim & Bragg, 2008) has educators, researchers, and policy makers looking for answers. Federal data indicated that 68% of community college students and 40% of public college students take at least one developmental education courses (CCRC, 2014). Such courses essentially reteach middle school and high school coursework in math, English, and reading. As pressure mounts for institutions of higher education to increase student success and degree completion, blame has been placed, in part, on inadequate high school preparation for college.

Unfortunately, many states are failing to hold high schools accountable for preparing students for college and career success (Adelman, 2010). This is evident in the 2014 ACT results. Only 26% of all 2014 ACT-tested high school graduates

demonstrated academic readiness for first-year, college level courses in English composition, college algebra, biology, and the social sciences (ACT, 2014).

Furthermore, 16% met only one ACT College Readiness Benchmark, and 31% met none.

College Readiness

Despite the importance being placed on improving college readiness, there remains debate on defining and assessing it (Maruyama, 2012). High school preparation has been measured by graduation, test scores, GPA, class rank, course rigor, and course performance (Maruyama, 2012). College success is also measured in a multitude of ways, from avoidance of developmental education coursework and first-semester GPA, to degree attainment.

College readiness definitions vary on multiple dimensions. Some definitions include non-cognitive facets such as motivation, socioeconomic status (SES), personality, and work ethic (Porter & Polikoff, 2011). Others focus on high school academic performance and outcomes (e.g., test scores, GPA, class rank). Some researchers simply defined college readiness as acceptance to college (Greene & Forster, 2003), while others defined it as being able to succeed in college (Porter & Polikoff, 2011). More recent definitions of college readiness focus on dependent variables (Maruyama, 2012).

According to Wiley, Wyatt, and Camara (2010), “students who are college-ready should be able to succeed in entry-level, credit-bearing college courses without the need for remediation” (p. 3). Similarly, Conley (2007) defined college readiness “as the level of preparation a student needs to enroll and succeed – without remediation – in a credit-bearing general education course at a postsecondary institution” (p. 5).

Predictors of College Readiness

According to Clinedinst and Hawkins (2011), the top factors in the college admission decision are based on high school achievement: (a) grades in college preparatory courses, (b) strength of curriculum, and (c) standardized admission test scores. Similarly, the three most common college readiness indicators recognized by colleges are pre-requisite coursework, placement test scores, and high school grade point average (HSGPA; Roderick, Nagaoka, & Coca, 2009). A review of literature will further expand on the current research in these three areas, as well as the impact of student demographics on college readiness and degree attainment.

High school coursework. Over the past fifty years, policy makers have expressed dissatisfaction with U.S. high school courses (Attewell & Domina, 2008), calling for more rigor and increased graduation requirements (Dougherty, Mellor, & Jian, 2006). “Academic rigor is increasingly being recognized as an essential component of college readiness” (Wyatt, Wiley, Camara, & Proestler, 2012, p. 10). Adelman (2006) recognized a high school graduate’s academic preparedness for college as a strong predictor of college success. Using student transcript data from National Education Longitudinal Study (NELS) of 1988, he found that high school coursework positively influenced college degree completion. More specifically, intensive math courses had the largest impact. Similarly, in a sample of over 3,000 U.S. eighth grade students who showed high achievement and an interest in college, Trusty and Niles (2004) found that four intensive math courses, Algebra II, trigonometry, pre-calculus, and calculus, had the largest impact on degree completion. Although Trusty and Niles (2004) did not

disaggregate data by ethnicity, Aldeman's (1999) findings were consistent across racial ethnicities.

Completing an advanced or college preparatory curriculum has been shown to positively predict year-to-year college persistence (Adelman, 1999, 2006; Horn, Kojaku, & Carroll, 2001; Ishitani, 2006; Nora, Barlow, Crisp, 2005; Perna, 2005). Curricular intensity also predicted four-year college entry and degree completion (Attewell & Domina, 2008). In a 1995-96 longitudinal study of beginning students attending a four-year college, Horn et al. (2001) found the level of selectivity increased as did the high school curriculum rigor. For those completing a rigorous high school curriculum, 71% enrolled in a selective university or college, compared to 40% who completed a mid-level curricula, and 32% who completed core or lower curricula. College persistence also increased, as did the first-year GPA.

Standardized admission test scores. Standardized tests are usually depicted as demonstrating greater methodological rigor and reliability than high school grades (Geiser & Santelices, 2007). Furthermore, the importance of these exam scores for college and university admission and course placement decisions has increased over the past 15 years (Clinedinst & Hawkins, 2011). The two most common standardized tests used today U.S. colleges are the SAT and ACT (Zwick, 2007). Most colleges and universities place students in credit-bearing or remedial coursework based on their placement test score (Camara, 2013; Clinedinst & Hawkins, 2011). According to Camara (2013), assessment exam scores help colleges identify deficiencies in student preparation, broadly certify a student's preparedness for college-level coursework, and determine in which course, credit-bearing or developmental, a student should enroll.

While many researchers have found assessment scores, such as ACT and SAT, to be a good predictor of college success (Mattern, Patterson, & Kobrin, 2012; Noble & Sawyer, 2002; Wiley et al., 2010), others have not (Conley, 2007; Geiser & Santelices, 2007; Maruyama, 2012; Zwick, 2007). Wyatt et al. (2012) found that students earning a higher SAT score were more likely to enroll in college. SAT scores were also found to predict GPA (Astin, 2001) and four-year degree completion rates (Astin & Oseguera, 2005). Among the three SAT sections, Kobrin, Patterson, Barbuti, Mattern, and Shaw (2008) found the SAT writing (SAT-W) section to have the highest correlation with FYGPA. Noble and Sawyer (2002) found ACT scores to be a strong predictor of college success.

The growth in college usage of entrance exam scores has brought about discussion regarding the validity and fairness of standardized admission tests. In short, low test scores may be due to low academic preparedness (Conley, 2007; Zwick, 2007), lack of motivation (Kennedy & Monrad, 2007), biases for certain populations (Geiser & Santelices, 2007; Zwick, 2007), low-quality education (Zwick, 2007), or insufficient course offerings (Conley, 2007). Geiser and Santelices (2007) argued that scores on standardized admissions tests are much more closely correlated with a student's socioeconomic and demographic characteristics. Likewise, Zwick (2007) found substantial differences in the average score among ethnic, gender, and socioeconomic groups.

High school performance. Research has consistently shown that high school grades, especially poor performance (Noble & Sawyer, 2002), are highly predictive of first-year college performance (Aldeman, 2006), college grades (Camara, 2013;

Williford, 2009), and graduation rates (Atkinson & Geiser, 2009; Geiser & Santelices, 2007). According to Clinedinst and Hawkins (2011), grades in college preparatory courses are a better indicator of college success than HSGPA. Bowen, Chingos, and McPherson (2009) found high school grades to be a substantially better predictor of college degree attainment than ACT or SAT test scores. In 2007, earning poor senior year grades was the number one reason colleges revoked an offer of admission (Clinedinst & Hawkins, 2011). For these reasons, high school grades are the most often used measured in college admission decisions.

Most high school performance research is focused on GPA as a predictor for college success (Williford, 2009). Studies have shown a strong correlation between HSGPA and freshman GPA (Geiser & Santelices, 2007), as well as college enrollment (Attewell & Domina, 2008). Others argued against the use of HSGPA in admission decisions due to the differences in grading standards across high schools (Geiser & Santelices, 2007). Nevertheless, HSGPA may be less biased for underrepresented groups of students. In a study of 80,000 University of California freshmen, Geiser and Santelices (2007) found HSGPA to have less adverse impact than standard admission tests on minority and low SES students. In addition, standardized admission tests reflect a student's ability at a single point in time, while HSGPA reflects a student's performance and motivation over four-years in a variety of subjects.

Student demographics. Readiness for college varies based on individual characteristics such as ethnicity, socioeconomic status, family income, parental educational attainment, and educational expectations. School district characteristics, such as fewer college preparatory and less rigorous courses, are more likely to affect low-

income, Black, and Hispanic students' preparedness for college. Furthermore, many of these traditionally underserved students will enter higher education having completed a less rigorous curriculum (Horn et al., 2001). In addition, first-generation college students, many students of color, and economically disadvantaged students are less likely to receive adequate college preparation information (Perna, 2005; Venezia & Kirst, 2005).

Completing a rigorous high school curriculum can improve college persistence, yet ethnicity, parents' education level, and SES all impact rigor (Horn et al., 2001; Nora et al, 2005). In fact, Adelman (1999) argued that differential access to rigorous high school courses is the main factor behind inequalities in college success and degree attainment among minorities and low-income students. Low-income, first-generation, and students attending a high school with a 25% or higher free and reduced lunch count are less likely to complete a rigorous high school curriculum (Horn et al., 2001).

