PREDICTORS OF POSTSECONDARY SUCCESS: AN ANALYSIS OF FIRST YEAR COLLEGE REMEDIATION

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This study was a quantitative multiple regression investigation into the relationships between campus factors of high school students graduating in 2013 who immediately enrolled in first-year college freshman level remedial coursework at a large, Central Texas two-year postsecondary institution. The goal of this study was to determine which high school campus-level factors predicted enrollment into college remedial education coursework. The dependent variable was a continuous variable representing the percentage of students from Texas public high school campuses enrolled into at least one student credit hour of remedial education during their first semester as a first-year college student. Eight high school campus-level independent variables were included in the regression model at the campus-level: at risk percentage, economically disadvantaged percentage, limited English proficient percentage, advanced course/dual-enrollment percentage, college ready math percentage, college ready English percentage, ACT average, and SAT average. Pearson correlations and linear regression results were examined and interpreted to determine the level of relationship between the eight selected variables and first-year college student remedial coursework. The multiple regression model successfully explained 26.3% ($F(8,286) = 12.74$. $p < 0.05$, $r^2 = 0.263$) of the variance between first-year college students enrolled into remedial coursework at a large, Central Texas two-year postsecondary institution and the campus-level variables from high schools from which they graduated and indicated campus-level economic disadvantaged percentage and campus-level SAT average to be statistically significant at the $p < 0.05$ level.

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CHAPTER 1

INTRODUCTION

Background of the Study

High school graduating seniors have long understood the pathway to prosperity in the United States began with higher education. The National Center for Education Statistics (2014) reported young adults who have obtained a bachelor's degree earned on average 57% more each year as compared to their peers with a high school diploma or equivalent. As much as 73% of America's fastest growing jobs and careers required some form of postsecondary education or training by the year 2016 (Dohm & Shniper, 2007). According to Baum, Ma, and Payea (2013), "The median four-year college graduate who enrolls at 18 and graduates in four years can expect to earn enough by age 36 to compensate for being out of the labor force for four years" (p. 5). In addition, access to college and increased postsecondary education enrollment became a national vision of Former President Barack Obama (2009), who stated "in a global economy where the most valuable skill you can sell is your knowledge, a good education is no longer just a pathway to opportunity, it is a prerequisite" (para. 59).

Furthermore, Former President Obama's administration challenged postsecondary education by setting a goal for the United States to have the largest college degree attainment rate in the world by the year 2020 (Obama, 2009). Jones (2009) of the National Center for Higher Education Management Systems estimated that this would equate to 781,000 additional degrees each year through the year 2025, which represented a postsecondary degree increase of 53% annually. A report released by the National Center for Education Statistics (2013a) showed on average, 66% of students were immediately enrolling into college following their high school graduation. For these college-bound students, this first year was vitally important for their

future. Not only would they discover whether they made a good decision about which college to attend, the academic experience and knowledge they acquired during this first year would be instrumental in determining their ultimate success with obtaining a degree.

College-Readiness Patterns in Texas and the United States

College certifications and degrees became vitally important for entry into the labor force and continued to be critical for gaining access into increasingly competitive graduate schools. Between 2000 and 2010, student enrollment in degree-granting postsecondary institutions increased 37%, from 15.3 million to 21.0 million (National Center for Education Statistics, 2003). As college enrollment continued to increase in Texas and the United States, significant numbers of college freshmen were deemed not college-ready because they had insufficient skills to meet the academic requirements of postsecondary work. Conley (2008) defined college readiness as the knowledge and skills students need to succeed in an entry-level college course from a postsecondary institution that offered a baccalaureate degree or transfers to a baccalaureate program without remediation.

Conley (2008), founder of the Educational Policy Improvement Center (EPIC), which studied and made recommendations concerning college readiness, expanded this college readiness definition to include a student's ability to complete entry-level college coursework with a level of proficiency and understanding allowing students to move successfully to the next level in the course sequence. Mahoney, Lain, and Clark (2009) reported the state of Texas had not adopted an official definition of college readiness. Instead, state education organizations such as the Texas Education Agency (TEA) and the Texas Higher Education Coordinating Board (THECB) measured college readiness with a range of indicators including: the percentage of high school students graduating with advanced diplomas; scores on college entrance

examinations; scores on advanced placement (AP) and international baccalaureate (IB) tests; scores on the State of Texas Assessment of Academic Readiness examination (STAAR); and a college preparedness indicator embedded within the Texas Academic Performance Report (TAPR). Given these many definitions of college readiness, many graduating high school seniors were increasingly surprised to find themselves academically and socially underprepared to matriculate successfully into the rigor and expectations of many colleges and universities.

Enrollment in Remedial College Courses

As a result of these academic deficiencies, alarming numbers of first-year college students were finding themselves encouraged by academic advisors, and often required by colleges, to enroll into developmental education programs and remedial courses as a prerequisite to entry-level college coursework. These non-credit bearing remedial courses at the postsecondary level became an academic necessity for an increasing number of students enrolling in America's colleges and universities. For example, 53,852 two-year college and 13,943 four-year college first-year Texas students enrolled in at least one remedial non-credit bearing course during the fall semester of 2006 (Complete College America, 2012). As a result, college-level developmental education became a top priority in higher education. Greene and Forster (2003) reported that as many as 22% of freshmen enrolling in public institutions and 13% of freshmen enrolling in private institutions were required to take remedial college coursework. The National Center for Public Policy and Higher Education (2010) reported "nearly 60% of first-year college students discovered that, despite being fully eligible to attend college, they were not academically ready for postsecondary studies" (p. 1). Long (2014) reported "more than one-third of all first-year students take some form of remedial coursework in either English or mathematics, but this figure could be as high as 60% or 70% of students at some institutions" (p.

67). For students enrolled at doctoral degree-granting institutions, approximately 20% took one or more remedial courses, with 30% at four-year institutions, and 60% at two-year colleges (Adelman, Daniel, Berkovits, & Owings, 2003; Conley, 2005).

These types of remedial courses became a frequent remedy to the problem of matriculating the large numbers of students accepted into postsecondary institutions who were unprepared for the content and rigor of collegiate-level coursework (Hagedorn, Siadat, Fogel, Noral, & Pascarella, 1999). At an increasing rate, this college readiness path for high school graduates included the need for some level of postsecondary developmental education. According to Martorell and McFarlin (2010), "College remediation is an umbrella term that describes services provided by postsecondary institutions to help underprepared students succeed in college" (p. 438). These classes most often involved coursework in reading, writing, or mathematics, and were generally taught by low-paid adjunct faculty (Bettinger & Long, 2005). According to Boylan and Saxon (2009), only 21% of college remedial education was taught by full-time faculty. As a result, college-level remedial courses did not normally award graduation credit (Martorell & McFarlin, 2010).

There were several definitions for what constitutes college-level developmental education. Some definitions used the terms *remedial* and *developmental* as synonyms for any course taken on a college campus by any student who had been found to be academically below acceptable college-level standards. However, it was important to differentiate between *remedial courses* that focused on academic gaps and core academic deficiencies and *developmental* programs, which often included diverse comprehensive services that provided tutoring, counseling, and skills refinement. Remedial education most often consisted of courses for students lacking academic skills necessary to perform college-level work at the degree of rigor

expected by the institution (Boylan, Bonham, & Tafari, 2005; Parsad, Lewis, & Greene, 2003). The purpose of remediation was to remove academic deficiencies that were either not previously mastered or had been forgotten over time (Levin & Calcagno, 2010; Miglietti & Strange, 1998). These courses were generally populated by recently graduated high school seniors who had been found to be academically underprepared or deficient in prior learning (Boylan, 2001; Levin & Calcagno, 2010; National Center for Developmental Educators, 2016).

Subsequently, developmental education programs were generally designed to address necessary academic skills and competencies that were not taught prior to enrolling in college, and to provide the holistic skills students need to be successful in college. For purposes of this study, *developmental* described the idea of comprehensive remedial education services and programs, while *remedial* described the idea of specific, individual courses intended to alleviate academic under-preparedness. Collegiate developmental education attempted to move beyond simple remediation to encompass a holistic educational approach that included tutoring, study skills, self-confidence, advising, and personal and career counseling. Many developmental programs were designed to improve collegiate-level content knowledge, such as terminology, factual information, and organizing concepts; cognitive strategies including problem-solving strategies, formatting hypotheses, and evaluating findings; key learning skills including time management, persistence, and goal setting; and transition knowledge comprised of admission/financial aid requirements and postsecondary culture (Conley, 2012). The National Association for Developmental Education (2016) gave the following definition:

> Developmental education is a field of practice and research within higher education with a theoretical foundation in developmental psychology and learning theory. It promotes the cognitive and affective growth of all postsecondary learners, at all levels of the learning continuum. Developmental education programs and services commonly address academic preparedness, diagnostic assessment and placement, development of general discipline specific learning strategies, and affective barriers to learning. Developmental

> education includes but is not limited to: all forms of learning assistance, such as tutoring, mentoring, and supplemental instruction; personal, academic, and career counseling; academic advisement; and coursework. (para. 3)

A common misunderstanding of developmental education programs was these programs were a recent phenomenon, resulting from perceived deficiencies inherent in America's public education system, or these types of programs were a modern necessity brought about by higher education's shift away from privileged education to mass education; examples of remedial education programs in the United States could be found dating back hundreds of years. Boylan and White (1987) indicated remedial education in today's higher education environment was simply "the modern version of past efforts to respond to the fact that, at their point of entry, many college students are unable to succeed without some sort of special assistance" (p. 3). The Massachusetts Bay Colony, to provide tutors in Greek and Latin, founded Harvard College in the 17th century for underprepared American clergymen. Land grant colleges were established in the mid-1800s to teach basic agricultural and mechanical courses. And in 1849, The University of Wisconsin became the first institute of higher education in the United States to offer remedial courses in reading, writing, and arithmetic (Boylan & White, 1987; Breneman & Haarlow, 1998). Payne and Lyman (1996) stated the need for remedial education surged following World War II as millions of returning veterans began to take advantage of the G.I. Bill. Thousands of underprepared students enrolled in colleges between 1960 and 1980 as a result of open enrollment admissions policies and federal government funding opportunities following the 1964 Civil Rights Act and Higher Education Act of 1965. Whether referred to as *remedial education*, *developmental education*, *college prep*, or *basic skills development*, the basis for this type of compensatory education for underprepared students had been a part the higher education environment in the United States for many years (Phipps, 1998).

While more students continued to enroll into college, far too many were failing college placement entrance exams and wasting valuable time and money taking non-credit-bearing remedial courses (Leonard, 2010). Students 21 years of age or younger made up approximately 80% of college level remedial class enrollment (Breneman & Haarlow, 1998). Typically, these remedial courses provided one-size-fits-all programs that frequently involved multiple semesters of classes that did not meet degree requirements, which repeatedly resulted in delayed entry into degree programs and depleted financial aid eligibility (Vandal, 2010). Students enrolled in a single remedial course might find this to be a minor hurdle, but those needing multiple remedial courses were more likely to struggle significantly with the academic expectations of collegiate level work and therefore more likely to give up on their goal of achieving a college education (National Center for Public Policy and Higher Education, 2010). In addition, these courses were costly to students because they frequently did not award college credit, so students paid fees and tuition expenses without making any progress towards degree obtainment (Levin & Calcagno, 2007).

Pretlow and Wathington (2011) identified remediation courses as the most referenced data in relation to the cost of collegiate developmental education. Breneman and Haarlow (1998) found the cost of remedial education for states, students, and institutions in the United States exceeded $1 billion annually in the year 1997. In a follow-up report to Breneman and Haarlow's original findings, Pretlow and Wathington (2011) used the same methodology to report collegiate-level remedial education costs for states increased 36.5% and 13% nationally. And more recently, Boatman and Long (2013) reported the estimated cost for remedial courses to be $1.4 billion in the form of direct costs to students and higher education institutions in the United States.

Concerning the state of Texas, Breneman and Haarlow (1998) found of the $153 million the state of Texas spent on collegiate remediation in the 1996-97 biennium, approximately 86%, or $132 million, was allocated directly to Texas two-year colleges. By the 2006-2007 biennium, this appropriated amount for collegiate remedial programs in Texas had risen to $206 million (Charles A. Dana Center at the University of Texas at Austin, 2007). In a follow-up report, Pretlow and Wathington (2011) found of this total 2006-2007 biennium remedial education appropriation, approximately $164 million was received by Texas two-year colleges. As displayed in Table 1, while the total cost of collegiate level remedial education increased in the state of Texas during this 10-year time span, spending decreased slightly as a percentage of total higher education expenditures in Texas. The average total cost per semester credit hour for remedial or developmental education in postsecondary Texas colleges was $164 statewide, with an average cost per semester credit hour of $256 at Texas public universities, $152 at Texas public community colleges, and $189 at Texas State Technical Colleges (Charles A. Dana Center at the University of Texas at Austin, 2007).

Table 1

Texas Collegiate Remedial and Higher Education Appropriations from 1996-1997 to 2006-2007

Study	Years	Appropriations to remedial education	Appropriations to higher education	% of total appropriations to remedial education
Breneman (1998)	1996-97	153.4 m	6.9 b	2.25
Pretlow & Wathington (2010)	2006-07	206.0 m	10.1 b	2.04

Note. m = million, b = billion; (Pretlow & Wathington, 2011, p. 4)

In addition to being costly and time consuming, college students enrolled in these remedial courses made up the majority of students who ultimately failed to complete their

college degrees (National Center for Public Policy and Higher Education, 2010). Therefore, addressing this disconnect between secondary academic preparation and college entry-level expectations must be an essential part of national and state education discussions.

The Role of Secondary Education in College Readiness

In the United States, 66% of graduated high school students in 2012 were immediately enrolled into two-year and four-year postsecondary institutions (National Center for Education Statistics, 2013b). The National Center for Education Statistics (2012) showed student enrollment in degree granting postsecondary institutions had increased 37%, from 15.3 million to 21.0 million. However, with this increase in student enrollment came a proportionate increase in the percentage of students deemed not academically prepared to succeed, without remediation, in credit-bearing general education courses at higher education institutions. There was a distinct gap between the knowledge and skills that secondary education systems were requiring for high school graduation and the academic skills and competencies colleges were expecting their incoming freshman to possess. Conley (2005) referred to this gap of knowledge for high school graduates as the distinction between being *college-eligible* and *college-ready*:

> Because of the unique nature of the U.S. educational system, high schools focus on making students college-eligible, to enable students to meet admissions requirements. However, these students may or may not be college-ready, which is defined as being able to meet the expectations they encounter in entry-level college courses. (p. xi)

As educators, being content with simply preparing our students to graduate high school could no longer be the ultimate goal of our secondary school systems. As evident in the amount of developmental courses taken by first-year college students, the acquisition of a high school diploma no longer ensured our graduating students would be able to seamlessly transition into the higher education environment.