Furthermore, students of color and students from low-income homes typically do not perform as well as white students from middle- to upper-income homes on standardized assessments such as the ACT, SAT, and advanced placement (AP) examinations (Clinedinst & Hawkins, 2011; Skrla, Scheurich, Garcia, & Nolly, 2004). In addition, when they do enroll in AP courses, they often receive inflated grades due to performing poorly on exams or do not take the examination. In summary, minority and low-income high school students are more likely to receive a vocational track rather than academic track, take fewer math and science courses, attend schools with fewer resources, have less-qualified teachers, and have a shortage of college prep coursework (Goldrick-Rab, 2010).

Conceptual Framework

The conceptual framework guiding this study was constructed from Astin's (2001) input-environment-outcome (I-E-O) model for studying student outcomes. The I-E-O model has been utilized by many researchers to evaluate the relationship between student inputs, college environmental factors, and outcomes (e.g., Astin, 2001; Astin & Sax, 1998; Campbell & Blakey, 1996; Kim & Bragg, 2008; Prion, 2008). Although most commonly utilized to research the college environmental factors on student success, the current modified model allows for analysis of high school college readiness measures.

The focus of this research is on the high school college preparation measures; however, the community college environment's impact on college degree attainment cannot be overlooked. For this reason, Astin's (2001) framework was modified to include three input blocks, two environmental blocks, and two outcome blocks resulting in an I_1 - E_1 - O_1/I_2 - E_2 - O_2/I_3 model (see Figure 1). Similarly, Buzynski (2011) modified Astin's framework to include two environmental blocks resulting in I - E_1 - E_2 - O . The first block focused on college credit earned while in high school, and the second environmental block examined the college environment. The current study will focus on blocks I_1 , E_1 , O_1/I_2 , and O_2/I_3 . The E_2 block will not be analyzed and is recommended for future research.

[Insert Figure 1 Here]

According to Astin (2001), "inputs refer to the characteristics of the student at the time of initial entry to the institution" (p. 7). The inputs analyzed in this study include student demographics (I_1) and post high school and pre-college assessment scores (O_1/I_2). The environment "refers to the various programs, policies, faculty, peers, and educational

experiences to which the student is exposed” (p. 7). The high school environment variables in this study will include academic measures taken by the student to ensure college readiness (E_1). The outcomes refer to “the student’s characteristics after exposure to the environment” (p. 7). The outcome variable investigated by this study is whether the student successfully completed an associate degree within three years or less while maintaining a 2.0 or higher GPA (O_2/I_3). This modified model will provide K-16 educators a better understanding of how to achieve the educational outcome of community college degree attainment.

Purpose

The purpose of this study was to investigate the relationship between college readiness measures taken in high school and the successful completion of a community college associate degree. Based on Astin’s (2001) modified input-environment-outcome (I-E-O) model, the inputs, or control variables, included student demographics. The environment, or independent variables, consisted of the high school college readiness measures. The high school outcome/community college input, or independent variables, consisted of the college placement exam scores (ACT or Compass). The output, or dependent variable, is defined as completing an associate degree within three years while maintaining a cumulative GPA of 2.0 or higher.

Research Questions

For the purpose of this study, community college degree attainment is determined by earning an associate degree within three years with a cumulative GPA of 2.0 or higher. Students were considered successful if they were able to obtain an associate degree within three years with a cumulative GPA of 2.0 or higher. Students were

considered unsuccessful if they were unable to complete an associate degree within three years with a cumulative GPA of 2.0 or higher. These unsuccessful students could still be enrolled or have dropped out of the community college. In order to better understand the impact college readiness has on community college degree attainment, the following research questions were addressed:

1. What are the differences in the student demographic variables of successful and unsuccessful community college students?
2. What are the differences in high school environmental variables for successful and unsuccessful community college students?
3. What are the differences in high school outcome variables for successful and unsuccessful community college students?
4. In a combined model, what demographic, high school environmental, and high school outcome variables predict community college degree attainment?

Method

Setting

The research was conducted at a public community college located in a rural area of the Midwest with approximately 5,500 students. Of the 5,584 students enrolled during the fall 2015 semester, 63% were female and 81% were white. Furthermore, 74% were under 25, 49% were first-generation college students, 32% were low-income students, and 62% attended full time taking at least 15 credit hours per semester. Only 29% of the fall 2012 cohort of first-time, full-time, degree seeking students graduated within three years.

Participants

This study utilized a purposive sampling method. Purposive sampling is a non-random sampling method that allows researchers to determine the characteristics of the sample they wish to analyze and select study participants based on those characteristics (Gay, Mills, & Airasian, 2006). The participants in this study consisted of 443 first-time, full-time students who graduated high school in May 2011 and enrolled at the community college in fall 2011 with a declared associate degree major. The majority of the participants were white (83%), female (56%), Pell-eligible (64%), and first-generation college students (57%). The successful graduates ($n=162$) achieved associate degree attainment within two years ($n=128$) or three years ($n=34$) with a cumulative GPA of 2.0 or higher. The unsuccessful students ($n=281$) were unable to complete an associate degree within three years with at least a 2.0 GPA and are still enrolled ($n=48$) or have dropped out ($n=233$).

Procedure

The current study was guided by Adelman's (2006) high school transcript analysis research, and Hagedorn and Kress's (2008) community college transcript analysis research. Hagedorn and Kress (2008) defined transcript analysis "as the coding and use of enrollment files, college enrollment files, college application data, financial aid records, and other data that community colleges must routinely collect to comply with state and federal reporting mandates" (p. 7). While Adelman's (2006) study followed students from ninth grade through eight years of college, the current study was limited to the fall 2011 cohort of associate degree seeking community college students. The researcher examined the individual high school transcript for each participant.

Additionally, data for this study was collected directly from students' registration files, admission records, financial aid records, and college transcript records.

Research Design

The design of this nonexperimental quantitative study is causal-comparative in nature (Fraenkel & Wallen, 2009). Causal-comparative studies seek to explore relationships among variables, compare two or more groups, typically involve at least one categorical variable, and often compare averages. Multiple and logistic regression are very common methods used in causal-comparative research, specifically when accounting for extraneous variables. In this causal-comparative research study, successful and unsuccessful community college students will be compared to see if their demographics (input variables I_1), high school environmental variables (E_1), or high school outcome variables (O_1/I_2) differ in ways that might account for their successful degree attainment.

Data Analyses

This quantitative study was designed utilizing Astin's (2001) modified I-E-O model to research high school variables that impact community college success. This model was originally designed to compensate for non-random sampling in non-experimental design studies (Astin & Sax, 1998). IBM SPSS Statistical Software version 23 was utilized to employ a range of descriptive and inferential analyses. Descriptive statistics were used to describe student demographics. Furthermore, independent samples *t*-tests and non-parametric chi-square tests were utilized to describe and analyze the proportion of successful and unsuccessful college students in regard to demographic, high school environmental, and high school outcome variables. The effect size was

determined as recommended by Cohen (1998) in which $d = 0.2$ is a small effect size, 0.5 is a medium effect size, and 0.8 is a large effect size. Independent samples *t*-tests were used for the continuous variables and chi-square for categorical variables. This data was utilized to answer research questions one (RQ1), two (RQ2), and three (RQ3).

To answer research question four (RQ4), an empirical investigation of quantitative variables, as well as the relationships between the *input*, *environmental*, and *outcome* variables was conducted utilizing binary logistic regression. According to Mertler and Vannatta (2009), “logistic regression tests the ability of a model or group of variables to predict group membership as defined by some categorical DV [dependent variable]” (p. 304). In this study, binary logistic regression was used to predict the probability of attaining an associate degree within three years, the dichotomous or categorical outcome for this study.

Although logistic regression offers greater flexibility, assumptions must first be tested. Logistic regression is sensitive to high correlation among predictor variables and highly sensitive to outliers (Mertler & Vannatta, 2009). Before running the logistic regression model, correlations were explored to eliminate multicollinear relationships and standardized residuals were examined to detect outliers (see Appendix C). Additionally, a preliminary multiple regression was conducted to calculate Mahalanobis’ distance to identify outliers and examine multicollinearity among the predictor variables (2009). After highly correlated variables were eliminated and outliers addressed using standard methods, binary logistic regression was performed using the hierarchical (blockwise entry) method. In hierarchical regression, predictors are selected and entered in blocks based on past research (Field, 2009). Step one included student demographic variables

(I₁), step two added the high school environmental variables (E₁), and step three added the high school outcome variables (O₁/I₂). All tests of statistical significance were conducted at an alpha level of .05.

Findings

Student Demographic Variables

Table 1 presents the frequencies and chi-square results between the student demographic variables used in this study and community college degree attainment. The successful student sample consisted primarily of white (85%) female (61%) students, 56% of whom were Pell-eligible and 49% who were first-generation college students. The unsuccessful student sample consisted primarily of white (82%) female (53%) students who were Pell-eligible (68%) and first-generation college students (61%).

The chi-square statistic can be distorted when expected counts are very small; therefore, all other races besides white were combined into a category labeled other. Chi-square tests of independence revealed a significant relationship in two areas, Pell eligibility $\chi^2(1) = 6.580, p = .014$, and first-generation college student status $\chi^2(1) = 6.480, p = .013$. No significant proportional differences were revealed between successful community college associate degree attainment and gender $\chi^2(1) = 2.110, p = .164$, or race $\chi^2(1) = .655, p = .432$.

[Insert Table 1 About Here]

High School Environmental Variables

Table 2 provides a breakdown of the participants by the categorical high school environmental variable as well as the chi-square analysis for these comparisons. The majority of the participants were eligible for the Missouri A+ scholarship (52%); met the

ACT recommended core curriculum (54%); did not take a math (54%), science (59%), or social studies (58%) class their senior year of high school; took an English class their senior year of high school (85%); and did not complete a math class beyond Algebra II (69%). With regard to the highest math course completed in high school, seven percent (7%) completed pre-algebra or algebra I, 14% completed geometry, 50% completed algebra II, 10% completed algebra III or trigonometry, and 19% completed pre-calculus, calculus, college algebra, or an AP or dual credit (DC) math course. Pertaining to the highest English course completed in high school, 26% completed English III, and 73% completed English IV, college-prep English, or an AP or DC English course. Regarding the highest science course completed in high school, 22% completed biology I, 54% completed chemistry or biology II, 11% completed anatomy and physiology, and 13% completed physics or an AP or DC science course.

Chi-square tests of independence were calculated to compare the relationship between the categorical high school environmental variables and successful community college associate degree attainment. There was a significant relationship between successful community college associate degree attainment and nine categorical high school environmental variables: (a) Missouri A+ scholarship attainment $\chi^2(1) = 12.479, p = .001$, (b) ACT recommended core curriculum $\chi^2(1) = 12.526, p = .001$, (c) highest level of math $\chi^2(1) = 61.219, p < .001$, (d) highest level of English $\chi^2(1) = 17.797, p < .001$, (e) highest level of science $\chi^2(3) = 26.532, p = < .001$, (f) senior year math $\chi^2(1) = 35.616, p < .001$, (g) senior year English $\chi^2(1) = 6.843, p = .009$, (h) senior year science $\chi^2(1) = 15.574, p < .001$, and (i) math beyond algebra II $\chi^2(1) = 47.623, p < .0001$. No

significant proportional differences were revealed between successful community college associate degree attainment and senior year social studies $\chi^2(1) = 1.258, p = .273$.

[Insert Table 2 About Here]

Table 3 presents the mean values and *t*-test differences between the continuous high school environmental variables used in this study and community college degree attainment. Statistically significant independent samples *t*-test results revealed that on average, successful students: (a) had a lower class rank percentage ($M=29.54, SD=18.79, SE=1.55$), (b) had a higher cumulative HSGPA ($M=3.49, SD=.43, SE=.03$), (c) earned more academic core credits in high school ($M=15.04, SD=1.69, SE=.13$), (d) a higher cumulative academic core HSGPA ($M=3.20, SD=.51, SE=.04$), (e) earned more math credits in high school ($M=3.69, SD=.55, SE=.04$), (f) had a higher cumulative high school math GPA ($M=3.03, SD=.61, SE=.05$), (g) had a higher cumulative high school English GPA ($M=3.29, SD=.59, SE=.05$), (h) earned more science credits in high school ($M=3.66, SD=.88, SE=.07$), (i) had a higher cumulative high school science GPA ($M=3.17, SD=.57, SE=.05$), (j) had a higher cumulative high school social studies GPA ($M=3.34, SD=.52, SE=.04$), (k) earned more foreign language credits in high school ($M=1.55, SD=1.04, SE=.08$), (l) completed more dual credit courses in high school ($M=.79, SD=1.42, SE=.11$), (m) completed more advanced placement courses in high school ($M=.34, SD=.79, SE=.062$), (n) transferred more college credits ($M=2.73, SD=4.85, SE=.38$), and (o) earned a higher math intensity score ($M=1.54, SD=.87, SE=.07$), than the unsuccessful community college students. A large effect size was revealed for: (a) class rank, $d=1.11$, (b) cumulative HSGPA, $d=1.08$, (c) cumulative academic core HSGPA, $d=1.00$, (d) cumulative high school math GPA, $d=.896$, (e) cumulative high school English GPA,

$d=.847$, (f) cumulative high school science GPA, $d=.914$, and (g) cumulative high school social studies GPA, $d=.945$. A medium effect size was revealed for (a) academic core credits, $d=.530$, (b) math credits, $d=.580$, and (c) math intensity score, $d=.706$. All other variables revealed a small or very small effect size.

[Insert Table 3 About Here]

High School Outcome Variables

Table 4 presents the mean values and t -test differences between the high school outcome variables used in this study and community college degree attainment. Statistically significant independent samples t -test results revealed that on average, successful students had a: (a) higher ACT composite score ($M=20.28$, $SD=3.61$, $SE=.296$), (b) higher ACT English score ($M=20.11$, $SD=5.01$, $SE=.409$), (c) higher ACT math score ($M=19.91$, $SD=3.56$, $SE=.292$), (d) higher ACT reading score ($M=21.01$, $SD=4.69$, $SE=.384$), (e) higher Compass math score ($M=119.44$, $SD=50.09$, $SE=4.75$), (f) higher Compass writing score ($M=168.30$, $SD=24.55$, $SE=2.913$), and (g) a higher Compass reading score ($M=179.47$, $SD=11.06$, $SE=1.465$), than the unsuccessful students. A medium effect size was revealed for Compass math score, $d=.504$, Compass writing score, $d=.470$, and Compass reading score, $d=.522$. All other variables revealed a small effect size.

[Insert Table 4 About Here]

Logistic Regression: A Combined Model

Preliminary data screening. Logistic regression is a common research design for predictive validity studies of student persistence and success due to the dichotomous nature of the dependent variable (Geiser & Santelices, 2007; Noble & Sawyer, 2002).

Logistic regression is; however, sensitive to multicollinearity, high correlation among predictor variables, and highly sensitive to outliers (Mertler & Vannatta, 2009). Since the presence of multicollinearity creates a problem for logistic regression, correlations were explored prior to running the logistic regression model to eliminate multicollinear relationships. Variables with a correlation above .8 were eliminated as recommended by Field (2009). No correlations were found between the four student demographic input variables (I_1). Several correlations were identified among the high school environmental variables (E_1). All of the GPA related variables were highly correlated, as was high school rank. The total academic core credits variable was highly correlated with the individual core subject variables. The math intensity score variable was highly correlated with highest level of math and the math beyond algebra II variable. Therefore, the high school environment variables eliminated from the logistic model due to multicollinearity included: (a) high school rank, (b) academic core GPA, (c) math GPA, (d) English GPA, (e) science GPA, (f) social studies GPA, (g) total math credits, (h) total English credits, (i) total science credits, (j) total social studies credits, (k) math intensity score, and (l) math beyond algebra II. Finally, analysis of the high school outcome variables (O_1/I_2), revealed a high correlation among the ACT composite score and the individual subject ACT scores. The high school outcome variables eliminated from the logistic model due to multicollinearity included: (a) ACT English, (b) ACT math, and (c) ACT reading score.

Additionally, a preliminary multiple regression was conducted with the remaining independent variables to calculate Mahalanobis' distance to identify outliers and to further examine multicollinearity among the predictor variables. No outliers were

identified and the collinearity tolerance for all predictor variables was greater than .1, indicating that multicollinearity was no longer a problem (Mertler & Vannatta, 2009). Furthermore, the average collinearity VIF for each predictor variable was very close to 1, confirming that collinearity is not a problem for this model (Field, 2009).

Finally, the initial logistic regression model failed due to an error related to the ratio of cases to variables included in the analysis ((Mertler & Vannatta, 2009). Investigation into the count of each independent variable revealed several offending variables in which too many cases included no data. Because only 90 of the 443 participants in this study earned college credit while in high school, the variable transfer GPA had a count of 90 and was eliminated from the logistic regression model. Similarly, just over half of the participants took the Compass reading ($n=231$) and Compass writing ($n=261$) placement assessment, further limiting the cases included in the logistic regression model, so they were both eliminated from the model. In summary, data screening led to the elimination of eighteen variables. There were 237 selected cases included in the logistic regression analysis, resulting in 206 missing cases.