Now more than ever, there was a need for secondary school educators to refocus their attention and resources to improve the identification, preparation, and prediction of high school students who would be most likely referred into collegiate-level developmental programs and remedial courses. There had to be movement away from traditional assumptions that a high school student who completed a core set of academic standards at the secondary level was inevitably ready to complete college level work successfully. Secondary administrators and teachers had to first understand and then accept there was a difference between students who were eligible for college and students who were prepared for college (Conley, 2007). Secondary educators had to move away from reactionary programs that relied on student state assessment scores to determine after-the-fact remedial placement, and to design and implement preventive strategies intended to identify, address, and predict academic deficiencies prior to graduation. A challenge for secondary educators was to have sufficient data available to help predict which students were most likely to be in need of collegiate level developmental education in the future.

Problem Statement

By analyzing data from Texas colleges and universities, Martorell and McFarlin (2010) discovered little evidence to support the premise that collegiate level remedial enrollment advanced graduation rates for students. Advanced coursework was frequently considered to be the main predictor for high school student higher education readiness and postsecondary persistence (Byrd & Macdonald, 2005; Conley, 2005; Royster, Gross, & Hochbein, 2015). Adelman (2006) found students completing rigorous courses in English; foreign language; social studies; pre-calculus, calculus, or trigonometry; and biology, chemistry, or physics, were 95% more likely to obtain their bachelor's degree. Given that college readiness was frequently measured in terms of participation in remedial courses, retention rates (Complete College

America, 2012; Long, 2014; National Center for Public Policy and Higher Education, 2010), semester one GPA (Pascarella & Terenzini, 2005), and enrollment in college-level developmental programs (Bailey & Alfonso, 2007; Dougherty, 2003; Long, 2014), few studies examined high school campus-level predictors of college success. Specifically, research had not considered predictors from existing high school campus-level data sets that informed understanding college-readiness. Collegiate-level remediation had become commonplace in higher education and assumed the unique role of bridging the gap of knowledge between secondary and postsecondary environments. Therefore, researchers must examine that pathway directly by examining predictors of college developmental enrollment within those specific programs. In light of the significant costs of remedial education to states, students, and higher education systems (Boatman & Long, 2013; Breneman & Haarlow, 1998; Charles A. Dana Center at the University of Texas at Austin, 2007; Pretlow & Wathington, 2011), empirical evidence was needed to identify campus-level predictors of this developmental enrollment, thereby to inform practice and procedure at both the secondary and postsecondary levels.

Purpose of Study

The purpose of this study was to evaluate the predictive validity of high school campus-level variables in order to identify possible areas of attention that might aid secondary schools' abilities to predict which students were more likely to require remedial intervention at the postsecondary level. This researcher analyzed high school campus characteristics of first-year college students enrolled in non-credit bearing remedial coursework during their first semester at a postsecondary institution in Texas for the purpose of determining which campus-level variables had the strongest relationship for predicting the students' enrollment into college-level remedial coursework. The dependent variable for the study represented the percentage of students from

each Texas public high school campus enrolled into at least one student credit hour (SCH) of remedial education during their first semester of college. Multiple independent variables representing high school campus-level characteristics chosen for the study included percentages of high school campus students who had been identified as at-risk, economically disadvantaged, limited English proficient, math college-ready, English college-ready, and campus-level ACT and SAT percentage. This researcher attempted to determine the strength of relationship between first-year college students' enrollment into an academic remedial course and variables from the students' high school campus. The rationale for this focus was two-fold: (a) to increase secondary educators' understanding of high school campus characteristics that are most likely to yield the eventual need of college remediation, and (b) to increase the number of students graduating high school sufficiently prepared and academically ready to be successful at the postsecondary level, thereby reducing the need for students to be enrolled into remedial, non-credit-bearing college courses.

Theoretical Framework

In addition to identifying predictors of college remediation, the present study sought to connect current practice with theoretical understanding. Specifically, it connected a theoretical lens used most often in the field of business to a college readiness context. Through study of motivation and decision-making in the field of business, Vroom (1964) proposed that an individual would choose to behave in a specific way because they were motivated to choose that behavior over other choices; based on the outcome they expected the chosen behavior would achieve. Within Vroom's theory, past successes and failures helped influence the current perceptions and choices that would influence a person's motivation (Demetriou & Schmitz-Sciborski, 2011). In 2010, Friedman and Mandel used Vroom's (1964) expectancy theory to

predict college student motivation to succeed and continue through college. Friedman and Mandel (2010) found student academic performance expectancies were valid predictors of cumulative GPA at the end of their first year of college, and desired grade outcomes and efforts to obtain higher grades predicted student retention beyond the first year.

Vroom's (1964) expectancy theory applied to the current study from the perspective that high school students would pursue postsecondary studies only if they believed they would be successful at either specific postsecondary institutions or specific areas of studies. Students who felt they were underprepared would be less likely to attend college, and therefore students who felt they were college-ready would be more likely to be motivated to reach graduation. The goal of an eventual college degree was the motivational factor underlying a student's ultimate success at the collegiate level. Within the context of the current study, Vroom's (1964) expectancy theory related to the concepts of academic rigor and optimal student challenge. Specifically, students who had experienced higher levels of academic rigor in high school were less likely to require postsecondary entry-level remedial coursework and therefore more likely to attain a college degree.

Research Questions

To accomplish the purpose of this study, the researcher included the analysis of academic data and personal characteristics of students who graduated from Texas high schools in the spring semester of 2013 and subsequently enrolled in the study site Central Texas two-year college the following 2013 fall semester. The research questions were:

1. Do high school campus-level variables of incoming freshmen at a Central Texas two-year college predict a student's enrollment into remedial education?

2. To what extent do high school campus-level variables of incoming freshmen at a Central Texas two-year college predict a student's enrollment into remedial education?

Significance of the Study

Numerous studies in the higher education identified predictors of high school student-level college readiness, including ACT scores, SAT scores, high school class rank, and high school course performance (Bean & Eaton, 2000; Bong, 2001, Friedman & Mandel, 2010). While this information might have been instrumental in helping colleges choose which students to recruit and ultimately admit, it provided little to help secondary school educators in predicting which of their campuses was more likely to produce greater numbers of graduates ultimately being in need of collegiate-level remedial education courses. The current researcher determined the strength of relationship between remedial college coursework and high school campus variables to conclude if statistically significant correlations existed in order to predict an incoming college freshman student's need for postsecondary remedial coursework. The findings of this study provided empirical evidence to potentially aide secondary educators as they evaluated existing intervention programs and looked to implement new college readiness ideas for their students.

Limitations

This research study's data set was limited to first-year, first-semester students who enrolled into college immediately following their graduation from high school in the year 2013. Student data and the corresponding information for the high schools from which they graduated for the study were obtained from a single two-year college located in Central Texas. Texas two-year colleges often have open enrollment admission policies that did not require academic

prerequisites, thereby often leading to greater numbers of students taking developmental education courses. Additionally, two-year colleges were more likely to offer more developmental education programs as compared to four-year universities (Dougherty, 2003). Hence, results of this study might not be appropriate to four-year university application. The data set was limited to only students graduating from Texas public high schools, which might have resulted in less generalizable findings at the national level. Furthermore, the majority of students in this data set graduated from public high schools in the general geographical service area of the two-year college. Therefore, variable correlations reported in this study might vary from other geographic regions, and might produce different results. Since the focus of this study was to find college-level remediation predictors of high school students, this researcher did not take into consideration students enrolled into the college's remedial courses who did not gain admission into the college immediately following their 2013 graduation from high school. Finally, the campus-level predictors did not contain demographic controls, which could result in findings unique to the context of a specific two-year college, or settings with similar student characteristics.

Definition of Terms

The following terms applied to this research study:

College Readiness: degree of academic knowledge and preparation a student needed in order to enroll and be successful, without remediation, in a postsecondary institution (Conley, 2007).

Conventional Academic Factors: universally accepted predictors of college readiness such as ACT and SAT scores, high school class rank, and high school course performance.

Non-Academic Factors: student personal characteristics such as race, sex, age, and socio-economic background.

Remedial Courses: courses populated by recently graduated high school seniors found to be academically underprepared or deficient in prior learning (Boylan, 2001).

Developmental Courses: designed to create or reinforce necessary academic skills and competencies not taught or not sufficiently mastered prior to enrolling in college.

Postsecondary: referred to a formal setting in which an individual pursued additional instruction beyond high school to include two-year or four-year degree programs, certificate or licensure programs, or training programs in the military (Conley, 2012).

Texas Academic Performance Report (TAPR): annual state accountability report that assesses school district and campus academic and financial performance.

Texas Education Agency (TEA): branch of the state government of Texas responsible for public education.

Texas Assessment of Knowledge and Skills (TAKS): the fourth state of Texas student standardized test designed to assess academic skills in reading, writing, math, science, and social studies.

Texas Essential Knowledge and Skills (TEKS): detailed state academic standards for Texas public schools.

Secondary: formal sixth grade through 12th grade school campuses.

State of Texas Assessments of Academic Readiness (STAAR): series of state mandated standardized tests used in Texas public schools to assess academic skills.

Summary

Although developmental education was not a new concept for higher education, current two-year and four-year colleges and universities in the United States became increasingly responsible for providing instruction to the growing amount of students who were enrolling into postsecondary institutions underprepared to be successful at the college level. With nearly one-third of first year students requiring remedial education in the core courses of reading, mathematics, or writing (Long, 2014), collegiate level remediation became an increasingly top priority in the world of higher education. Proponents often argued collegiate remediation provided the opportunity for underprepared students to gain the competencies necessary for college-level work, while critics suggested these types of developmental education courses removed student incentive to prepare for postsecondary study adequately (Bettinger & Long, 2004). Regardless of the stance, colleges and universities continued to enroll new students in record numbers. As such, institutions continued to see an increased need for college level developmental education programs. Educators were responsible for providing the absolute best educational experience for students, and were therefore obligated to identify and address the sources of their academic deficiencies in efforts to promote true college readiness. Chapter 2 was a thorough review of literature intended to provide background and foundational context related to college readiness, and college level educational developmental programs and remedial courses. It is divided into three sections: college readiness, postsecondary developmental education, and predictors of postsecondary success.

CHAPTER 2

REVIEW OF LITERATURE

Each year in the United States, millions of students graduated high school and enrolled in community colleges or universities with the goal of obtaining a college education. However, many of these students began their college careers by discovering that they needed to complete remedial courses in math, reading, or writing before they would be allowed to continue to their academic program of choice. The demand for college-level remedial courses increased rapidly in recent years, especially at community colleges which opened their doors to all students regardless of their foundational skills or academic preparedness (Dougherty, 2003). In a 2006 National Education Longitudinal Study, Bailey and Alfonso (2007) found more than 60% of first-time community college students and 29% of first-time college students enrolled in four-year institutions took at least one remedial course. Hagedorn et al. (1999) reported these students varied, from students who graduated high school with poor grades in all subjects to students who might be academically deficient in just a single subject, to older students who performed satisfactorily during high school but had forgotten basic foundational concepts, to still others who developed poor study habits or had mild to serious learning problems. Given the many challenges college students encounter with remedial coursework, it could be argued that a student's success in college may often be associated with their enrollment, or non-enrollment into college-level remedial coursework. In an attempt to supplement the current knowledge and literature related to understanding which indicators had the most success in predicting college success, identifying which high school level indicators were most predictive of a student's enrollment into collegiate-level remediation coursework was the focus of this study. In this chapter, the researcher focused on the existing literature concerning common definitions of

college readiness, postsecondary developmental programs and remedial coursework, and commonly accepted indicators of student college success.

College Readiness

Too many students graduating from high school are academically underprepared for the rigor and expectations of college entry-level coursework. This lack of college readiness among high school graduates was alarming when considering the growing number of jobs and careers that require postsecondary certification or degree. Royster et al. (2015) cited only 38% of American jobs in 2018 will require a minimum high school education as compared to 72% from 1973. College readiness was listed as one of seven national priorities for the United States in 2000 (Byrd & Macdonald, 2005). Research literature in college readiness consistently found high school students must master basic understanding and show proficiency in the core subjects of math, reading, and writing in order to be college-ready (Adelman, 2006; Byrd & Macdonald, 2005). Students must possess both cognitive and non-cognitive skills that aid in facilitating the learning process across academic disciplines. Cognitive skills, including "critical thinking, problem solving, collaboration, effective communication, motivation, and persistence," were found to be vital for college readiness (National Research Council, 2012, p. 17). Additionally, non-cognitive skills like student attitude and beliefs were needed for positive engagement, motivation, and self-efficacy (Robbins et al., 2004). Furthermore, Conley (2012) upheld that student college-ready behaviors such as help-seeking, self-motivation, goal setting, time management, self-efficacy, study skills, and task completion were qualities found to be instrumental for college success. As a result, many states, educators, and researchers attempted to identify the components encompassing the knowledge and skills students should have acquired in high school in order to obtain a postsecondary certification or degree successfully.

Definitions of College Readiness

National education trends pushed beyond the high school dropout crisis of the early 1990s and now focused on increasing the number of high school graduates deemed ready to enroll and succeed in postsecondary entry-level coursework (Royster et al., 2015). While the literature reflected consensus concerning the importance of college readiness, there was not a universally agreed upon definition (Bailey, 2011; Conley, 2007; Olson, 2006; Porter & Polikoff, 2012). When college readiness was defined in educational research, the definitions often varied on multiple dimensions and were often characterized within a broad range of accepted descriptions and definitions (Porter & Polikoff, 2012). Conley (2008) provided a broad description of college readiness:

> The likelihood that students will make a successful transition to the college environment is often a function of their readiness−the degree to which previous educational and personal experiences have equipped them for the expectations and demand they will encounter in college . . . [therefore] college readiness can be defined as the level of preparation a student needs in order to enroll and succeed–without remediation–in a credit-bearing general education course at a postsecondary institution. (p. 24)

Mijares (2007) expanded this broad perspective, stating "students are college ready when they have the knowledge, skills, and behaviors to complete a college course of study successfully, without remediation" (p. 1). Other definitions emphasized specific predictors of readiness. Green and Forster (2003) wrote to be college-ready, students must have completed high school; taken a sequential level of core classes in English, math, science, social studies, and foreign language; and achieved cut score minimums in basic levels of achievement. Maruyama (2012) provided the following summary: "College readiness represents an accumulation of knowledge and experiences that prepare students for college. It is defined using measures available during high school that can act as proxies for how students perform in college courses" (p. 253). Conley (2012) upheld examples of these high school measures included collegiate-level content

knowledge consisting of factual information and terminology; cognitive strategies such as formulating and evaluating hypothesis; and postsecondary transition knowledge such as admission and financial aid requirements.