Logistic regression results. In examining what demographic, high school environmental, and high school outcome variables predict community college degree attainment, binary logistic analysis was conducted in three steps using the hierarchal (blockwise entry) method. Step 1 included the student demographic variables. As shown in Table 5, Step 1 regression results indicated that the overall model was statistically reliable in distinguishing between successful and unsuccessful community college students ($-2 \text{ Log Likelihood} = 568.67, \chi^2(4) = 13.10, p < .05$). Nevertheless, the model only correctly classified 64.1% of the cases, compared to block 0 (63.4%). Pell eligibility

and first-generation college student status were both significantly related to degree attainment. When controlling for other variables in the model, the odds of attaining an associate degree within three years with a GPA of 2.0 or greater increased by a factor of 1.53 by not being Pell-eligible, and increased by a factor of 1.51 by not being a first-generation college student.

[Insert Table 5 About Here]

When high school environmental variables were entered into the model, high school cumulative GPA, total high school credits earned, highest English course, senior year math, and college credits earned significantly predicted the probability of community college degree attainment. As shown in Table 6, Step 2 regression results indicated that the overall model was statistically reliable in distinguishing between successful and unsuccessful community college students ($-2 \text{ Log Likelihood} = 438.35, \chi^2(20) = 137.90, p < .001$). The model correctly classified 74.6% of the cases, indicating that the block of high school environmental variables significantly improved the fit of the model. After controlling for the high school environmental variables, Pell eligibility and first-generation status variables were no longer statistically significant. When controlling for other variables in the model, the odds of attaining an associate degree within three years with a GPA of 2.0 or greater increased by a factor of 6.14 with every one-point increase in HSGPA, increased by a factor of 2.40 by adding an additional English class, increased by a factor of 2.24 by taking a math class senior year, and increased by a factor of 1.11 with every additional college credit earned in high school. For each increase in one high school credit earned, the likelihood of community college degree attainment slightly decreased by a factor of .88.

[Insert Table 6 About Here]

When high school outcome/college input variables were added in Step 3, HSGPA, senior year math, and college credits earned were positive and significant predictors of community college degree attainment (see Table 7). The variable high school credits earned was also a significant, yet negative predictor of degree attainment. After controlling for high school outcomes, the highest English course taken was no longer statistically significant. It should be noted that controlling for these variables also slightly decreased the magnitude and level of significance of the effect of HSGPA, yet slightly increased the magnitude and significance level of senior year math and number of college credits earned on degree attainment.

In summary, the final and complete logistic regression model included all independent variables simultaneously. As shown in Table 7, Step 3 regression results indicated that the overall model was statistically reliable in distinguishing between successful and unsuccessful community college students ($-2 \text{ Log Likelihood} = 253.79$, $\chi^2(22) = 66.57$, $p < .001$). The addition of the placement test scores, however, failed to improve the fit of the model by correctly classifying fewer cases than the previous model, 73.7% compared to Step 2 at 74.6%. Taken together, among first-time, full-time, traditional age, degree-seeking community college students, the likelihood of attaining an associate degree within three years with a 2.0 or higher GPA was significantly associated with HSGPA, total high school credits earned, senior year math, and college credits earned in high school. The odds of attaining an associate degree increased by a factor of 4.44 with a one-point increase in HSGPA, by a factor of 2.34 by taking a math class senior year, and by a factor of 1.15 with each additional college credit earned in high

school. For each increase in one high school credit earned, the likelihood of community college degree attainment slightly decreased by a factor of .82.

[Insert Table 7 About Here]

Discussion

The notion behind college readiness is that all students should graduate high school with the capacity to earn a college degree. The purpose of this study was to investigate the relationship between college readiness measures taken in high school and the successful completion of a community college associate degree. Results of the logistic regression analysis indicated that the likelihood of attaining a community college degree within three years with a GPA of 2.0 or higher was uniquely influenced by HSGPA, total high school credits earned, senior year math, and college credits earned in high school. These findings corroborate with existing studies that demonstrate the importance of high school achievement and rigor, especially in the areas of math and dual credit.

The logistic regression results also found total high school credits earned to have a significant, yet negative influence on community college degree attainment. Holding all other variables equal, for each additional high school credit earned, the likelihood of degree attainment decreased by 20%. This could be explained by low-achieving students being required to complete additional credit-recovering courses in high school. Additionally, more high-achieving high school students could be taking DC courses rather than upper-level high school courses and electives, decreasing their total high school credits.

Among the demographic variables in the model, being Pell-eligible, a race other than white, and being a first-generation college student negatively impacted the probability of associate degree attainment within three years. Although demographic variables did not significantly contribute to the model in this study, Attewell, Heil, and Reisel (2011) found family SES to have a significant predictive effect on degree completion for all students, except those attending highly selective colleges. Using the NELS 1988 longitudinal data set, Ishitani (2006) found that being a first-generation student reduced the odds of graduating in four years to 51% and five years to 32%. In a study utilizing the same NELS 1988 data, Attewell, Lavin, and Domina (2006) investigated remediation and discovered that Black students are significantly more likely than their academically equivalent white peers to enroll in remedial courses. Although research has shown that degree completion varies by race, ethnicity, and SES, there is disagreement whether these gaps are due to inadequate high school preparation, or simply due directly to race, ethnicity, and SES (Attewell et al., 2011).

Given the critical role of prior academic achievement and rigor (Adelman, 1999), the positive and significant relationship found in the current study between HSGPA, taking a senior year math class, and earning college credits in high school is not surprising. Consistent with Adelman's (1999) findings, of all high school variables, math intensity was found to have the strongest predictive value on degree completion. Furthermore, finishing one additional math course beyond Algebra II more than doubled the likelihood of degree completion. In a similar study, the Montgomery County school district in Maryland discovered that virtually all students who completed math through at least pre-calculus and honors English required no college remediation (Nunley, Sharle-

Galotto, & Smith, 2000). With regard to the importance of earning college credit while in high school, Kim and Bragg (2008) used Astin's I-E-O model to research the high school environment on college readiness, and found a significant effect on the amount of dual credit and articulated credits earned on the total number of community college credits earned, while controlling for gender and high school rank.

Consistent with prior research, HSGPA was the strongest significant predictor of community college success. At the University of California, HSGPA was the strongest predictor of four-year college outcomes for all academic disciplines, yet the predictive weight increased after the freshman year and was greater in the fourth year (Geiser & Santelices, 2007). Furthermore, the combination of HSGPA and test scores was a statistically significant predictor of freshman grades, but HSGPA accounted for the largest predicted variation share. In that same study, HSGPA was found to have less adverse impact than standard admission tests on minority and low SES students. In a statewide community college study, Belfield and Crosta (2012) found HSGPA to be an extremely good and reliable predictor of college performance. These results are consistent with the findings of Kobrin et al. (2008) who found HSGPA and class rank to be as predictive of freshman GPA as aptitude tests designed for that purpose. There are limitations, however, to using HSGPA and class rank for admission and placement decisions. According to Porter and Polikoff (2011), the obvious problem with both HSGPA and class rank is that they lack a "common metric and meaning across high schools" (p. 399).

The results from the current study are not consistent with many researchers who have found assessment scores, such as ACT and SAT, to be a good predictor of college

success (Mattern et al., 2012; Noble & Sawyer, 2002; Wiley et al., 2010). Wyatt et al. (2012) found that students earning a higher SAT score were more likely to enroll in college. SAT scores were also found to predict GPA (Astin, 2001) and four-year degree completion rates (Astin & Oseguera, 2005). In sharp contrast, Conley (2007) determined that ACT and other entrance exam scores may not be a good measure of college readiness. In short, low test scores may be due to low academic preparedness (Conley, 2007; Zwick, 2007), lack of motivation (Kennedy & Monrad, 2007), biases for certain populations (Geiser & Santelices, 2007; Zwick, 2007), low-quality education (Zwick, 2007), or insufficient course offerings (Conley, 2007). Likewise, Geiser and Santelices (2007) argued that scores on standardized admissions tests are much more closely correlated with a student's socioeconomic and demographic characteristics. In addition, test scores are most often used to predict first-year college GPA, rather than cumulative GPA or degree attainment (Zwick, 2007). Such reasons may explain why the current study did not find any effect of the ACT composite score or Compass math score on community college degree attainment.