Porter and Polikoff (2012) defined cognitive academic factors as the knowledge and cognitive skills necessary to be successful in entry-level college coursework. College readiness definitions that had a foundation in student cognitive ability relied on research indicating high school students who take high-level courses were more likely to be successful in their postsecondary studies. The academic intensity of the student's high school curriculum and resulting grade point average (GPA) and college admission scores were commonly accepted indicators of college readiness (Adelman, 2006). Thirteen states defined college readiness by identifying recommended or required high school coursework (Lloyd, 2009). Academic rigor of courses taken in high school greatly determined the ultimate successfulness of students in college. Royster et al. (2015) reported preparing students for rigorous, college level coursework as early as the eighth grade was paramount to meeting college readiness goals.

Lombardi, Conley, Seburn, and Downs (2012) believed college readiness knowledge and skills became the underlying goal of the national policy initiatives such as the Common Core State Standards (CCSS) and subsequent Race to the Top national assessment programs. Realizing the need for consistent learning goals, the CCSS were launched in 2009 by 42 states, two territories, and the District of Columbia (Common Core State Standards Initiative, 2016). Lombardi et al. (2012) stated not only were these national policy initiatives designed to address the knowledge and skills students needed to be successful in college, they reduced the 30%-60% of underprepared high school graduates in need of college-level developmental education.

When attempting to determine student academic skills and knowledge associated with definitions of college readiness, as compared to state-level assessments, states were more likely to use student data taken from major national college admission tests such as the American College Test (ACT) and the Scholastic Aptitude Test (SAT). Student scores on these aptitude examinations were frequently related to the concept that achievement on these exams could be defined and meaningfully measured (Atkinson, 2001). The ACT and SAT examinations were designed to measure secondary students' college readiness as they prepare for postsecondary admission and enrollment. Texas Education Agency (2015) reported most U.S. colleges and universities took into consideration some combination of student high school academic achievement and college admission test scores such as the ACT and SAT when making decisions about college admission and course placement.

College Readiness in Texas

A review of literature found Texas offered a notable example of a strategy for setting college readiness standards (Lloyd, 2009). As part of the Texas College and Career Readiness Initiative, in May 2006, the 79th Texas Legislature (Third Called Session) set out to improve the college and career readiness of Texas high school students. Through House Bill 1 (HB1), the Texas Education Agency (TEA) and the Texas Higher Education Coordinating Board (THECB) were assigned the task to develop a single comprehensive system that would create a system capable of tracking K-12 students' progress from one grade level of education to another. Known as the College and Career Readiness Standards (CCRS), the system identified specific grade-level college readiness standards in the areas of English/language arts, mathematics, science, and social studies (THECB, 2016c).

It was important to note the CCRS were not created to be the end of the secondary system and the beginning of the postsecondary system. Instead, they were created to indicate seamless student readiness from one grade level of education to the next. The focus of the CCRS was to specify the uniform knowledge and skills that Texas graduating students must have obtained in high school in order to be successful at entry level college courses. The THECB (2016c) reported high school courses were generally designed around a general set of core knowledge and skills intended to provide a foundation of knowledge in literacy and basic mathematics while college courses typically require students to use content knowledge to weigh and analyze important issues and questions in a field of study. Therefore, the CCRS:

> . . . distinguish themselves from high school standards by emphasizing content knowledge as a means to an end: the content stimulates students to engage in deeper levels of thinking . . . this is crucial because at the postsecondary level, students need to understand the structure of the discipline and how knowledge expands from initial study of a topic. (THECB, 2016c, p. iii)

As part of a study undertaken as part of the Texas College and Career Initiative, Conley, Hiatt, McGaughy, Seburn, and Venezia (2010) set out to "establish the validity of the Texas CCRS standards as an accurate representation of the key knowledge and skills necessary for college and career readiness and success" (p. 14). The study used a validity analysis designed to identify the alignment and possible existing gaps between the CCRS and current instructional content present at entry-level college courses in Texas. Colleges and universities throughout Texas were asked to submit entry-level course syllabi as well as respond to a web-based survey designed to measure the importance of what was being taught in their entry-level college courses in relation to the CCRS (Conley et al., 2010). Conley et al. reported the study received responses from over 800 instructors representing 87 institutes of higher education, and over 900 syllabi

from 20 different entry-level, credit-bearing college courses. Analysis of the results showed the CCRS to be highly aligned with entry-level college courses in Texas (Conley et al., 2010).

The state of Texas annually issued a report detailing the academic performance of its students. The Texas Academic Performance Reports (TAPR) is an accountability report that assessed academic performance for all campuses and school districts in the state of Texas. This information continues to be generated annually by the Texas Education Agency (TEA). TEA annually collects a broad range of information on over 1,200 districts (including charters), more than 8,000 schools, 320,000+ educators, and over 4.7 million students (TEA, 2010). Additionally, the TAPR report contained student participation rates and performance on national standardized student assessments such as the SAT, the ACT and Advanced Placement Exams to complete the annual TAPR reports.

The Texas state accountability system for public education was constructed on a framework consisting of four performance indexes: student achievement, student progress, closing performance gaps, and postsecondary readiness. Based on student performance, each campus and school district earned an index score of 0-100 with annual target scores being set by the Texas Commissioner of Education (TEA, 2016). Index Four determined a campus and school district index score derived from how well their students performed on the mandated state accountability assessment test known as the State of Texas Assessments of Academic Readiness (STAAR).

Index Four of the TAPR emphasized how well elementary and middle school campuses were preparing their students for the rigors of high school course work, and how well high school campuses were preparing their students, ". . . for success in college, the workforce, job training programs, or the military" (TEA, 2016, p. 26). For school districts and high school

campuses, Index Four was comprised of four equally weighted components: STAAR at postsecondary readiness standard, graduation rate, graduation diploma plan, and postsecondary component: college and career readiness.

The first component for postsecondary readiness, STAAR at postsecondary readiness standard, was determined by the percentage of students who met the postsecondary readiness standards on two or more tested subject areas in math, reading, writing, science, or social studies. School districts and campuses received an index score based on how all students, all student grouped by student race/ethnicity group, students coded as English language learners (ELL), and students receiving special education services scored on the STAAR exam.

The second component for postsecondary readiness, graduation rate, reflected the highest number of points possible from the combined performance graduation rates for Grades 9-12. Student grade cohorts were tracked longitudinally by TEA (2016) to determine "how many students in a specific grade cohort successfully completed the requirements for graduation within a specified time frame" (p. 27). Students in a cohort who dropped out or received a general education development (GED) certificate were not counted as graduates.

The third component for postsecondary readiness, graduation plan, was based on a longitudinal cohort of students as calculated by the percentage of students graduating under the recommended high school program (RHSP) or the distinguished achievement program (DAP) and the percentage of students graduating under either the RHSP/DAP or the foundation high school program (FHSP) with an endorsement (FHSP-E) or the distinguished level of achievement (DLA). Note the FHSP, FHSP, and DLA graduation plans were introduced to Texas high school students during the 2015-16 school year. Therefore, students with the

maximum six-year graduation plan that were set to graduate during the 2016-2017 school year could be the last students to receive a RHSP or DAP graduation plan diploma.

The fourth component for postsecondary readiness, college and career readiness indicator score, was calculated for school districts and campuses by the percentage of annual graduates who either met or exceeded Texas Success Initiative (TSI) criteria in both English language arts (ELA) and mathematics on the TSI assessment, the SAT, or the ACT; or completed and earned credit for at least two advanced/dual-credit courses; or enrolled in a coherent sequence of career and technology education (CTE) courses (TEA, 2016). Student participation and performance on the SAT and ACT standardized college entrance exams were also reported on TAPR reports. SAT and ACT student participation percentages and performance results were gathered by the College Board (2013) and ACT, Inc. and then forwarded to TEA in order to be published for campus and school district college readiness indicators on TAPR reports.

In addition to the creation and implementation of the CCRS, the state of Texas partnered with ACT Inc. to offer ACT, PLAN, and EXPLORE assessments to public school students. These assessments, offered at no cost to students, were part of the Texas legislature's goal to expand the availability of college entrance exams to the students of Texas. TEA believed these no-cost college entrance exams helped in their efforts to create a culture of college-going expectations for all Texas students, especially those who in the past might not have taken a national college entrance exam such as the ACT because of family financial limitations (ACT, 2010b).

Postsecondary Developmental Education

Developmental education continued to successfully help underprepared college students by teaching or reinforcing basic math, reading, or writing concepts that were either not

adequately learned in high school or were not at the levels deemed appropriate for initial enrollment into a specific college. This absence of core academic skills often necessitated college remedial education in order to obtain a college certification or degree successfully (Bettinger & Long, 2005). The National Center for Education Statistics (NCES, 2003) reported every two-year college in the United States initiated some level of educational developmental program or remedial coursework. Nationwide, an estimated 1.2 million, or 60%, of all two-year students participated in at least one remedial education course (Bailey, 2011; Bailey & Alfonso, 2007; Saxon & Slate, 2013).

A review of the literature showed despite the developmental programs being offered by colleges and universities, these same students were more likely to prolong their college timelines and were statistically less likely to fulfill the course requirements needed to obtain a certificate or degree as compared to their fellow students who began their college careers deemed academically prepared (Bailey, Joeng, & Cho, 2009; Bettinger & Long, 2004; Martorell & McFarlin, 2010; National Center for Education Statistics, 2003; National Center for Public Policy and Higher Education, 2010; Parsad, Lewis, & Greene, 2003). However, Bettinger and Long (2005) found students who were enrolled in and completed their recommended remedial coursework were more likely to persist with two-year college and to transfer to a four-year university than similar students who never enrolled in recommended developmental programs. Research by Boylan and Saxon (2006) indicated developmental education students who completed one remedial course and immediately enrolled into subsequent remedial courses were more likely to persist in college than students who postponed taking the next level course.

College students enrolled in remedial courses comprised the majority of students who ultimately failed to complete their college degrees (Bettinger & Long, 2004; National Center for

Public Policy and Higher Education, 2010) and evidence linked students' first-year academic performance to both postsecondary persistence and ultimate degree completion (Pascarella & Terenzini, 2005). In addition, as much as 90% of cognitive skill gains achieved by first-year students in reading, math, science, and social sciences occurred during their first two years of college study (Pascarella & Terenzini, 2005). Therefore, appropriately identifying and addressing the needs of academically underprepared first year college students remained a challenge facing both secondary and higher education.

This lack of academic preparation led to approximately 50% of first-year students in community colleges and approximately 25% of first-year students in four-year universities not continuing on to a second year (Adelman et al., 2003). Additionally, college students enrolled in four-year institutions who were enrolled in remedial programs or courses were more likely to drop out of college or transfer to a two-year institution (Bettinger & Long, 2004) prior to completing their degree plan.

Many first-year college students were discouraged and failed to register for college altogether after learning they would be enrolled into freshman-level remedial classes, and still others failed to complete the remedial courses in which they were enrolled (Bailey et al., 2009; Dougherty, 2003; Jenkins, Jaggars, & Roksa, 2009). It should be noted that even though many colleges found many of their students to be in need of developmental education, many of those higher education institutions did not require the student to take the remedial course. Bailey et al. (2009) and Jenkins et al. (2009) supported this statement and reported 30% of students referred to college-level developmental education failed to show up or enroll in any recommended remedial class. The National Association for Developmental Education (2016) reported students who were given the option to skip remedial courses for which they had been referred often chose

to do so. Bailey et al. (2009) found more than 50% of students referred into remedial education programs failed to complete the developmental course sequences because they never enrolled into the recommended courses.

Bettinger and Long (2004) reported academically underprepared students enrolled into college-level remedial courses had a greater chance of negative outcomes with later courses than those students not initially enrolled in remedial programs. Subsequently, college-level remedial education was directly associated with both longer time to degree completion and the decreased likelihood of eventual degree completion (Bettinger & Long, 2004; National Center for Education Statistics, 2004; National Center for Public Policy and Higher Education, 2010). Concerning the state of Texas, Complete College America (2012) showed of the 53,852 fall 2006 freshman students enrolled in Texas two-year college remedial education courses, 30% actually completed that developmental coursework, and only 14.3% of those students who completed their recommended remedial courses continued on to complete their additional associated coursework within two years.

Using a discontinuity methodology, Martorell and McFain (2010) analyzed data from Texas colleges and universities and determined there was little evidence to support the idea that enrollment into remedial coursework at the college level helped in increasing student graduation rates. A similar study by Calcagno and Long (2008) analyzed college data from the state of Florida and found students referred to and enrolled into college level remedial courses appeared to persist into their second year of college, but were not more likely to obtain their degree. These two studies suggested while college level remediation might promote persistence early in the college career, developmental programs were not found to help students earn a two-year certificate or four-year degree.

Postsecondary Developmental Education in Texas

Improving the academic preparation and performance of students enrolling into higher education institutions were found to be a significant challenge facing Texas and other states throughout the nation. Developmental education in Texas was found to be primarily composed of incremental interventions, frameworks, and courses intended to scaffold underprepared students with remedial needs to the competency levels expected of college freshmen (Booth et al., 2014). THECB (2015) reported approximately 41% of Texas' first year college freshmen were enrolled into some level of collegiate remediation. A review of the literature showed Texas had continually shown a focused commitment to creating education policy designed to improve remedial education practice, implementation, and support (Saxon & Slate, 2013).

According to Saxon and Slate (2013), "as is true for much of higher education, most developmental education policy and practice is formulated at the state level" (p. 35), and Texas had an established history of being honored as an exemplar for remedial best practice (Boylan & Saxon, 2006; Mahoney et al., 2009). As referenced by Boylan and Saxon (2006), the state of Texas was recognized for remedial program excellence in the first national study of developmental education published in 1974 and again in a follow up national study conducted in 1985. The Texas legislature began mandating the creation of compensatory education practices and programs intended to increase the academic skills of underprepared high school students in the early 1970s. With the implementation of these new educational practices and programs, Texas high schools set out to increase student academic skill competencies that would be expected of them as they enter college. Saxon and Slate (2013) noted "that from this era came a strengthening of assessment practices and the recognition that smaller class sizes, adequate

program facilities, and integration with college-level courses and other campus operations were practices that may improve student [academic] outcome" (p. 35).