Implications

Scholarship. The perceived lack of college readiness by the majority of incoming college freshmen has placed eminence on college readiness empirical research in an effort to increase the number of successful college graduates. Educators, researchers, and policymakers have focused on college access, yet little research has concentrated on degree attainment (United States Department of Education, 2006). According to Hagedorn and Kress (2008), "transcript analysis has been employed productively in higher education to help shape policy and practice" (p. 8). High school

transcripts can be used to determine if students enter college with a “deficit in academic capital” (p. 8). Furthermore, Scott-Clayton, Crosta, and Belfield (2014) found high school transcript data to be just as useful, if not better than placement exam scores when determining student placement. Likewise, Williford (2009) found performance in high school coursework to be a strong predictor of college success and failure. The current high school transcript analysis study will help researchers and policy makers determine which college readiness skills and practices lead to college success, and how to measure those skills (Roderick et al., 2009).

In addition, Astin’s (2001) I-E-O Model provided a conceptual and methodological guide for this study. The basic purpose of the I-E-O model is to assess the environmental impact of various experiences on a student’s growth. Although most commonly used to analyze the impact of the college environment on degree completion and other factors of college success, the modified $I_1-E_1-O_1/I_2-E_2-O_2/I_3$ model utilized in this study allowed for analysis of the impact of the high school environment on community college success. The significant input and high school environmental and outcome variables found in this study were added to the modified $I_1-E_1-O_1/I_2-E_2-O_2/I_3$ model (see Figure 2). This new model may shed light on the college readiness topic, and provide scholarly researchers an applicable conceptual college readiness model.

Practice. The office of institutional research collects and compiles data in most colleges, often resulting in very few people on campus seeing the results or discussing the implications (Bensimon, 2004). The current study analyzed untapped high school transcript data in an effort to understand why some students enter college more prepared than others. The findings will allow school district administrators and teachers to reflect

on how their policies and practices might be contributing to the college preparedness of their students, and community college administrators and faculty to seek special programs that will increase the preparedness of those who lack it. If school districts have data indicating how prepared their students are for college, they will have the information necessary to modify curricular, instruction, and graduation requirements (Kirst & Venezia, 2006).

Furthermore, the current study will assist the research site in determining which high school measures are the best predictors of successful degree attainment. Such information can be utilized to implement the new state placement policy (MDHE, n.d.) requiring institutions to use multiple measures when placing students in college-level coursework. Due to the unfairness of single, high-stake assessment scores, additional high school measures such as GPA and end-of-course examination scores are being recommended to place students in college-level or developmental mathematics, English, and reading coursework. The use of multiple placement measures will expectantly result in the better placement of students in college-level coursework, reducing the number of developmental non-credit courses (Scott-Clayton et al., 2014) thereby leading to better retention and increased degree attainment.

Call for Future Research

There remains a great need for additional research to be conducted related to college readiness issues. Although the current study has shown the influence high school course taking can have on degree completion, it did not address how well the student performed in these courses. According to Williford (2009), performance in high school courses has not been sufficiently studied to determine its value in predicting college

success and is recommended for future research. In addition, researchers could analyze the significance of other college readiness measures not included in this study such as end of course exam scores (EOC), which are now required in the state of Missouri in several core classes, the grade earned in DC and AP courses, and the passage of AP exams. Furthermore, additional college readiness indicators such as FYGPA and the avoidance of remedial coursework could be investigated. Remedial course placement typically means a student is not prepared for college-level coursework in a particular subject, leading to longer time to degree completion, increased costs, and decreased likelihood of degree attainment (CCRC, 2014; Jaggars & Hodara, 2011; Porter & Polikoff, 2011). Future research should investigate the relationship between high school pre-college variables and the placement in developmental education coursework. Finally, qualitative and mixed methods techniques could also play a critical role in increasing our understanding of how so many high school graduates enter college unprepared.

Limitations

The findings of this study should not be generalized to all community college students. Instead, this study was limited to the first-time, full-time students attending a mid-sized community college located in rural, southwest Missouri. The student population lacks diversity, with the majority of students being white. Additionally, the sample was limited to traditional-age students who graduated with a high school diploma in May 2011 and who were seeking an associate degree. The sample did not include students who transferred to another two- or four-year institution, as they are not recognized by the Integrated Postsecondary Education Data System (IPEDS) as

successful degree completers. This purposeful sampling procedure decreased the generalizability of the study.

Another limitation of this study was that some demographic data, ethnicity and first-generation status, was based upon self-reported responses by students on the college admission form. As such, the accuracy of these responses cannot be verified. Also, this research was limited to data reported on student high school transcripts, which limited the number of available research variables. Furthermore, other than Pell-grant eligibility, there was no data available regarding the socioeconomic status of the students and their family.

Additionally, no data was available regarding the characteristics of the high schools themselves such as size of the high school, average teacher experience, average teacher educational level, average class size, and average ACT score. The rigor of the high school curriculum taken by the students in this study varies, which could affect the accuracy of the results. A student's high school grades may be affected by the rigor of a student's curriculum; however, such factors were not captured and, therefore, could not be considered in this study. Another limit in scope is that the current research is only looking at variables students brought with them to predict community college success, rather than including types of support they received at the community college which may have contributed to degree attainment.

Conclusion

The findings from this study revealed significant predictors of community college success. Through the examination of high school transcripts of community college students who have successfully completed a degree within three years, the current study

shows that community college degree attainment is associated with HSGPA, total high school credits earned, taking a math course senior year, and earning college credits while in high school. The ability to predict which college readiness measures best prepare students for college success will enable school districts to increase preparation for and access to such measures. This study will also help community college administrators make better placement decisions for incoming freshmen and offer support to students who enter college underprepared. Furthermore, by evaluating multiple measures or predictors of future college success, including student demographics, the current study will expand college readiness research. Ultimately, such data will foster communication between community colleges and school districts in an effort to better prepare students for college success.

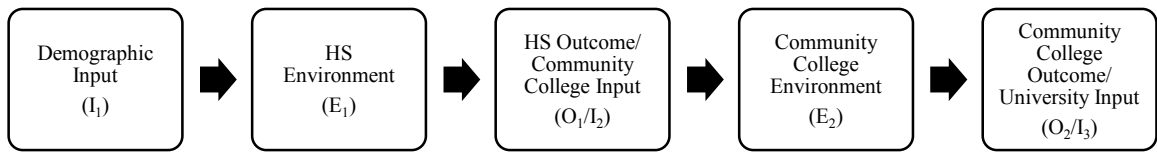


Figure 1. Astin's (2001) I-E-O Model modified for this study resulting in I₁-E₁-O₁/I₂-E₂-O₂/I₃

Table 1

Results of Chi-square Test for Demographic Variables and Attaining Community College Degree

Variable	Degree attainment		χ^2 (1)	p
	Successful (n=162)	Unsuccessful (n=281)		
Gender			2.11	.164
Female	98	150		
Male	64	131		
Race			0.66	.432
White	138	231		
Other	24	50		
Pell-Eligible*			6.58	.014
Yes	91	192		
No	71	89		
First-Generation*			6.48	.013
Yes	79	172		
No	83	109		

Note. * Significant at alpha of .05.

Table 2

Results of Chi-square Test for Student High School Environmental Variables and Attaining Community College Degree

Variable	Degree attainment		$\chi^2(1)$	<i>p</i>
	Successful (<i>n</i> =162)	Unsuccessful (<i>n</i> =281)		
MO A+ Scholarship*			12.48	.001
Yes	102	128		
No	60	153		
ACT Core Curriculum*			12.53	.001
Yes	106	135		
No	56	146		
High Math*			61.22	<.001
Alg I or Pre-Alg	91	27		
Geometry	8	53		
Alg II	69	150		
Alg III or Trig	22	23		
Pre-calc, Calculus, College Alg, DC, AP	58	28		
High English*			17.80	<.001
Eng III	24	92		
Eng IV, College-prep, DC, AP	138	185		
High Science*			26.53	<.001
Bio I	18	78		
Chem or Bio II	88	151		
A & P	24	25		
Physics, DC, AP	32	24		
Sr Year Math*			35.61	<.001
Yes	104	98		
No	58	183		
Sr Year English*			6.84	.009

Yes	147	229		
No	15	52		
Sr Year Science*			15.57	<.001
Yes	87	97		
No	75	184		
Sr Year Social Studies			1.26	.273
Yes	74	113		
No	88	168		
Math Beyond Alg II*			47.62	<.001
Yes	82	54		
No	80	227		

Note. * Significant at alpha of .05.