In 1987, the Texas legislature established a state-wide student assessment program known as the Texas Academic Skills Program (TASP) to address the lack of adequate preparation of incoming college students (THECB, 2014b). TASP required all students applying to Texas colleges to take assessments in English, reading, and mathematics. Students scoring below the specified cut score in any or all of these assessments were then required to be enrolled into mandatory remedial education courses. Additionally, students failing these remedial courses were required to be provided non-course based tutoring, and were required to remain in the course until they passed the corresponding section of the TASP (Boylan & Saxon, 2006). In addition to establishing a standardized student performance-based testing assessment that impacted student placement into remedial education programs, the TASP provided remedial program data that brought to light identifiable academic gaps between college retention and degree persistence for students requiring TASP remediation and those who did not.

In October of 2000, the state of Texas created and adopted a higher education plan outlining goals intended to closing the academic gaps associated with college participation, success, and educational excellence (THECB, 2014b). Known as *Closing the Gaps by 2015*, this state plan identified higher education goals, set a date of 15 years by which time the state of Texas should reach those goals, and created a means by which the state could measure progress towards those goals. In accordance with *Closing the Gaps by 2015*, the TASP was phased out and replaced by the Texas Success Initiative (TSI) in 2003 (THECB, 2016b). As noted by Saxon and Slate (2013), remedial assessment and referral decisions previously mandated by the TASP

were now localized to individual institutions of higher education to provide them more flexibility in determining the college readiness of the specific students they were looking to enroll.

In 2003, the 78th legislative session saw the Texas Legislature intensify the focus on secondary education. This new era witnessed many, ". . . new programs, assessments, collaborative leadership efforts, accountability measures, and grant programs aimed at improving postsecondary readiness" (Mahoney et al., 2009, p. 7). The Texas High School Project of 2003 was a joint venture between the state of Texas, the Texas Education Agency, the Bill & Melinda Gates Foundation, and the Susan Dell Foundation to invest $130 million directly into redesigning underperforming high schools and supporting at-risk students (SRI International, 2003). Additionally, the Texas Legislature initiated a system-wide council to ensure long-range educational plans and programs aligned with the entire Texas public education system. Known as *P-16*:

> The plan created strategic actions plans that included definitions of the standards for college readiness, descriptions of P-16 individual graduation plans, recommended strategies for decreasing the number of students in developmental education, and recommended changes to teacher certification and professional development to assist public schools in preparing students for college. (Mahoney et al., 2009, p. 8)

In 2006, the 79th Legislature brought about widespread changes to Texas public school college-ready plans (Mahoney et al., 2009). Senate Bill 976 began the *Early College Education Program* which directed the state of Texas Commissioner of Education and the Texas Higher Education Coordinating Board to establish and administer early college high schools and education programs for at-risk students in danger of dropping out of high school. Additionally, House Bill 1 (HB1), which brought about statewide tax relief and public school finance provisions, was equally known for ambitiously addressing Texas public school success and college readiness. First, HB1 created vertical teams of educators for the purpose of evaluating

high school graduation requirements and establishing college readiness standards for language arts, mathematics, science, and social studies. Secondly, HB1 required Texas public schools to offer their students the opportunity to earn a minimum 12 semester hours of college credit through advanced placement, dual-credit, or international baccalaureate courses and increased the number of math and science credits required for graduation (Mahoney et al., 2009). Lastly, known as the *4x4 Plan*, HB1 mandated that every Texas public high school student be required to take four years of math, science, social studies, and language arts. Knowing that the implementation of the *4x4 Plan* would be financially challenging for school districts, HB1 also initiated a $275 per student *High School Allotment* for every student in Grades 9-12 (THECB. 2016a).

Texas' *60x30TX* higher education plan replaced *Closing the Gaps by 2015*. Implemented by the state in June 2015, this new Texas plan created and outlined three ambitious goals for Texas colleges and universities in the areas of increased degree completion, identifiable marketable skills, and reduced student loan debt. With the objective of at least 60% of Texans ages 25-34 holding a certificate or degree by the year 2030, this overarching goal of *60x30TX* was based upon the premise that, "higher education increased freedom from poverty, afforded social mobility, and encouraged greater participation in the public arena" (THECB, 2015, p. 13). The *60x30TX* plan began with the first goal of increasing the number of students obtaining a certificate, associates, bachelors, or master's degree from a Texas institution of higher education by defining four specific strategies: expand co-requisite course opportunities that allow students to take credit-bearing coursework while also taking developmental education courses to improve their skills, implemented competency-based programs to allow adult students the ability to demonstrate essential skills or knowledge, take advantage of existing assessments such as the

Texas Success Initiative Assessment to more accurately determine students' strengths and weaknesses, and create electronic degree plans to aide students in understanding prerequisites for specific degree plans (THECB, 2015). Concerning the second goal for Texas colleges to create identifiable marketable skills, the *60x30TX* plan encouraged collaboration with local chambers of commerce and other workforce related organizations to identify job and industry skills and created opportunities for students to acquire workplace experience that would also count towards college credit. Lastly, in an effort to reduce the amount of accumulated student debt, the *60x30TX* plan outlined strategies to help two-year and four-year institutions better counsel students concerning determining degree plans earlier in their postsecondary careers, helped students narrow their course and program choices, and emphasized the need to plan, enroll, and complete an appropriate number of semester credit hours needed to achieve their certificate or degree in a timely manner (THECB, 2015).

Traditional Indicators of Postsecondary Success

With increasing numbers of high school students now enrolled into postsecondary institutions, the focus on increasing the number of these students who possessed entry-level college coursework skills and competencies became increasingly paramount. This portion of the literature review is focused on examining several of the traditional indicators commonly attributed to high school students' postsecondary success.

Advanced Coursework

Extensive research was performed with the focus of determining predictors of college readiness, research findings consistently indicated the quality and intensity of a student's high school curriculum and coursework was a major predictor for their college readiness (ACT, 2007; Adelman, 2006; Geiser & Studley, 2002; Hoffman, Vargas, Venezia, & Miller, 2007). The

intensity and quality of student's high school curriculum had greater relationship to college degree completion than high school achievement scores and overall grade point average (Fernandez, Fletcher, & Klepfer, 2017). Adelman (2006) cited a rigorous high school coursework as a key predictor for student postsecondary success. Adelman found high school students completing rigorous courses in English; foreign language; social studies; pre-calculus, calculus, or trigonometry; and biology, chemistry, or physics were 95% more likely to obtain their bachelor's degree. Studies performed by ACT (2007) supported Adelman's findings by surmising that high school curriculum should consist of a minimum three years' study of math consisting of at least algebra I, geometry, and physics; and three years study of science consisting of at least biology, chemistry, and physics (ACT, 2007).

College mathematics courses of algebra and calculus were found to be the most often failed and dropped courses at the postsecondary level (Adelman, 2006). Klepfer and Hull (2012) found high school students dramatically improved their likelihood of college degree completion if they had successfully completed high school level pre-calculus and calculus. Additionally, students that had completed algebra I in the eighth grade and algebra II in the ninth grade were found to be less likely to need developmental education at the college level (Klepfer & Hull, 2012; Lee, 2012).

Many school districts across the United States and the state of Texas implemented advanced academic courses designed to enhance the academic rigor of their secondary curriculum intended to help bridge the gap between high school and college. According to Maruyama (2012), "the effectiveness of postsecondary education increases when students aspiring to attend college have developed academic skills preparing them to succeed" (p. 252). ACT (2010a) reported students taking additional courses above the core curriculum were more

likely to achieve college readiness, benchmark standards. Advanced academic course offerings became more common among secondary schools. Hughes (2010) reported Texas had made it mandatory for its high schools to offer students the option to earn at least 12 college-level SCH's through any combination of AP, IB, or DC advanced academic coursework. The two most common advanced academic courses taken by Texas high school students were found to be AP and DC.

Since the late 1950s, AP courses were offered through collaboration between local school districts and the College Board, and continue to be the most readily available means for secondary schools to increase academic challenges for their students (Conley, 2005). Students who successfully completed high school AP courses were found to have had more success on all measures of academic achievements through both high school and college, and were more likely to graduate from a four-year university as compared to students who did not participate in high school AP courses (Scott, Tolson, & Lee, 2010). Advanced coursework was consistently considered to be the main predictor for both high school completion and college persistence (Byrd & Macdonald, 2005; Conley, 2005; Royster et al., 2015). The AP program presented academically motivated students the opportunity to take college level coursework while in high school, and offered them the ability to obtain college credit through an examination process. The AP program offered 37 advanced courses in 22 subject areas, and more than 3,600 colleges and universities around the world awarded admission credit based on AP examination results (Scott, Tolson, & Lee, 2010).

The exam was designed to assess student knowledge and skill through levels needed for entry-level college coursework. According to Conley (2005), "the format favors students who develop mastery of content knowledge and key concepts as well and analytic and writing skills

consistent with college work. Therefore, AP courses that are properly taught improve students' readiness for college" (p. 50). Academic achievement in the form of course grades throughout the duration of an AP course had no bearing on earning college credit. Instead, whether or not a student earned college-level credit was dependent upon their score on an end-of-course AP exam, and whether or not the college they were admitted to accepted that particular score (Hughes, 2010). Additionally, Hein, Smerdon, and Sambolt (2013) reported scoring a 3 or higher on the AP exam was positively correlated with college enrollment and course persistence during a student's first two years of postsecondary education. Students who participated in these programs were found to be better prepared for postsecondary coursework, and therefore more likely to pursue additional coursework in that subject and field of study. Scott et al. (2010) found the most common courses for AP credit taken by Texas high school students were mathematics, English language, and history.

With respect to advanced academics, the literature showed student participation in dual-enrollment programs was also significant to high school students' college success (Hughes, Karp, Fermin, & Bailey, 2005; Karp, Calcagno, Hughes, Jeong, & Bailey, 2008; THECB, 2016a). The Texas Higher Education Coordinating Board (THECB) defined dual credit as a process by which a high school junior or senior enrolled in a college course and received simultaneous academic credit for the course from both the college and the secondary campus (THECB, 2016a). As compared to their non-dual enrollment peers, researchers found high school students enrolled in DC coursework were more likely to earn their high school diploma, had a greater chance to gain admission into a four year institution, were more likely to persist with their college education, and had higher college GPAs (Hughes et al., 2005; Karp et al., 2008).

Pretlow and Wathington (2014) reported even though dual enrollment programs often varied in structure, 46 states had adopted some form of DC policy. While high school students had the option of enrolling and taking DC courses with college students on a college campus or online, the majority of dual credit courses in Texas were taught on secondary campuses to high school students only (Conley, 2005). Even though these courses were scheduled and occurred on high school campuses and were most often taught by high school teachers serving as college adjuncts, this DC coursework assessed identical content to similar courses being taught at college campuses or online by college professors (Hughes, 2010). In contrast to AP, DC students were assigned and completed the same course assessments as were normally completed as part of the college course, and their final grade was issued on a college transcript (Hughes, 2010).

The state of Texas experienced a steady rise in high school student participation in dual credit programs in the 10-year span from 1999-2009, and saw DC enrollment increased 765% (THECB, 2016a). In the year 2013, 107,599 high school students in Texas concurrently enrolled into dual credit courses, with 4% concurrently enrolled into public four-year universities and 96% concurrently enrolled into public two-year colleges (TEA, 2017a). This increase in student participation was linked to the advantages offered by DC programs which included: the likelihood that a DC student completed high school, enrolled, and persisted in college; the decreased cost of college tuition; and an accelerated student time to degree (NRC, 2012; THECB, 2016a). Furthermore, the NRC (2012) found DC students were more likely than their peers to pursue a bachelor's degree, and student participation in DC was positively related to first semester college GPA.

The ACT and SAT College Admission Examinations

Each year, millions of high school students from around the country signed up and paid to take the SAT and the ACT, the United States' most used college admission tests (Atkinson, 2001). Designed to be taken by students while they are still in high school, both the SAT and ACT were designed to measure examinees' academic readiness for postsecondary coursework and college readiness standards. The SAT was developed by the College Board with guidance from exam development committees comprised of professional educators and subject matter experts (TEA, 2015). The SAT consists of three sections: critical reading, mathematics, and writing. First used as a college readiness assessment in 1933, the SAT was adopted by Harvard University as an instrument to assess the cognitive abilities, not just the information learned in high school, of university scholarship candidates (Public Broadcasting System, 2014). In contrast, the ACT was developed in 1959 by Everett Lindquist as an alternative to the SAT that would measure both cognitive abilities and the levels of information actually learned in high school (Lindsay, 2015). TEA (2015) reported the ACT examination was developed using a range of information, including state curriculum frameworks, state-adopted textbooks, surveys of college teaching staff, and professional consultation at both the secondary and postsecondary levels.

ACT (2010a) created the college readiness benchmarks, a system comprised of multiple components involving ACT subject-area exam scores that represented achievement benchmarks to help colleges and universities determine which students were sufficiently prepared to begin college entry-level courses. These target benchmark scores in English, mathematics, reading, and science were created to provide performance-based measures and were based on actual grades earned by college students (ACT, 2010a). In line with academic skills and knowledge

definitions of college readiness, ACT (2016) boasted that students meeting their college readiness benchmarks ". . . had a 50 % chance of obtaining a B or higher or about a 75 percent chance of obtaining a C or higher in corresponding credit bearing first year college courses" (para. 1). Table 2 displays a comparative illustration of the SAT and the ACT college entrance examinations. Additionally, the ACT had an interest inventory section built into the assessment that allowed students to evaluate their interests in various career options.

Table 2

Comparison of the 2012-2013 ACT and SAT College Entrance Examinations

Components	ACT	SAT
Exam Length	215 questions: 2h, 55m Optional writing section: 30m	170 questions: 2h, 55m Required writing section: 25m
Incorrect Answers	No penalty	¼ point reduction for each question attempted but scored as incorrect
Scoring	Range:1-36 average of all sections	Range: 200-800 for each section Possible high score of 2400
Structure	English Mathematics Reading Science Optional Writing	Critical Reading Mathematics Writing

Note. TEA, 2017b, p. 2

While the ACT and SAT college entrance examinations might have been commonly accepted as traditional indicators of college readiness and success, some researchers cautioned against blindly accepting these exams as universal determinates of college success. Conley (2003) argued these tests were not reliable college readiness indicators because there was no correlation between mastery scores on these exams and the acquisition of skills and knowledge

necessary for college-level success. Many high school students were likely to be left with a false sense of preparedness based on their ACT and SAT scores; and it was likely some colleges recruited and admitted students based on these national norm-based exams, only to discover these students were not actually as prepared for college as originally believed (National Center for Public Policy and Higher Education, 2010). Geiser and Studley (2002) reported the SAT was a poor predictor of student college performance as compared to a student's mastery of their high school curriculum. Furthermore, they found the SAT as a college admission criterion commonly had a negative effect on poor and minority college applicants as compared to criterion based on high school class rank and overall academic achievement.