Table 3

Results of t-test for Student High School Environmental Variables and Successful (n=162) and Unsuccessful (n=281) Community College Degree Attainment

Variable	Successful degree attainment		Unsuccessful degree attainment		<i>df</i>	<i>t</i>	<i>p</i>	Cohen's <i>d</i>
	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>				
HS Rank*	29.54	18.79	50.41	22.12	342	10.08	<.001	1.11
HS Cum GPA*	3.49	0.43	3.02	.54	395	9.95	<.001	1.08
Total HS Cr.	28.83	2.26	28.75	2.33	441	0.38	.703	0.04
Total Acac Core Cr*	15.04	1.69	14.15	1.50	441	5.78	<.001	0.53
Acad Core* Cum GPA*	3.20	0.51	2.69	0.58	372	9.62	<.001	1.00
Total Math Cr*	3.69	0.55	3.37	0.56	441	5.84	<.001	0.58
Math GPA*	3.03	0.61	2.48	0.70	374	8.61	<.001	0.90
Total Eng Cr	4.05	0.60	3.97	0.50	441	1.51	.133	0.13
English GPA*	3.29	0.59	2.79	0.65	441	8.06	<.001	0.85
Total Sci Cr*	3.66	0.88	3.34	0.80	441	3.94	<.001	0.37
Science GPA*	3.17	0.57	2.65	0.68	384	8.64	<.001	0.91
Total SS Cr	3.61	0.69	3.48	0.75	441	1.84	.067	0.19
SS GPA*	3.33	0.52	2.85	0.66	400	8.66	<.001	0.94
Total Foreign Language Cr*	1.55	1.04	1.10	1.09	441	4.16	<.001	0.42
Total DC Courses*	0.79	1.42	0.37	1.02	259	3.30	.001	0.30
Total AP Courses*	0.34	0.79	0.17	0.66	290	2.31	.022	0.22
Transfer College Cr*	2.73	4.85	0.89	2.77	223	4.43	<.001	0.38
Transfer College GPA	3.53	0.52	3.50	0.60	88	0.25	.800	0.06
Math Intensity Score*	1.54	0.87	0.93	0.78	310	7.50	<.001	0.71

Note. * Significant at alpha of .05.

Table 4

Results of t-test for Student High School Outcome Variables and Successful (n=162) and Unsuccessful (n=281) Community College Degree Attainment

Variable	Successful degree attainment		Unsuccessful degree attainment		df	t	p	Cohen's d
	M	SD	M	SD				
High ACT Comp*	20.28	3.61	19.09	3.18	330	3.17	.002	0.33
High ACT Eng*	20.11	5.01	18.35	4.54	332	3.35	.001	0.35
High ACT Math*	19.91	3.56	18.26	2.94	286	4.52	<.001	0.46
High ACT Read*	21.01	4.69	19.98	4.48	331	2.03	.043	0.22
High Compass Math*	119.44	50.09	94.18	55.11	339	4.22	<.001	0.50
High Compass Writing*	168.30	24.55	156.76	33.18	169	3.05	.003	0.47
High Compass Read*	179.47	11.06	173.70	23.08	198	2.53	.012	0.52

Note. * Significant at alpha of .05.

Table 5

Logistic Regression Analysis Predicting Successful Community College Degree Attainment, Step 1

Predictor	B	SE	Odds ratio	Wald statistic	p
Gender	-0.31	0.20	0.73	2.35	.125
Race	0.13	0.28	1.14	0.21	.646
Pell Eligibility*	0.43	0.21	1.53	4.04	.044
First-Generation*	0.41	0.21	1.51	3.88	.049
Constant	-0.87	0.29	0.42	9.21	.002

Note. CI = confidence interval for odds ratio (Exp(B)).

* Significant at alpha of .05.

Table 6

Logistic Regression Analysis Predicting Successful Community College Degree Attainment, Step 2

Predictor	<i>B</i>	<i>SE</i>	Odds ratio	Wald statistic	<i>p</i>
Gender	0.49	0.23	1.63	3.38	.066
Race	0.00	0.33	1.00	0.00	.993
Pell Eligibility	0.08	0.26	1.08	0.09	.762
First-Generation	0.10	0.25	1.10	0.16	.693
A+ Scholarship	0.11	0.26	1.11	0.17	.685
HS GPA*	1.82	0.33	6.14	30.59	<.001
Total HS Credits*	-0.14	0.06	0.87	5.81	.016
Total Academic Core Credits	0.03	0.11	1.04	0.10	.753
Total Foreign Language Credits	0.20	0.12	1.22	2.72	.099
Total DC Credits	-0.11	0.11	0.90	1.06	.302
Total AP Credits	0.03	0.17	1.03	0.03	.853
ACT Core Curriculum	-0.43	0.29	0.65	2.30	.130
Highest Math Class	0.24	0.14	1.27	2.71	.100
Highest English Class*	0.88	0.40	2.40	4.88	.027
Highest Science Class	-0.15	0.17	0.86	0.77	.380
Senior Year Math*	0.81	0.27	2.24	8.99	.003
Senior Year English	0.19	0.51	1.21	0.14	.705
Senior Year Science	0.35	0.29	1.43	1.47	.225
Senior Year Social Studies	-0.09	0.26	0.92	0.12	.730
Transfer Hours Earned*	0.11	0.03	1.11	9.83	.002
Constant	-7.72	2.38	0.00	10.49	.001

Note. CI = confidence interval for odds ratio ($\text{Exp}(B)$).

* Significant at alpha of .05.

Table 7

Logistic Regression Analysis Predicting Successful Community College Degree Attainment, Step 3

Predictor	<i>B</i>	<i>SE</i>	Odds ratio	Wald statistic	<i>p</i>
Gender	0.52	0.36	1.05	0.02	.886
Race	-0.11	0.44	0.90	0.06	.808
Pell Eligibility	-0.06	0.34	0.94	0.03	.853
First-Generation	-0.01	0.33	0.99	0.00	.968
A+ Scholarship	0.04	0.35	1.04	0.01	.920
HS GPA*	1.49	0.47	4.44	9.99	.002
Total HS Credits*	-0.20	0.08	0.82	6.45	.011
Total Academic Core Credits	-0.04	0.14	0.96	0.07	.788
Total Foreign Language Credits	0.12	0.16	1.13	0.52	.472
Total DC Credits	0.11	0.15	1.12	0.59	.443
Total AP Credits	0.21	0.28	1.23	0.55	.459
ACT Core Curriculum	0.11	0.40	1.11	0.07	.788
Highest Math Class	0.29	0.19	1.33	2.36	.125
Highest English Class	0.45	0.52	1.57	0.74	.388
Highest Science Class	-0.24	0.23	0.79	1.05	.305
Senior Year Math*	0.85	0.37	2.34	5.35	.021
Senior Year English	0.34	0.70	1.41	0.25	.621
Senior Year Science	0.30	0.39	1.35	0.60	.440
Senior Year Social Studies	-0.15	0.34	0.87	0.18	.669
Transfer Hours Earned*	0.14	0.05	1.15	8.09	.004
High ACT Comp	-0.12	0.07	0.89	3.07	.080
High Compass Math	0.01	0.00	1.01	2.04	.153
Constant	-0.48	3.15	0.62	0.02	.879

Note. CI = confidence interval for odds ratio ($\text{Exp}(B)$).

* Significant at alpha of .05.

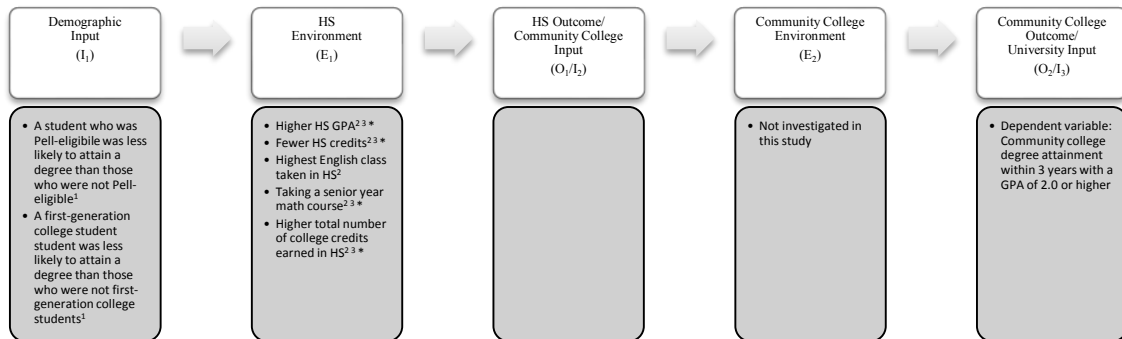


Figure 2. Astin's (2001) I-E-O Model modified for this study including the significant variables identified during the binary logistic regression steps 1-3.

¹ Variables identified as predictors of community college degree attainment from Step One.

² Variables identified as predictors of community college degree attainment from Step Two.