Economically Disadvantaged

In educational research, one of the most commonly discussed variables in relationship to student academic success was socioeconomic status (SES). The Texas Education Agency (2014) defined the SES identification of PK-12 students as *economically disadvantaged* when any student was from a family with an annual income at or below the official federal poverty line, or met eligibility requirements for free or reduced-price meals under the National School Lunch and Child Nutrition Program, programs assisted under Title II of the Job Training Partnership Act (JTPA), Food Stamp benefits, Temporary Assistance to Needy Families (TANF), or other public assistance; this definition of economically disadvantaged applied to students who received Pell grants or a comparable state program of need-based financial assistance in college. Fernandez et al. (2017) noted among the six largest states in 2015, Texas had the highest overall poverty rate at 15.9%. Harwell and LeBeau (2010) found SES to be a recurring educational literature topic, and frequently studied variable common to many educational studies spanning over 90 years. Education literature often included SES because it routinely correlated with many other variables

(Tate & Gibson, 1980) and consistently accounted for much of the observed variance in education research (Jeynes, 2002). Lower income students who resided in rural and poorer communities had the greatest educational disadvantages because they often did not have the same levels of family support and school resources available to more wealthy families and communities (Blackboard Institute, 2010). Harwell and LeBeau (2010) noted SES definitions were very broad and might often have different applications given a specific study, and therefore researchers should provide a clear rationale for including SES in their study's purpose.

When considering the 5,135,880 children enrolled in Texas schools in 2013, TEA (2014) reported over 3 million (60.3%) were identified as being economically disadvantaged or low SES. These students also had the lowest school attendance rates, accounted for 65% of the students who dropped out of Grades 9-12, and made up the greatest percentage of students who failed to achieve passing standards on end-of-course exams (TEA, 2017a). Students from low SES backgrounds often displayed lower educational aspirations, reduced secondary and postsecondary persistence rates, and decreased college degree obtainment as compared to their non-economically disadvantaged peers. Concerning parental expectations of their children:

> . . . low SES parents are more likely to view a high school diploma as the norm for their children than high SES parents, to whom a bachelor's or advanced degree is considered the norm. Low SES parents are more likely to define success as a secure full-time job after graduating from high school. College attendance is not an expectation and often means enrolling in a community college or technical school when it does occur. For high SES parents, the definition of success for their children is tightly tied to four years of college attendance. (Walpole, 2003, p. 48)

Furthermore, data compiled by Fernandez et al. (2017) showed economically disadvantaged students in Texas were less likely to enroll into college immediately following their high school graduation, and those who did immediately enroll in college were more likely to attend a two-year community college as compared to a four-year university. Overall, as compared to their

non-economically disadvantaged peers, the review of literature showed that economically disadvantaged students were more likely to struggle through high school, less likely to attend college immediately following high school graduation, and had a greater chance of attending a two-year community college.

Limited English Proficiency

The state of Texas saw an unprecedented amount of public school student growth from 2000-2010. During this time span, TEA (2014) reported public school student enrollment in the state of Texas increased by 21.6% from 2000-2010, equating to approximately four times the overall increase in public school enrollment experienced by the United States. During this time, the proportion of public school students in Texas identified as English language learners (ELL) who received limited English proficiency (LEP) educational services increased 46.9% (TEA, 2014). ELL were defined as students who did not speak English as their primary language, and had a limited ability to read, speak, write, or understand the English language (TEA, 2014).

Concerning ELL and LEP individuals, Klein, Bugarin, Beltranena, and McArthur (2004) reported "63% of all language minorities in the United States were native born – that is, they were born in the United States or its outlying areas" (p. iv). For the school year 2012-13, TEA (2014) reported the public schools in Texas were providing LEP educational services to approximately 865,000 students, 91% of which were Hispanic. Concerning Texas public school Hispanic students, the Hispanic/Latino ethnic category included students of Cuban, Mexican, Puerto Rico, South or Central America, or other Spanish culture or origin (TEA, 2014). By 2050, the state of Texas projected that 61% of all PK-12 aged children will be Hispanic (Fernandez et al., 2017).

A disproportionate number of LEP students did not matriculate into postsecondary education, and a large percentage that did often enrolled only in two-year community college (Flores & Drake, 2014; Kanno & Cromley, 2012). When compared to their English-speaking classmates, LEP students consistently showed lower college and university enrollment with only 6% who did not speak or read English as their primary language being successfully enrolled in a postsecondary institution (Klein et al., 2004). Among all LEP students, Hispanic students were less likely than all other language minority groups to be enrolled in a postsecondary institution (Fernandez et al., 2017). If they attended college, Hispanic students were more likely to attend a two-year community college and to be required to take college-level remedial education coursework (Staklis & Horn, 2012). Payan and Nettles (2008) found 63% of all Hispanic students attending postsecondary institutions were enrolled into at least one remedial course. Bahr (2010) suggested Hispanic students were at a disadvantage when it came to persisting through college-level remedial coursework largely due to their high school academic skill levels upon entering college.

Academically At-Risk

In regards to education research, a review of literature found there to be many factors associated with the identification of students as *at risk*. The term was frequently utilized to describe individual students or groups of students who were considered to have a high probability of failing academically or dropping out of school. In determining the factors specifically associated with Texas high school students, the Texas Education Code (2013) defined a student as being at-risk of dropping out of school if:

> they were under 26 years of age and not advanced from one grade to the next for one or more school years; in Grades 7-12 did not maintain an average of 70 on a 100 point scale in two or more subjects during any semester; did not meet satisfactory performance on state assessment instruments; was pregnant or was a parent; was placed in an alternative

> education program at the secondary junior or senior years; was expelled from secondary school during their junior or senior years; was on parole, probation, or deferred prosecution; was previously reported as having dropped out of school; had limited English proficiency, was in the custody or care of the Department of Protective and Regulatory Services; was considered homeless; or had resided in a residential placement facility within the past two years. (TEC, Sec. 29.081 (d))

Summary

Sixty percent of first-time community college students and 29% of first-time university students were themselves in need of postsecondary developmental education (Bailey & Alfonso, 2007). Adequately preparing high school students to transition into college entry-level coursework successfully, without remediation, continued to be at the forefront of both secondary and higher education discussion. A review of literature revealed abundant information on the characteristics and attributes higher education believed high school students must possess in order to matriculate into entry-level college coursework successfully. But the review of literature found limited information concerning campus-level indicators, campus-level predictors, or other potential campus-level factors that had the highest probability of producing the greatest high school student postsecondary readiness and success. Once these programs, strategies, and initiatives were identified, recommendations were made to secondary educators to help them understand and identify which of their programs, and ultimately which of their students, would be more likely to begin entry-level college coursework without the need of developmental education. Chapter 3 included details pertaining to the purpose and design of this study, as well as the guiding questions and an examination of the key variables under investigation.

CHAPTER 3

METHOD

While abundant information on student-level college readiness indictors existed, the researcher found limited literature concerning high school campus-level predictors of college success. In this chapter, the researcher addressed the research method used in this study which included a description of the study's design, participants, variables, data collection, and data analysis. This study was a quantitative analysis of first-year college freshman data taken from a large two-year college located in Central Texas and selected Texas high school campus data obtained from the Texas Education Agency. Multiple linear regression analytics and descriptive statistics were used to investigate high school campus-level variables of first-year college freshman to determine if statistically significant predictability existed in regards to the need for these students to be enrolled into college-level remedial education coursework. In this quantitative study, the researcher utilized a multiple linear regression model to investigate relationships between high school campus-level variables and remedial education courses taken by first-year college students to answer the research questions:

1. Do high school campus-level variables of incoming freshmen at a Central Texas two-year college predict a student's enrollment into remedial education?
2. To what extent do high school campus-level variables of incoming freshmen at a Central Texas two-year college predict a student's enrollment into remedial education?

Purpose

The purpose of this study was to evaluate the predictive validity of high school campus-level variables in order to identify possible areas of attention that might aid secondary schools'

abilities to predict which of their students were more likely to ultimately require remedial intervention at the postsecondary level. This researcher attempted to identify associations between first-year college students enrolled in non-credit bearing remedial coursework during their first semester at the study site Central Texas two-year college, and campus characteristics from the Texas public high schools from which they graduated. This focus was intended to increase the understanding of which high school campus factors were most significantly associated with college remediation. The intent of the research was to help define policy and aide in decision-making processes that emphasized college readiness needs and programs for secondary schools to increase the number of students graduating high school sufficiently prepared and academically ready to be successful at the postsecondary level.

Research Design

In this study, the researcher investigated the predictive relationships between Texas public high school campus factors of high school students graduating in spring 2013 who immediately enrolled in first-year college freshman level remedial coursework at the study site Central Texas two-year college during the fall of 2013. The goal of this study was to determine the strength of relationship between Texas high school campus-level factors and student enrollment into remedial education courses at study site Central Texas two-year college. In this quantitative study, the researcher utilized a linear multiple regression model to examine the predictive relationship between multiple high school campus-level predictors and first-year college student enrollment into remedial coursework.

Multiple regression analysis is "broadly applicable to hypotheses generated by researchers in behavioral sciences, health sciences, education, and business" (L. Cohen, Cohen, West, & Aiken, 2003, p. 29). Tabachnick and Fidell (2000) reported, "multiple regression

analysis is an extension of bivariate regression in which several independent variables are combined to predict a value on a single dependent variable" (p. 111). Multiple regression analysis provided a logical analytic system for this situation where a quantitative dependent variable was to be studied in relationship to any number of independent factors of interest (L. Cohen et al., 2003; L. Cohen, Manion, & Morrison, 2007; Field, Miles, & Field, 2012). It enabled researchers to predict and weight the relationship between explanatory and explained variables (L. Cohen et al., 2007). Given the goal of the study was to determine the strength of relationship that multiple high school campus-level variables had in predicting enrollment into college remedial education courses, a multiple regression inquiry was chosen as this study's analytic method.

Data Sources

Data sources utilized for this study included first-year college student data (n = 5,036) from the study site, a large two-year college located in Central Texas and campus-level data corresponding with the 296 Texas public high schools from which they graduated obtained from the Texas Education Agency. Texas public school districts were classified into one of eight district types as determined by the school district's community type, school district enrollment, school district community economic status, and geographic location in relation to urban areas as shown in Table 3.

Concerning the Texas public high school campuses from which these first-year study site Central Texas two-year college students had recently graduated, the majority of students or 37% graduated from Major Suburban school districts, 17% graduated from Central City school districts, 16% graduated from Central City Suburban school districts, 9% graduated from Independent Town school districts, 8% graduated from Non-Metropolitan Stable Growth school

districts, 7% graduated from Major Urban school districts, 5% graduated from Rural school districts, and less than 1% from Non-Metropolitan Fast Growth school districts.

Table 3

School District Classifications (TEA, 2017a)

Classification	Criteria
Major Urban	(a) located in a county with a population of at least 870,000; (b) enrollment was the largest in the county or at least 75% of the largest district enrollment in the county; and (c) at least 35% of enrolled students were economically disadvantaged.
Major Suburban	(a) did not meet the criteria for classification as major urban; (b) was contiguous to a major urban district; and (c) enrollment was at least 3% that of the contiguous major urban district or at least 4,500 students.
Other Central City	(a) it did not meet the criteria for classification in either of the previous subcategories; (b) it was not contiguous to a major urban district; (c) it was located in a county with a population of between 100,000 and 869,999; and (d) its enrollment was the largest in the county or at least 75% of the largest district enrollment in the county.
Other Central City Suburban	(a) did not meet the criteria for classification in any of the previous subcategories; (b) located in a county with a population of between 100,000 and 869,999; and (c) enrollment was at least 15% of the largest district enrollment in the county.
Independent Town	(a) it did not meet the criteria for classification in any of the previous subcategories; (b) it was located in a county with a population of 25,000 to 99,999; and (c) its enrollment was the largest in the county or greater than 75% of the largest district enrollment in the county.
Non-Metropolitan: Fast Growth	(a) did not meet the criteria for classification in any of the previous subcategories; (b) enrollment of at least 300 students; and (c) enrollment had increased by at least 20% over the past five years.
Non-Metropolitan: Stable	(a) did not meet the criteria for classification in any of the previous subcategories; and (b) enrollment exceeded the median district enrollment for the state
Rural	(a) enrollment between 300 and the median district enrollment for the state and an enrollment growth rate over the past five years of less than 20%; or (b) enrollment of less than 300 students.

Furthermore, it appeared the majority of first-year study site Central Texas two-year college students graduated from high school campuses located within the immediate service area of college. Table 4 indicates the top 25 Texas high schools that sent first-year college students to the Central Texas two-year college during the 2013 Fall Semester.

Table 4

Top 25 Texas High Schools Sending Freshman to the Study Site College 2013 Fall Semester

			Campus and School District Information		
Rank	Students	%	Campus Name	District Name	District Category
1	226	3.9	A&M Consolidated	College Station ISD	Central City
2	224	3.9	James Earl Rudder	College Station ISD	Central City
3	109	1.9	Brenham	Brenham ISD	Independent Town
4	91	1.6	The Woodlands	Conroe ISD	Central City
5	63	1.1	Katy	Katy ISD	Major Suburban
6	60	1.0	Cypress Woods	Cy-Fair ISD	Major Suburban
7	60	1.0	Tomball	Tomball ISD	Major Suburban
8	59	1.0	Taylor	Taylor ISD	Central City Suburban
9	55	1.0	Seven Lakes	Katy ISD	Major Suburban
10	53	0.9	Cinco Ranch	Katy ISD	Major Suburban
11	51	0.9	Austin	Fort Bend ISD	Major Suburban
12	51	0.9	Navasota	Navasota ISD	Central City Suburban
13	50	0.9	Bellville	Bellville ISD	Independent Town
14	48	0.8	Friendswood	Friendswood ISD	Central City Suburban
15	47	0.8	Sealy	Sealy ISD	Central City Suburban
16	46	0.8	Cypress Fairbanks	Cy-Fair ISD	Major Suburban
17	43	0.7	La Grange	La Grange ISD	Independent Town
18	43	0.7	Montgomery	Montgomery ISD	Central City Suburban
19	42	0.7	Klein	Klein ISD	Major Suburban
20	41	0.7	Klein Oaks	Klein ISD	Major Suburban
21	41	0.7	Waller	Waller ISD	Independent Town
22	40	0.7	Caldwell	Caldwell ISD	Central City Suburban
23	40	0.7	Cypress Falls	Cy-Fair ISD	Major Suburban
24	39	0.7	Foster	Lamar CISD	Central City
25	38	0.7	Reagan	North Side ISD	Major Urban

Variables Examined

In this quantitative study, the researcher utilized a linear multiple regression model to examine the predictive relationship between multiple high school campus-level predictors and first-year college student enrollment into remedial coursework.

Dependent Variable

The dependent variable for the study represented the percentage of students from each Texas public high school campus enrolled into at least one student credit hour (SCH) of remedial education during their first semester as a freshman at the study site Central Texas two-year college during the 2013 fall semester. This continuous variable was reported in the study as a campus-level percentage ranging from 0-100. This campus-level percentage was calculated by dividing the total number of graduates from each of the high school campuses by the total number of graduates from that campus who were enrolled into at least one remedial SCH their first year enrolled into study site college. Table 5 shows 69.0% of the 3,970 first-year students included in the sample population did not enroll in any remedial course hours, while 31.0% (1,783 students) enrolled in at least one or more remedial SCH their first year as a college freshman at the study site college.

Table 5

Frequency and Percentage of Remedial Education Student Credit Hours During the First Semester of 2013

	Statistics		
Dev Ed SCH	Frequency	%	Cumulative %
0	3970	69.0	69.0
1	1783	31.0	31.0
Total	5753	100.0	

Independent Variables

Multiple high school campus-level predictors were selected to be included as independent variables of interest for the study. Each of these campus-level predictors was common to all high school campuses included in the study, and each predictor was included in the analysis as a continuous variable. A list and definitions of independent variables used in the study at the campus level were:

- *At-Risk* was defined as the percentage of high school campus students at risk of dropping out of school if they were under 26 years of age and not advanced from one grade to the next for one or more school years; in Grades 7-12 did not maintain an average of 70 on a 100 point scale in two or more subjects during any semester; did not meet satisfactory performance on state assessment instruments; was pregnant or was a parent; was placed in an alternative education program at the secondary junior or senior years; was expelled from secondary school during their junior or senior years; was on parole, probation, or deferred prosecution; was previously reported as having dropped out of school; had limited English proficiency, was in the custody or care of the Department of Protective and Regulatory Services; was considered homeless; or had resided in a residential placement facility within the past two years. *At-risk* percentage was measured as a continuous variable.
- *Economically Disadvantaged* was defined as the percentage of high school campus students eligible to receive free or reduced-price meals or who were eligible for other public assistance. *Economically Disadvantaged* percentage was measured as a continuous variable.

- *Limited English Proficient* (LEP) was defined as the percentage of high school campus students whose primary language was one other than English. *LEP* percentage was measured as a continuous variable.
- *Advanced Course/Dual-Enrollment* was defined as the percentage of high school campus students who completed and received credit for at least one advanced course or dual-enrollment course for Grades 9-12. Advanced courses were defined as either advanced placement (AP) courses or international baccalaureate (IB) courses where students could be awarded college credit for scores of 3, 4, or 5 on an AP examination or scores of 4, 5, 6, or 7 on an IB examination. Dual-enrollment was defined as a course where students received advanced academic instruction above that of normal secondary courses where students earned both high school and college credit. *Advanced course/dual-enrollment* percentage was measured as a continuous variable.
- *Math College Ready* was defined as the percentage of high school graduates that met or exceeded college-ready criteria on state exit-level examinations (≥ 2200 scale score), or the SAT examination (≥ 500 on math and ≥ 1070 Total Score), or the ACT examination (≥ on math and ≥ 23 Composite Score). *Math college ready* percentage was measured as a continuous variable.
- *English College Ready* (ELA) was defined as the percentage of high school campus graduates that met or exceeded college-ready criteria on state exit-level examinations (≥ 2200 scale score on ELA and 3 or higher on essay), or the SAT examination (≥ 500 on Critical Reading and ≥ 1070 Total Score), or the ACT examination (≥ 19 on English and ≥ 23 Composite Score). *English College Ready* percentage was measured as a continuous variable.

- *ACT Average* was defined as the average ACT composite score for all high school campus graduates as calculated by dividing the total number of ACT examinees by the sum of ACT scores. *ACT Average* was measured as a continuous variable.
- *SAT Average* was defined as the average SAT total score for all high school campus graduates as calculated by dividing the total number of SAT examinees by the sum of SAT scores. *SAT Average* was measured as a continuous variable.

Data Collection

Multiple reports and resources from the Central Texas two-year college and the Texas Education Agency (TEA) were utilized to create the culminated data source analyzed in this study. All information was publically accessible and retrieved in accordance with the guidelines and procedures outlined by the Family Educational Rights and Privacy Act (FERPA).

Concerning the Central Texas two-year college data, queries were obtained from archived the Central Texas two-year college databases to produce Texas Higher Education Board (THECB) student data Coordinating Board Management (CBM) reports. CBM001 and CBM002 were annual student data reports created by all postsecondary educational institutions operating in Texas. The THECB student report CBM001 provided a summary of the Central Texas two-year college student data for all students enrolled for the 2013 fall semester including high school institution campus code, student ID number, gender, ethnic origin, academic semester, academic year, residence status, and total SCH enrolled course hours. THECB student report CBM002 provided a summary of the Central Texas two-year college student data for all students enrolled in remedial education hours for the 2013 fall semester. CBM001 and CBM002 were created in a comma delineated format using de-identified identification numbers to protect personal student information. Using Microsoft Excel 2010, CBM001 and CBM002 were merged

together to produce a single combined fall 2013 Central Texas two-year college student data set indicating an overall study site enrollment of n = 17,908. Column information for this combined college student data set was retitled using the *Reporting and Procedures Manual for Texas Community, Technical, and State Colleges* (THECB, 2014a).

Concerning Texas public high school campus-level data, high school campus identification codes and high school campus-level accountability information for 2013 student graduates were downloaded from TEA's publically accessible website into a comma delineated spreadsheet. Using Microsoft Excel 2010, high school campus code information was merged with the public school accountability information obtained from TEA to produce an aggregated data set for all the Texas high schools that graduated students in the spring of 2013.

Finally, using the Texas high school campus identification codes present in both the TEA high school campus data and the combined college student data set, the two individual data sets were merged together to create a master data spreadsheet containing all 2013 Texas high school campus-level information and the 2013 Central Texas two-year college student data. This master data set was then formatted for analysis, screened for erroneous entries, and sorted to include only Texas high school campus information related to the first-year students enrolled into the Central Texas 2 year college for the 2013 fall semester. This master data set identified 5,036 first-year students that represented 296 Texas public high school campuses. Note that TEA did not post the public archived public school information in real time. At the time of this analysis, archived public school information had been updated only through the spring 2013 academic school year, thus providing the reasoning for using the Central Texas two-year college admissions data for the 2013 fall semester.

Limitations

Data for this research study were limited to the specific public high school campuses of first-year, first semester college students gaining admission into the Central Texas two-year college during the 2013 fall semester. Additionally, current college students who met the immediate college enrollment after high school graduation criteria, but who did not graduate from the state of Texas, or who graduated from a Texas high school other than a public school, were excluded from this study. Furthermore, analysis showed the majority of students in this study's cohort graduated from high school campuses located within the general geographical service area of the college. Because of this, independent variable correlations reported in this study might vary from other geographic regions of Texas, and therefore might produce different results within this model. Similar to many other two-year postsecondary colleges, at the time this study was performed, the Central Texas two-year college had an open enrollment admission policy that required few student coursework or grade prerequisites. Therefore, this research study did not take into consideration students who were enrolled into this college's remedial courses, yet did not gain admission into the college immediately following their graduation from high school.

Data Analysis

Regression models were well suited for predicting the value of an outcome variable (Y) from values of one or more independent variables (X) (L. Cohen et al., 2003), and it was determined a multiple linear regression model was the best analytic system to run this analysis. Tabachnick and Fidell (2000) wrote the goal of regression analysis was to arrive at a set of regression coefficient values for each predictor variable that brought the Y values predicted from

the equation as close as possible to the Y values obtained by the analysis. The equation for this study's multiple regression analysis was expressed as:

$$Y = a + b_1X_1 + b_2X_2 + b_3X_3 + b_4X_4 + b_5X_5 + b_6X_6 + b_7X_7 + b_8X_8 + e$$

Y was the predicted value of the dependent variable, *a* was the *Y* intercept (value of *Y* when all *X* values = 0), X_1–X_8 represented the various independent variables, and b_1-b_8 were the regression coefficients assigned to each independent variable during regression analysis (Tabachnick & Fidell, 2000). Table 6 displays the variables for this multiple linear regression study.

Table 6

Variable−Multiple Linear Regression Analysis

Variable	Explanation of the Variable
Y	= % of high school campus students enrolled into the Central Texas two-year college remediation coursework
X1	= high school campus At Risk students percentage
X2	= high school campus Eco Disadvantage percentage
X3	= high school campus LEP students percentage
X4	= high school campus Advanced Course/Dual Enrollment students percentage
X5	= high school campus Math College Ready students percentage
X6	= high school campus ELA College Ready students percentage
X7	= high school campus ACT average
X8	= high school campus SAT average

The researcher entered the data into SPSS 22.0, and descriptive statistics (i.e., frequency, range, percentage, mean, and standard deviation) were calculated for each continuous variable included in the study. A series of bivariate correlation models were created to examine the correlations the high school campus-level variables had in relationship with first-year Central

Texas two-year college students being enrolled into remedial education coursework. Lastly, multiple regression analysis was performed on the eight selected predictor variables and the one outcome variable to determine predictive relationships.

A multiple linear regression was the statistical method chosen for this analysis. L. Cohen et al. (2007) reported assumptions for regression analysis included determination of adequate sample size, assumption of normality, assumption of linearity, assumption of homoscedasticity, and the assumption of independence of errors. Regression model assumptions were examined to ensure the analysis would produce accurate estimates and results. Pallant (2001) suggested using the following formula to determine minimum regression sample size: sample size $\geq 50 + (8 \times$ number of independent variables). With a sample size of 296 high school campuses, this study's sample size assumption was confirmed: 8 x 8 independent variables = 64, 50 + 64 = a minimum needed sample size of 114. Additionally, Stevens (2002) suggested using a sample size 20 times the number of independent variables when conducting regression analysis. This study's sample size of $N = 296$ exceeded the preferred sample size of 114 and 160, and therefore satisfied the minimum regression analysis sample size requirement.

Summary

The purpose of this study was to evaluate the predictive validity of high school campus-level variables in order to identify possible areas of attention that might aide secondary schools' abilities to predict which of their students were more likely to eventually require remedial intervention at the postsecondary level. The focus of this study was students enrolled in at least one remedial SCH during their first year as a college freshman at the Central Texas two-year college. The researcher used multiple linear regression analysis to examine the relationship between these students and their respective high school campus factors of percentage at-risk,

percentage economically disadvantaged, percentage limited English proficient, percentage with advanced course/dual enrollment, percentage college readiness math, percentage college readiness ELA, ACT average, and SAT average. The results of this linear multiple regression analysis allowed the researcher to determine if statistically significant predictive relationships existed between high school campus-level variables and first-year college student enrollment into remedial coursework. Chapter 4 included a presentation of the findings of this study and a discussion concerning the relationship of how the findings related to existing college-level developmental education literature.

CHAPTER 4

RESULTS

With this study, the researcher investigated the predictive relationships between high school campus-level characteristics and the percentages of high school campus graduates enrolled in at least one student credit hour of remedial education during their first year of college. The sample included first-year college students enrolled in the Central Texas two-year college during the fall semester of 2013. All 5,036 students in the sample were spring 2013 Texas public high school graduates that represented 296 Texas public high school campuses. Within this chapter are the findings related to this study. The researcher utilized descriptive statistics, Pearson correlations, and multiple regression analysis to examine the data.

This study was guided by the hypothesis that high school campus factors could be used to successfully predict a first-year college students' enrollment into postsecondary remedial education coursework. Research questions related to the predictive relationships between campus-level variables and enrollment in remedial college coursework. In this chapter, the researcher reported the results of the investigation in regards to the two research questions:

1. Do high school campus-level variables of incoming freshmen at a Central Texas two-year college predict a student's enrollment into remedial education?
2. To what extent do high school campus-level variables of incoming freshmen at a Central Texas two-year college predict a student's enrollment into remedial education?

In order to answer each of the study's research questions effectively, descriptive statistics and a predictive regression model were utilized to identify the level of relationship between the independent and dependent variables.

Power analysis for linear regression was conducted in G-Power to determine a sufficient sample size using an alpha of 0.05, a power of 0.95, and a large effect size of 0.35. With 8 campus-level predictors, G-Power calculation provided a sufficient sample size of 73 thereby confirming the sample size of 296 exceeded sample size assumptions. Figure 1 displays the power analysis of this study's regression model.

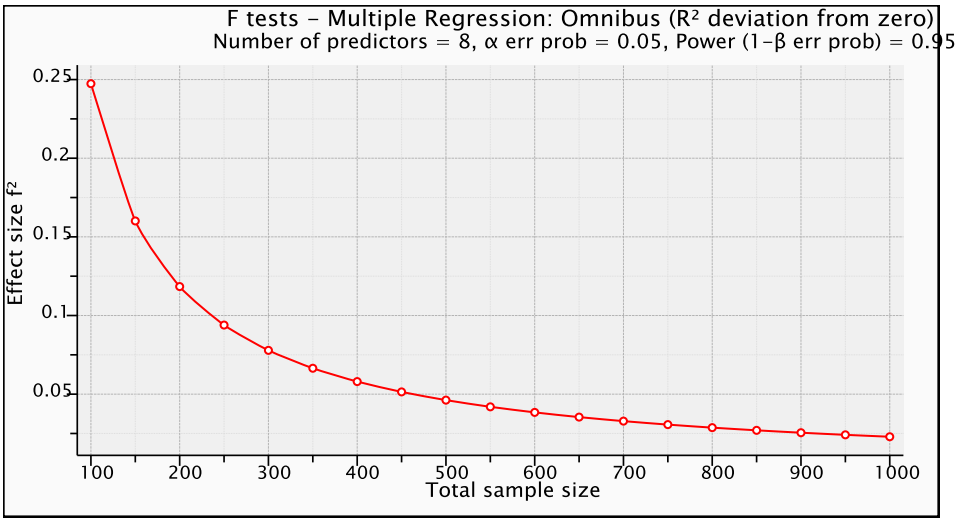

Figure 1. Power analysis of the multiple regression model.