³ Variables identified as predictors of community college degree attainment from Step Three.

* Variables identified as predictors of community college degree attainment from final logistic regression model.

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CHAPTER SIX:
SCHOLARLY PRACTITIONER REFLECTION

Introduction

In this paper, I will reflect on the knowledge I have gained during the University of Missouri, Columbia (MU) EdD program, along with how this knowledge has transformed me as an educational leader. Specifically, I will discuss how the dissertation process influenced my practice as an educational leader and conclude with how it has influenced me as a scholar.

How the Dissertation Influenced My Practice as an Educational Leader

The dissertation process has greatly increased my ability as a leader to rely on empirical research and data to shape my decisions. After just two years as a business faculty member at Crowder College, our division chair accepted the associate vice president of academic affairs position. Her absence left our division with two veteran members and two members with only two years of college teaching experience each. The division decided to appoint me as the replacement division chair. As a division chair, making decisions is something that I am faced with every day. Prior to the start of this program and my year and a half effort toward my dissertation defense, I did not rely on empirical studies and data to shape my planning and decision-making process. Instead, I relied on past experience or would consult with my division faculty team members on important issues.

Although it was excruciating, conducting the literature review for my dissertation opened my eyes to the world of scholarly research. I had no idea that so many studies existed on the very topics that affect my world as a division chair and as a college instructor. As I read articles on my dissertation topic, college readiness, I found myself equipped to have meaningful conversations with our college administrators. In fact, I

was asked to serve on a newly formed college readiness committee made up of college employees and K-12 administrators, and was able to not only provide various articles on the topic, but also make suggestions such as implementing supplemental instruction (SI) for underprepared college students.

In addition, I am now cognizant of the college preparedness issues facing K-12. About a month ago, I was discussing standards-based learning with the elementary principal where my children attend school. This is a newly implemented program where learning is individualized for each student, and they are given numbers rather than grades. The principal is very happy with this program and was excited to inform me that several high school teachers were piloting the program. I raised several concerns, but my main concern was how the high school would equate the number system to a GPA. She had not thought about that but liked the idea of getting rid of GPA. I then asked how the students would apply for college admission and scholarships since high school GPA is a very important factor at most colleges. She quickly stated that they would just have to use their ACT score. Because of all the studies I read regarding ACT scores and other placement test scores, I was able to point out that many researchers found these exams to be biased to minority, low-income, and first-generation students, not to mention that our state is pushing colleges to use additional measures beyond exam scores, such as high school GPA, to place students in college-level courses. Because the school district has a very large free and reduced lunch percentage, she was extremely concerned by this and thanked me for my insight.

Through this experience, I also learned that high performing leaders look for data everywhere, from both formal and informal sources. They listen to students and are

willing to try new instructional methods. They read scholarly studies to investigate the findings of various teaching methods and retention strategies. Community colleges have a wealth of student data that is being used to drive very few decisions. Most faculty that I work with assess student and course-level data, but I see limited interest to investigate deeper. I now have the ability to study data to conduct meaningful research.

In summary, one of the greatest leadership skills I developed during the dissertation process is the desire to use data to drive decisions, along with the technical ability to use SPSS to analyze data. I now understand how to search for empirical research on important post-secondary problems of practice such as attrition, student engagement, and college readiness. I also have a greater understanding of our institutional research department and the types of data that is being collected. I have worked with them to develop reports for my department, something that I would not have been equipped to do prior to this program. Thanks to this program and the dissertation process, I now have a true appreciation of the data inquiry process and the importance of making data-driven decisions.

How the Dissertation Process Influenced Me as a Scholar

The dissertation process has greatly improved my ability to conduct and write scholarly research, along with increasing my knowledge of statistics. Upon entering this program, it had been 10 years since I had completed my master's degree. To say that my ability to write scholarly research was a bit rusty is an understatement! In addition, I had no previous familiarity with APA and very little statistical experiences.

I now have the ability to conduct scholarly research on topics that impact my department. For instance, online courses have grown in popularity in our department. In

fact, the number of students taking online business courses makes up half of our enrollment. Prior to conducting the research for my dissertation, I never would have thought to read empirical research regarding the success rates of online courses versus face-to-face courses. As an online instructor, I know that the drop and fail rate of my online course sections is much greater than that of my face-to-face courses. Over the years, I have tried various tactics to improve these rates. I never thought to explore the scholarly research on this very topic. I now know there is a plethora of empirical research on this very topic that I will review for instructional and retention ideas.

I am now very interested in conducting research. Prior to writing my dissertation, I had limited interest in teaching at a research institution. I currently teach at a community college and love being able to focus on teaching; however, I now see the importance that research plays on my teaching. In fact, I am rethinking my future plans to move into higher education administration. I may instead look for a position that affords me the opportunity to teach and conduct research. Now that I see how the two are connected, I am very intrigued.

Furthermore, the experience I gained through writing a journal article has been both eye opening and exciting. In fact, I already explored additional research questions that could be investigated utilizing the data I have gathered. Using SPSS to run various statistical analyses has been fascinating. Reading Field (2009) and trying to then apply it in a classroom setting was stressful; however, applying it to my actual research made sense. As I complete the finishing touches on my dissertation, I am eager to see what the future holds. Whatever that might be, I feel the knowledge and skills that I have learned will be an enormous asset.

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Appendix A

PERMISSION TO USE NAME

Crowder College

Check any applicable:

I hereby authorize Kali Bard, student of the University of Missouri, to use the name of the institution identified above when publishing results from the research study.

I hereby authorize Kali Bard, student of the University of Missouri, to use data that does not contain student identifying information from the institution identified above when publishing results from the research study.

Jennifer Methvin 6-9-15
Signature Date

Jennifer Methvin
Name

President, Crowder College
Title

PERMISSION TO USE NAME

Crowder College

June 8, 2015

Dr. Jennifer Methvin
President
Crowder College
601 Laclede
Neosho, MO 64850

Dear Dr. Methvin:

I am a doctoral student from the University of Missouri writing my dissertation prospectus under the direction of my advisor, Dr. Cynthia MacGregor, who can be reached at 417-836-6046 or CMacgregor@MissouriState.edu.

The purpose of this study is to investigate the relationship between college readiness measures taken in high school and the successful completion of a community college associate of art's degree. More specifically, the study aims to identify which high school factors best predict success at Crowder College. Based on Astin's (2001) modified input-environment-outcome (I-E-O) model, the inputs, or control variables, include student demographic and pre-college placement exam scores. The environment, or independent variables, consists of the high school college readiness measures. The output, or dependent variable, is defined as completing an associate of art's degree within three years while maintaining a cumulative GPA of 2.0 or higher.

I would like your permission to use Crowder College's name and data in my prospectus and subsequent dissertation.

If these are acceptable terms and conditions, please indicate on the following page by checking the applicable responses, and replying via e-mail kalibard@crowder.edu.

Sincerely,

Kali Bard
MU EdD Doctoral Candidate

FERPA RELEASE

Crowder College

Dissertation Purpose: The purpose of this study is to investigate the relationship between college readiness measures taken in high school and the successful completion of a community college associate degree. More specifically, the study aims to identify which high school factors best predict success at Crowder College.

Dissertation Scope: Based on Astin's (2001) modified input-environment-outcome (I-E-O) model, the inputs, or control variables, include student demographic information. The environment, or independent variables, consists of the high school college readiness measures. The output, or dependent variable, is defined as completing an associate degree within three years while maintaining a cumulative GPA of 2.0 or higher. Specifically, the descriptive demographic information that will be analyzed in this study include: gender, race, Pell eligibility, and first-generation student status. The high school transcript predictor variables that may be analyzed include: Missouri A+ scholarship recipient, cumulative GPA, total credits earned, total academic core credits earned, academic core GPA, total math credits earned, math GPA, total English credits earned, English GPA, total science credits earned, total social studies credits earned, total foreign language credits earned, total number of dual credit (DC) coursework, total number of advance placement (AP) coursework, whether they met the ACT recommended core curriculum, math intensity, highest level of math, highest level of English, highest level of science, science intensity, senior year academic core coursework, and whether they completed math beyond Algebra II. The high school outcomes and community college inputs analyzed in this study may include: ACT composite and English, writing, and mathematics Compass scores for those students who did not take the ACT.

Duration of Dissertation: December 2016

Check any applicable:

I hereby authorize Kali Bard, student of the University of Missouri, to use data from Crowder College that does not contain student identifying information when publishing results from the research study. It is also understood that such data will be destroyed at the conclusion of the study.