Descriptive Statistics

For descriptive analysis, data consisted of demographic and college attendance data from 5,036 first year students at the Central Texas two-year college. Based on this college student-level analysis, campus means were calculated for 296 Texas public high schools. From these 296 public high school campuses, eight campus-level measures were chosen for analysis as independent variables. For five of the independent variables, low scores represented non-desirable campus output, while high scores would be considered successful. For example, a score of 1300 on the SAT was considered *lower* than a score of 1800. In the current study, this

progressive scale held for ACT, SAT, college-ready math, college-ready ELA, and advanced/dual participation. However, the three campus-level demographic variables—LEP, ECON, and at-risk—were typically viewed on an opposite scale. In fact, relatively low percentages of LEP, ECON, and at-risk typically aligned with higher achievement. Conversely, campuses with relatively high representations of LEP, ECON, and at-risk would tend to demonstrate lower scores on achievement measures. Based upon this assumption, the campus-level percentage variables LEP, ECON, and at risk were expressed in an inverse manner as percentage non-LEP, percentage non-ECON, and percentage non-at-risk. This approach aligned all eight independent variables, facilitating easy examination of correlations, and ultimately, a hypothesized direction of the relationship between the dependent variable and all predictors. It should also be noted the dependent variable, percentage of students requiring remedial hours, was calculated by dividing total students with remedial hours from a campus by the total number of students from that campus represented in the data set. Thus, a high number (percentage of students requiring remedial courses) would be viewed by campuses as a *negative* value. A relatively high representation in this group would be non-desirable. Therefore, it was hypothesized that all predictor variables would have a negative relationship with the dependent variable.

For the eight campus-level variables, the range, mean, and standard deviation values were calculated. Regarding the first-year students at the Central Texas two-year college studied, 1,262 (25.1%) indicated they were from low socio-economic households, while 3,774 (74.9%) indicated their household income was above the poverty threshold. In addition, 2,567 (51%) were male, while 2,469 (49%) were female. Regarding racial/ethnic origin of the 5,036 first-year students at the Central Texas two-year college, the majority of students in the study self-reported

as being White (63.6%). The remaining third of the students were Hispanic (863 at 17.1%), Black (708 at 14.1%), Asian (2.0%), and American Indian (91 at 1.8%), and provided no response (1.4%). Table 7 presents the gender and race distribution of the first-year college student data sample at the Central Texas two-year college.

Table 7

Gender and Ethnicity Distribution of First-Year College Students

	Statistics		
Gender/Ethnicity	Frequency	%	Cumulative %
Female	2,469	49.0	49.0
Male	2,567	51.0	100.0
Total	5,036	100.0	
Black	708	14.1	14.1
American Indian	91	1.8	15.9
Asian	101	2.0	17.9
Hispanic	863	17.1	35.0
White	3,205	63.6	98.6
No Response	68	1.4	100.0
Total	5,036	100.0	

Range, mean, and standard deviation statistics were examined for the eight independent campus-level predictor variables. Out of the 296 Texas high schools included in the analysis, 89% of the campuses had students enrolled into at least one remedial SCH at the Central Texas two-year college. Campus-level average ACT score was 21.1, and SAT score was 1460, with the highest scores for these exams reported as 27 and 1820 respectively. It was noted the highest possible scores on these exams in the year 2013 was a 32 for the ACT, and 2400 for the SAT. Concerning the student demographic information for the study's high school campuses, 3% of

the overall campus students were identified as being limited English proficient, 40% were identified as economically disadvantaged, and 38% were identified as at-Risk. Thirty-two percent of the students representing the high school campuses included in this study had taken at least one advanced or dual credit course in high school. Concerning high school campus ratings for college readiness, 78% of the campuses had been recognized as *College Ready Math*, and 70% had been recognized as *College Ready English/Language Arts*. Table 8 displays the descriptive statistics for the high school campus-level predictor variables.

Table 8

High School Campus−Level Descriptive Statistics

	Statistics					
Variable	*N*	Range	Min	Max	*M*	*SD*
Non-LEP	296	19.3	80.7	100.0	96.9	2.9
Non-Eco Disadvantage	296	89.3	10.7	100.0	60.5	19.5
Non-At Risk	296	64.0	28.0	92.0	62.1	13.3
ACT	296	28.1	0	27	21.1	3.5
SAT	296	1821.0	0	1820	1456.3	172.2
College Ready Math	296	99.0	0	98	78.1	10.1
College Ready ELA	296	96.0	0	95	69.4	12.1
Advanced Course	296	70.7	9.0	80	32.0	11.5
SCH Hours	296	88.9	0.0	89	32.3	19.7

Bivariate Correlations

Pearson correlations were used to assess the relationship between the dependent variable and independent variables. Regarding correlations between campus-level percentage of students taking college-level remedial coursework and the campus-level predictor variables, all eight

campus-level independent variables showed significant relationship at the $p < 0.05$ level. J. Cohen (1988) described effect size as < 0.1 = trivial effect, 0.1- 0.3 = small effect, 0.3- 0.5 = moderate effect, and > 0.5 = large effect. Non-LEP (r = -0.272) and advanced coursework (r = -0.247) showed weak correlations, indicating these two campus-level factors had a weak relationship with first-year college student remedial coursework. Table 9 displays the Pearson correlations among the variables.

Table 9

Pearson Correlations among Variable

Variables	1	2	3	4	5	6	7	8	9
Remedial Hrs. (1)	1.00								
Non LEP % (2)	-.272*	1.00							
Non Eco Dis % (3)	-.474*	.565*	1.00						
Non At Risk % (4)	-.360*	.543*	.780*	1.00					
ACT % (5)	-.388*	.297*	.612*	.480*	1.00				
SAT % (6)	-.308*	.241*	.640*	.530*	.674*	1.00			
CR Math % (7)	-.403*	.265*	.652*	.570*	.683*	.713*	1.00		
CR ELA % (8)	-.427*	.340*	.716*	.621*	.669*	.708*	.766*	1.00	
Adv Course % (9)	-.247*	.029*	.488*	.498*	.386*	.486*	.492*	.498*	1.00

Note. * Correlation significant at the 0.01 level (2-tailed).

Non-at-risk (r = -0.360), SAT % (r = -0.308), ACT % (r = -0.388), college ready math (r = -0.403), and college ready ELA (r = -0.427) had moderate negative correlations with first-year college student remedial coursework. Since the dependent variable was expressed in terms of percentage of students with remedial hours, the negative relationship was expected. Non-economically disadvantaged had strongest correlation (r = -0.474) indicating this high school

campus-level student demographic factor had the closest association to first-year college students taking remedial coursework. When converted to r^2, campus-level non-economically disadvantaged percentage accounted for 22% of the variance in first-year college students taking remedial coursework. While several variables showed strong correlations with each other, non-economically disadvantaged percentage showed to have the overall strongest campus-level correlations among the other predictor variables, including strong correlations with college-ready ELA (r = 0.716) and non-at-risk (r = 0.780).

Regression Analysis

Multiple regression analysis provided insight into the research questions by determining if the high school campus-level variables non-LEP, non-economic disadvantaged, non-at-risk, ACT, SAT, college level math, college level ELA, and advanced coursework predicted first-year college student enrollment into remedial coursework. Table 10 displays the multiple regression results.

Table 10

Regression of Non-LEP, Non-Econ, Non-At Risk, ACT, SAT, College Ready Math, College Ready ELA, and Advanced/Dual on College Remediation SCHs

Model	Unstandardized Coefficients		Standardized Coefficients	t	Sig.	95.0% Confidence Interval for B	
	B	Std. Error	Beta			Lower	Upper
(Constant)	88.112	45.444		1.939	.053	-1.335	177.558
Non LEP	-.194	.474	-.028	-.409	.683	-1.127	.739
Non Econ	-.352	.103	-.350	-3.420	.001	-.555	-.150
Non At Risk	.098	.130	.066	.754	.452	-.158	.355
ACT2013	-.716	.439	-.126	-1.631	.104	-1.579	.148
SAT2013	.020	.010	.174	2.082	.038	.001	.039
College Ready Math	-.221	.174	-.114	-1.271	.205	-.563	.121
College Ready ELA	-.258	.153	-.159	-1.681	.094	-.559	.044
Advanced/Dual	-.015	.114	-.009	-.135	.893	-.240	.209

Employing the *enter method*, results indicated the regression model of eight predictor variables had an $r^2 = 0.263$, thereby explaining 26.3% of the variance ($F(8,286)=12.74$, $p = 0.05$) in first-year college students taking remedial coursework. Of the eight campus-level predictor variables, analysis showed campus-level non-economically disadvantaged percentage ($p = 0.01$) and campus-level SAT score percentage ($p = 0.04$) to be statistically significant.

Research Question 1

Do high school campus-level variables of incoming freshmen at a Central Texas two-year college predict a student's enrollment into remedial education?

With Research Question 1, the researcher examined predictive relationships between high school campus-level variables and college-level remedial school credit hours to determine if the campus-level variables could be used to predict enrollment into postsecondary remedial education coursework. The dependent variable for the study represented the percentage of students from each Texas public high school campus enrolled into at least one student credit hour of remedial education during their first semester as a freshman at the Central Texas two-year college during the 2013 fall semester. Independent predictor variables examined for the study included campus-level: at-risk, economically disadvantaged, limited English proficient, advanced course/dual credit courses, math college-ready, English college-ready, ACT average, and SAT average.

The multiple regression model produced an *r*-square value of 0.263, indicating the model successfully explained 26.3% of the variance between first-year college students enrolled in remedial coursework at the Central Texas two-year college and the selected variables from the high schools from which they graduated. Furthermore, regression analysis indicated statistical significance of two high school campus-level variables: non-economic disadvantaged

percentage ($p = 0.01$) and SAT percentage ($p = 0.04$), significance was set at $p < .05$. Therefore, regression results regarding Research Question 1 suggested high school campus-level variables of incoming freshmen at a Central Texas two-year college provided a low level of prediction of a student's enrollment into remedial education.

Research Question 2

To what extent do high school campus-level variables of incoming freshmen at a Central Texas two-year college predict a student's enrollment into remedial education?

With Research Question 2, the researcher sought to expand Research Question 1 by exploring the level of predictive impact each of the selected campus-level variables had on college-level remedial coursework SCHs. Multiple regression analysis was used to determine the strength of relationship between first-year college student enrollment into remedial education coursework and the selected campus-level predictor variables: at-risk, economically disadvantaged, limited English proficient, advanced course/dual credit courses, math college-ready, English college-ready, ACT average, and SAT average. The overall regression model was statistically significant, ($F(8,286) = 12.74$, $p = 0.05$), and yielded an $r^2 = 0.263$, indicating the overall model explained 26.3% of the variance in first-year college student taking remedial education courses.

Campus-Level Non-Limited English Proficient

Campus-level non-LEP percentage was included in the regression model as a continuous predictor variable to be studied. Campus-level non-LEP percentage was found to have a weak correlation ($r = -0.272$) to first-year student remedial enrollment, thereby indicating a high school campus' LEP percentage had a weak relationship to college remedial coursework. However, regression analysis showed campus-level non-LEP percentage to have no statistical

significance in relationship to predicting college remediation. Therefore, campus-level non-LEP percentage did not successfully predict an incoming college freshmen's enrollment into remedial education coursework.

Campus-Level Non-Economically Disadvantaged

Campus-level non-economically disadvantaged percentage was included in the regression model as a continuous variable. Non-economically disadvantaged percentage had the strongest correlation (r = -0.474) to first year college students taking remedial education. In addition, non-economically disadvantaged percentage had the overall strongest campus-level correlations among the other predictor variables, showing moderate correlation with college ready ELA (r = 0.716) and non-at-risk (r = 0.780). In addition to its moderate correlations, multiple regression showed campus-level non-economically disadvantaged to be a statistically significant predictor of first-year college student remedial coursework (β = -0.350, $t(8)$ = -3.42, p = 0.01). With a moderate effect size of r = 0.474 and controlling for the remaining variables, non-economically disadvantaged percentage produced the highest degree of predictability of first-year college student remedial education with r^2 = 0.224. This suggested a statistically significant relationship between campus-level non-economically disadvantage percentage and first-year college student enrollment into remedial education coursework, indicating high school campuses with higher percentages of economic disadvantaged students were more likely to see larger numbers of their graduates enrolling in college-level remedial education. Therefore, high school campus-level non-economically disadvantaged percentage proved to be a statistically significant predictor and had the overall greatest probability of predicting first-year college student enrollment into remedial education coursework.

Campus-Level Non-At-Risk

Campus-level non-at-risk percentage was included in the model as a continuous variable. Non-at-risk showed a moderate effect size (r = -0.360) with first-year college student remediation. However, regression analysis of campus-level non-at-risk exhibited no statistical predictability in relationship to college remediation education coursework, indicating high school campuses with low percentages of at-risk students had low probabilities of student enrollment into collegiate-level remedial courses. Therefore, high school campus-level non-at-risk did not successfully predict an incoming college freshman's enrollment into remedial education.

Campus-Level Advanced Course/Dual Credit Courses

Campus-level participation in advanced course/dual credit courses was included in the model as a continuous variable. Advanced coursework showed a small effect size (r = -0.247) with first-year college student remediation. However, regression analysis found it did not significantly predict first-year college student enrollment into remedial education coursework. This indicated high school student enrollment into advanced academic programs such as advanced placement, international baccalaureate, and college dual-credit courses did not statistically predict an incoming college freshman's enrollment into remedial education coursework.

Campus-Level College Ready Math

Campus-level college ready math was included in the model as a continuous variable. College ready math displayed a moderate effect size with first-year college student remediation (r = -0.403). However, regression analysis found it did not significantly predict first-year college student enrollment into remedial education coursework. Therefore, campus-level college-ready

math did not successfully predict an incoming college freshmen's enrollment into remedial education coursework.

Campus-Level College Ready ELA

Campus-level college-ready ELA was included in the model as a continuous variable. College ready ELA displayed a moderate effect size with first-year college student remediation (r = -0.427). While not found to be statistically significant, analysis showed college-ready ELA to have a strong correlation to first-year college student remedial coursework (r = 0.427). High school campuses that receive the college ready ELA distinction from the Texas Education Agency were more likely to see lower numbers of their graduates enrolling in college-level remedial education. An effect size of r = 0.427 suggested campus-level college ready ELA explained approximately 18% of the variance in first-year college students being enrolled into remedial education coursework. Therefore, while not found to be statistically significant, high school campus-level college ready ELA had a strong correlation to first-year college student enrollment into remedial education coursework.

Campus-Level ACT Average

Campus-level ACT average was included in the model as a continuous variable. ACT average displayed a moderate effect size with first-year college student remediation (r = -0.388). Despite showing a moderate correlation to college remediation, regression analysis did not indicate campus-level ACT average to be a significant predictor of first-year college student enrollment into remedial education coursework. As a result, campus-level ACT average did not successfully predict an incoming college freshmen's enrollment into remedial education coursework.