Bhonda Helm
Signature
Bhonda Helm
Name
Records Manager
Title

3-10-16
Date

Appendix B

Name and Type of Variable

Demographic Input Variables (I ₁)	Description	Coding
AGE	Student's current age	Continuous
GENDER	Gender	Categorical (male=0, female=1)
RACE	Race/Ethnicity	Categorical (white=0, Black=1, Hispanic=3, Asian=4, Native American=5, Other or Unknown=6)
PELL	Pell eligibility	Categorical (Yes=1; No=0)
FIRSTGEN	First-generation college student	Categorical (Yes=1; No=0)
HS Environmental Variables (E ₁)	Description	Coding
APLUS	Missouri A+ Scholarship	Categorical (Yes=1; No=0)
HSRANK	High school class rank	Continuous
HSGPA	High school cumulative GPA	Continuous
HSTYPE	Type of high school	Ordinal (public =1, private=2)
HSNAME	Graduating high school	Continuous
TOTALHSCR	Total high school credits earned	Continuous
TOTALAC	Total number of academic core credits	Continuous
COREGPA	Academic core GPA	Continuous
TOTALMATH	Total math credits	Continuous
MATHGPA	Total math GPA	Continuous

TOTALENG	Total English credits	Continuous
ENGGPA	Total English GPA	Continuous
TOTALSCI	Total science credits	Continuous
SCIGPA	Total science GPA	Continuous
TOTALSS	Total social studies credits	Continuous
SSGPA	Total social studies GPA	Continuous
TOTALFL	Foreign language credits earned	Continuous
TOTALDC	Total number of dual credit (DC) courses	Continuous
TOTALAP	Total number of advanced placement (AP) courses	Continuous
TRANHOURS	Total college credits transferred to Crowder College (college credits earned while in high school)	Continuous
TRANSGPA	Transfer credit GPA (for courses taken while in high school)	Continuous
ACTCORE	ACT recommended core curriculum (English, 4 years; math, 3 years; sciences, 3 years; social studies, 3 years)	Categorical (Yes=1; No=0)
MATHINT	Credits in five intensive math course—algebra 2, trigonometry, pre-calculus, and calculus—were added together to create the math intensity variable	Continuous

HIGHMATH	Highest level of math	Categorical (Calculus, Pre-Calculus, College Algebra DC, or AP course=5; Trigonometry=4; Algebra 2=3; Geometry=2; Algebra I=1; Pre-algebra (1))
HIGHENG	Highest level of English	Categorical (English IV, DC, or AP=4; English III=3; English II=2; English I=1)
HIGHSCI	Highest level of science	Categorical (Physics, DC, or AP=5; Chemistry=4; Biology II=3; Biology I=2; Life Science=1)
SRYMATH	Senior year math	Categorical (Yes=1; No=0)
SRYENG	Senior year English	Categorical (Yes=1; No=0)
SRYSCI	Senior year science	Categorical (Yes=1; No=0)
SRYSS	Senior year social studies	Categorical (Yes=1; No=0)
MATHALGII	Math beyond algebra II	Categorical (Yes=1; No=0)

HS Outcome/ Community College Input (O ₁ /I ₂)	Description	Coding
ACTCOMP	Highest composite ACT score	Continuous
ACTMATH	Mathematics ACT score	Continuous
ACTENG	English ACT score	Continuous
ACTREAD	Reading ACT score	Continuous
ACTWRITE	Writing ACT score	Continuous
ACTSCI	Science ACT score	Continuous
COMP MATH	Compass mathematics score	Continuous
COMP ENG	Compass English score	Continuous
COMP READ	Compass Reading score	Continuous

Comm College Environmental Variables (E ₂)	Description	Coding
FIRSEM GPA	First semester GPA	Continuous
FIRSEM TC	First semester total credits	Continuous
CONTEN RLL	Continuous enrollment – Student did not stop out for at least one fall or spring semester	Categorical (Yes=1; No=0)
SUMMER	Summer enrollment – Student took at least one summer course	Categorical (Yes=1; No=0)
AVGACR	Average attempted credits per semester	Continuous
TOTALCCCR	Total number of college credits earned	Continuous
COLL GPA	Cumulative college GPA	Continuous
YRSDECOM	Years to degree completion	Categorical (2 years=1; 3 years=2)
REMCOURSE	Any developmental course work	Categorical (Yes=1; No=0)
MAENGDEV	Both math and English developmental coursework	Categorical (Yes=1; No=0)
MATHDEV	Math developmental coursework	Categorical (Four or more=4; Three=3; Two=2; One=1; None=0)
ENGDEV	English/Communications/Reading developmental coursework	Categorical (Four or more=4; Three=3; Two=2; One=1; None=0)
Community College Outcome/ University Input (O ₂ /I ₃)	Description	Coding
DEGREE	Associate degree attainment within three years with	Categorical (Highly Successful=2; Successful=1; Not Successful=0)

	cumulative GPA of 2.0 or higher	
YRSDECOM	Years to degree completion	Categorical (2 years=1; 3 years=2)

Appendix C

Table 1

Intercorrelations for Successful Community College Degree Attainment and Student Demographic Variables

Variable	1	2	3	4	5
1. Associate Degree Attainment	—				
2. Gender	.07	—			
3. Race	-.04	-.08	—		
4. Pell Eligibility	-.12*	.02	.02	—	
5. First-Generation	-.12*	.03	.10*	.25**	—

Note. * $p < .05$. ** $p < .01$. *** $p < .001$.

Table 2

Intercorrelations for Successful Community College Degree Attainment and High School Environmental Variables

Variable	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
1. Associate Degree	—																
2. A+ Scholarship	.17**	—															
3. HS GPA	.41**	.39**	—														
4. Total HS Credits	.02	.24**	.21**	—													
5. Total Acad Core Cr	.27**	.23**	.35**	.24**	—												
6. Total For Lang Cr	.19**	.20**	.25**	.14**	.23**	—											
7. Total DC Credits	.17**	.11*	.29**	.07	.16**	.11*	—										
8. Total AP Credits	.12*	.08	.15**	.18**	.16**	.28**	.17**	—									
9. ACT Core	.17**	.24**	.37**	.15**	.40**	.22**	.08	.04	—								
10. High Math	.36**	.24**	.53**	.12*	.46**	.34**	.35**	.23**	.32**	—							
11. High Eng	.20**	.09	.16**	.15**	.29**	.19**	.20**	.16**	.38**	.21**	—						
12. High Sci	.24**	.13**	.42**	.11*	.44**	.28**	.28**	.28**	.30**	.45**	.22**	—					
13. Sr. Year Math	.28**	.06	.18**	.07	.45**	.13**	.14**	.09	.17**	.33**	.19**	.28**	—				
14. Sr. Year English	.12**	.12**	.08	.09	.31**	.11*	.06	.11*	.36**	.10*	.64**	.14**	.20**	—			
15. Sr. Year Science	.19**	.09	.20**	.05	.45**	.13**	.11*	.07	.10*	.22**	.00	.45**	.26**	.04	—		
16. Sr. Year Soc Stud	.05	-.02	.06	-.02	.29**	.08	.01	.14**	.02	.12*	.02	.12*	.09	.02	.13**	—	
17. Transfer Hours	.24**	.13**	.22**	.12*	.18**	.07	.24**	.10*	.12**	.24**	.03	.21**	.13**	-.03	.14**	.05	—

Table 3

Intercorrelations for Successful Community College Degree Attainment and High School Outcome Variables

Variable	1	2	3	4	5	6	7	8
1. Associate Degree	—							
2. ACT Composite	.17**	—						
3. ACT English	.18**	.90**	—					
4. ACT Math	.25**	.77**	.60**	—				
5. ACT Reading	.11*	.88**	.78**	.54**	—			
6. Compass Math	.22**	.44**	.35**	.56**	.31**	—		
7. Compass Reading	.12	.43**	.47**	.27**	.41**	.25**	—	
8. Compass Writing	.16**	.46**	.44**	.37**	.39**	.39**	.66**	—

Note. * $p < .05$. ** $p < .01$. *** $p < .001$.

VITA

Kali Bard is a Business Professor at Crowder College in Neosho, Missouri and serves as the Business Department Chair. She has served seven years as department chair, and nine years as a faculty member teaching personal finance, management, and computer application courses. Prior to teaching at the post-secondary level, she taught business and computer courses for nine years in public education. Kali holds a Bachelor's of Science in Secondary Business Education from Missouri Southern State University; a Master's of Education in Secondary Administration from William Woods University; and defense of the present dissertation will meet the remaining requirements for 2016 completion of her Doctorate of Education in Leadership and Policy Analysis from the University of Missouri – Columbia. Kali resides with her husband and four children in Joplin, Missouri. In her free time, she enjoys gardening, traveling, scuba diving, and spending quality time outdoors with her family.