Campus-Level SAT Average

Campus-level SAT average was included in the model as a continuous variable. SAT average displayed a moderate effect size with first-year college student remediation (r = -0.308). Multiple regression analysis showed SAT average to be a significant predictor of first-year college student remedial coursework (β = -0.174, $t(8)$ = 2.082, p = 0.04). With a moderate effect size of r = 0.308 and controlling for the remaining variables, non-economically disadvantaged percentage proved to be a statistically significant predictor of first-year college student remedial education with r^2 = 0.095. SAT average proved to have the second strongest college remediation predictability from among the eight independent variables. Therefore, in regards to Research Question 2 and the predictive relationship between high school campus-level variables and college remediation, SAT average proved to be a statistically significant high school campus-level predictor of first-year college student remedial education coursework.

Summary

In this chapter, the researcher presented the descriptive data and statistical results concerning the regression analysis examining the strength of relationship between high school campus-level non-LEP, non-economically disadvantaged, non-at-risk, ACT percentage, SAT percentage, college-ready math, college-ready ELA, and advanced courses/dual credit courses have on first-year college student enrollment into remedial coursework. The investigation was guided by the hypothesis that high school campus factors were relevant predictors of college student enrollment into remedial education coursework. Pearson correlations and linear regression results were examined and interpreted to determine the level of relationship between the eight selected predictor variables and first-year college student remedial coursework. Regression analysis indicated statistical significance of two high school campus-level variables:

non-economic disadvantaged percentage ($p = 0.01$) and SAT percentage ($p = 0.04$). Chapter 5 reviewed the study's purpose, method, and results, along with a discussion of the study's results in relationship to the literature.

CHAPTER 5

DISCUSSION

Remedial education coursework is not a new concept for higher education. Colleges and universities have become increasingly more responsible for providing developmental instruction to the growing amount of students being enrolled into postsecondary institutions underprepared to be successful at the college level. With nearly one-third of first-year college students requiring remedial education in the core courses of reading, mathematics, or writing (Long, 2014), high school student college readiness and collegiate-level remediation remain as conversational topics in both secondary and postsecondary learning environments. This investigator evaluated the relationship between selected high school campus-level predictor variables and first-year college student enrollment into remedial education coursework. The results of the investigation aid both secondary and postsecondary educators, as they continue their attempts to increase high school student college readiness and reduce the need for first-year college student remedial coursework. This chapter includes a review of the research questions and analysis of the method. It also provides a discussion of the study's results as they relate to the corresponding literature, along with suggestions on further educational research.

Problem Statement

The purpose of this study is to determine if high school campus-level factors can be identified as predictors of student college readiness. Given that college readiness is frequently measured in terms of participation in college-level remedial courses (Complete College America, 2012; Long, 2014; NCPPH, 2010), knowledge of which high school campus-level factors have the greatest relationship to college-level remediation allow for increased understanding and programmatic planning concerning preparing high school students for the academic expectations

they will face in college. The intent of the study is to help define policy and aide in decision-making processes that emphasize college readiness needs and programs for secondary schools, to ultimately increase the number of students graduating high school sufficiently prepared and academically ready to be successful at the postsecondary level. Therefore, the problem of the study is to examine the predictive relationship between selected high school campus-level factors and first-year college student remedial coursework.

Method Review

This study is a quantitative analysis of first-year college freshman data taken from a Central Texas two-year college and selected Texas high school campus data obtained from the Texas Education Agency. Multiple linear regression analytics and descriptive statistics are used to investigate high school campus-level variables of first-year college freshman. In this quantitative study, the researcher utilizes a multiple linear regression model to investigate relationships between high school campus-level variables and remedial education courses taken by first-year college students to determine if significant predictability exists in regards to the need for these students to be enrolled into college-level remedial education coursework.

The dependent variable for the study represents the percentage of students from each Texas public high school campus enrolled into at least one student credit hour (SCH) of remedial education during their first semester as a freshman at a Central Texas two-year college during the 2013 fall semester. Selected independent variables for the study are campus-level percentages for: at-risk, economically disadvantaged, limited English proficient, advanced course/dual-enrollment, college ready math, college ready English, ACT average, and SAT average.

Discussion of Results

In this quantitative study, the researcher utilizes a multiple linear regression model to investigate relationships between high school campus-level variables and remedial education courses taken by first-year college students in an attempt to answer the research questions:

1. Do high school campus-level variables of incoming freshmen at a Central Texas two-year college predict a student's enrollment into remedial education?
2. To what extent do high school campus-level variables of incoming freshmen at a Central Texas two-year college predict a student's enrollment into remedial education?

Results of this study show statistically significant findings in relationship to the two research questions. In this section, the researcher provides a discussion of the study's results, presents an interpretation of the findings, and will make recommendations in regards to college readiness application and suggestions for future researchers.

Interpretation of the Findings

This study's design was to evaluate the predictive relationship high school campus-level predictor variables have with first-year college student enrollment into remedial education coursework. The dependent variable for the study represents the percentage of students from each Texas public high school campus enrolled into at least one credit hour of remedial education during their first semester as a freshman at a Central Texas two-year college during the 2013 fall semester.

Multiple regression results regarding Research Question 1 identify relevant campus-level factors in relationship to first-year college student remediation. The multiple regression model successfully explained 26.3% ($F(8,286) = 12.74$, $p = 0.05$, $r^2 = 0.263$) of the variance between

first-year college students enrolled into remedial coursework at the Central Texas two-year college and the campus-level variables from the high schools from which they graduated. Furthermore, regression analysis indicates campus-level economic disadvantaged percentage and high school campus-level SAT percentage, to be significant predicators of college remediation. Therefore, regression results regarding Research Question 1 suggest that high school campus-level variables of incoming freshmen can successfully predict a student's enrollment into remedial education.

In regards to Research Question 2, using multiple regression analysis, the researcher identifies two campus-level variables as significant predictors of first-year student remedial coursework. Regression results show high school campus-level economically disadvantaged percentage to be the strongest predictor, as well as high school campus-level SAT percentage.

Campus-level economically disadvantaged. Socioeconomic status is a recurring educational literature topic of study because economic status consistently accounts for much of the observed variance in education research (Harwell & LeBeau, 2010; Jeynes, 2002; Tate & Gibson, 1980). While most literature relates to socioeconomic status on a student-level, this researcher examined socioeconomic relationships from the high school campus-level. Campus-level economically disadvantaged is the percentage of high school campus students eligible to receive free or reduced-price meals or who are eligible for other public assistance. Regression results of this study reveal high school campus-level economically disadvantaged percentage has the greatest correlation among all other high school campus-level predictor variables and the most variance in relationship to first-year college student remedial education. With strong correlations to high school campus-level college ready ELA ($r = 0.716$) and high school campus-level non-at-risk ($r = 0.780$), it can be surmised the economically disadvantaged students in this

study's data set who are enrolled into first-year student college remedial coursework have statistically significant chances of failing to achieve Texas Education Agency standards for college-ready ELA, and are coded academically at-risk while they were in high school.

The measurement of economically disadvantaged percentage also provides the most variance in relationship to first-year college student remediation coursework within the regression model. Overall, the regression shows high school campuses with higher percentages of economic disadvantaged students are statistically more likely to see larger numbers of their graduates enrolling in college-level remedial education. This finding supports previous educational literature regarding socioeconomic status and the predictive nature the factor of economically disadvantaged has in relationship to high school student college readiness.

This finding is in line with educational literature. The Texas Education Agency (2017a) reports Texas students identified as being economically disadvantaged make up the greatest percentage of students who fail to achieve passing standards on end-of-course exams and account for 65% of the students who drop out of high school. In addition, economically disadvantaged students tend to display lower educational aspirations, reduced secondary and postsecondary persistence rates, and have decreased college degree obtainment rates as compared to their non-economically disadvantaged peers (Walpole, 2003).

Campus-level college ready ELA. Campus-level *college ready ELA* is the percentage of high school campus graduates that meet or exceed college-ready criteria on state exit-level examinations (≥ 2200 scale score on ELA and 3 or higher on essay), or the SAT examination (≥ 500 on Critical Reading and ≥ 1070 Total Score), or the ACT examination (≥ 19 on English and ≥ 23 Composite Score). College ready ELA displays a moderate correlation with first-year college student remediation (r = -0.427). While not statistically significant (p = 0.01), analysis

shows campus-level college-ready ELA to have a strong correlation to first-year college student remedial coursework. An effect size of $r = 0.427$ suggests campus-level college ready ELA explains approximately 18% of the variance in first-year college students being enrolled into remedial education coursework indicating Texas public high school campuses that receive the *college ready ELA* distinction from the Texas Education Agency are more likely to see lower numbers of their graduates enrolling in college-level remedial education. Research literature in college readiness consistently shows high school students must master basic understanding and show proficiency in the core subjects such as reading and writing in order to be college-ready (Adelman, 2006; Byrd & Macdonald, 2005).

Campus-level SAT average. Campus-level *SAT average* is the average SAT total score for all high school campus graduates as calculated by dividing the total number of SAT examinees by the sum of SAT scores. Campus-level SAT average displays a moderate correlation with first-year college student remedial coursework ($r = -0.308$). While statistically significant, multiple regression analysis shows campus-level SAT average to be a statistically significant predictor of first-year college student remedial coursework ($\beta = -0.174$, $t(8) = 2.082$, $p = 0.04$). A moderate correlation of $r = 0.308$ suggests campus-level SAT percentage explains approximately 9% of the variance in first-year college student being enrolled in remedial education coursework. This finding is consistent with existing research literature. The validity of national norm referenced tests as indicators of college readiness is well addressed in the literature. Geiser and Studley (2002) report the SAT is a poor predictor of student college readiness as compared to other student factors such as mastery of high school curriculum. Furthermore, Conley (2003) argues national norm referenced tests such as the SAT are not reliable college readiness indicators because there is no correlation between mastery scores on

these exams and the acquisition of skills and knowledge necessary for college-level success. As a predictor variable, with only 9% variance to college remediation, campus-level SAT proves to be a weak predictor of first-year college student remedial coursework. Analysis of the data in this study supports the premise that SAT is a weak predictor of first-year college student enrollment into remedial coursework.

Implications of the Study

While there is a broad range of accepted descriptions of college readiness, a common definition is the level of preparation a student receives in order to enroll and succeed in a postsecondary institution with remediation (Conley, 2008; Mijares, 2007). Concerning college students enrolled into remedial education coursework, accepted predictors of college readiness is most often linked to student-level academic factors such as overall grade point average (Fernadez et al., 2017), successful completion of rigorous high school coursework (Adelman, 2006; Geiser & Studley, 2002, Hoffman et al., 2007), and high school enrollment into advanced and higher-level math (Adelman, 2006; ACT, 2007; Klepfer & Hull, 2012; Lee, 2012) as commonly accepted predictors of college success. As identified through the literature review, most studies and educational literature tend to focus on student-centered variables and outcomes concerning college success. The current researcher expands the literature by focusing on high school campus-level predictors.

Focusing on high school-campus level variables is an important topic for both secondary and postsecondary educators. The value campus-level information adds to college-ready discussions is important because too many Texas public school students are graduating high school and being enrolled into postsecondary institutions not adequately prepared to be successful at the collegiate level. High school campus-level conversations and the understanding

that factors such as socioeconomic demographics, college-ready ELA distinctions, and SAT score percentages can help secondary school administrators understand which programs or which of their campus students are more likely to have, or not have success in college.

Knowledge of the predictive relationship socioeconomic status has on first-year college student success can help secondary educators identify which of their high school students are statistically more likely to struggle with collegiate coursework. Understanding that high school students who are economically disadvantaged are more likely to struggle with college coursework can help secondary educators adequately plan and implement appropriate programs to help increase student college readiness. Knowing the English-Language Arts assessment criteria related to earning a college-ready ELA distinction is statistically significant to first-year college student enrollment into remedial coursework can aide secondary administrators as they look to provide their professional staff with teaching strategies and classroom materials. Lastly, the knowledge that SAT score percentage has a relationship with college-level remediation can help secondary schools allocate resources, create curriculum, and implement strategies to help increase high school student acquisition of the academic skills measured by the SAT examination.

Suggestions for Further Educational Research

Many graduating high school students are finding themselves academically underprepared to matriculate successfully into the rigor and expectations expected of many colleges and universities. As a result, these first-year college students are often being required to enroll into developmental education programs and remedial courses as a prerequisite to entry-level college coursework. The researcher designed the study to evaluate high school campus-level factors in order to help determine which of these factors serve as predictors of college

remedial coursework. Although this study adds to existing educational research by confirming campus-level variables are statistically relevant in predicting first-year college student enrollment into remedial coursework, there are additional research opportunities that might help expand the current understanding of high school college readiness.

In this study, the researcher includes only first-year college students who recently graduated from Texas public high schools. Future studies may include recent high school graduates from private, parochial, and early college high schools. Such a study can provide additional insight into the role these various types of campuses and their associated educational environments have in determining their student college readiness levels. Similar research can also expand this study's premise to include postsecondary institutions other than the Central Texas two-year colleges or states in addition to Texas. Additionally, this study's descriptive statistics identify eight public district types as determined by the high school campus' community type, school district enrollment, school district community economic status, and geographic location in relation to urban areas. Future studies can consider analysis of these eight public school district types to determine the relationship size of school district has on first-year college student remedial education coursework. Lastly, since the study results find certain campus-level factors to be statistically related to first-year college student readiness, further study can focus on specific high school programs and curriculum that might improve a student's college readiness while in high school to help bridge the gap between secondary school practice and postsecondary institution expectations.

Conclusion

In this chapter, the researcher provides a comprehensive review of this study concerning the predictive relationship high school campus-level factors have with first-year college student remediation. The researcher develops the premise that high school student college readiness is an educational enigma that consistently challenges secondary school and postsecondary educators. As compared to past generations, today's graduating high school students are finding their world to be both global and knowledge-based. First-year college students are discovering higher levels of knowledge and application are now required as compared to the manufacturing economies of the past century. The National Center for Education Statistics reported in 1973, individuals with a high school education make up 72% of the nation's workforce (NCES, 2013a). By 2007, this percentage had fallen to 41%. This trend is expected to continue. By 2020, 65% of all jobs will require some form of postsecondary education or training. It is estimated 11% of all jobs will require a master's degree or higher; 24% will require a bachelor's degree; 12% will require an associate's degree; and 18% will require some postsecondary training or industry credential but no formal degree (NCES, 2013a).

As greater numbers of graduating high school students continue to be enrolled into institutions of higher education, the challenge of adequately preparing these students for postsecondary success will be paramount. This study's results support prior educational research in identifying campus-level factors that can be used to predict a student's enrollment into college-level remediation. Secondary school educators can use this information to expand their knowledge of which of their students have the highest probability of being in need of remediation at the college level. Postsecondary educators can use this information to help

increase the number of students achieving postsecondary success thereby helping them to matriculate successfully towards degree completion.

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