THE IMPACT OF VOLUNTARY REMEDIATION ON GATEWAY COURSE SUCCESS AND MINORITY AND LOW-INCOME STUDENTS IN FLORIDA COLLEGES

By

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This dissertation was prepared under the direction of the candidate's dissertation advisors, Dr. Deborah L. Floyd and Dr. Patricia Maslin-Ostrowski, Department of Educational Leadership and Research Methodology, and has been approved by the members of her supervisory committee. It was submitted to the faculty of the College of Education and was accepted in partial fulfillment of the requirements for the degree of Doctor of Philosophy.

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ABSTRACT

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The primary purpose of the study was to explore the potential impact of voluntary remediation on success in ENC1101 and MAT1033 (gateway courses) and on minority or low-income students in Florida. The study was prompted in 2013 when the Florida Senate exempted most students entering the Florida College System from placement testing or developmental education regardless of their skill level. A quantitative design compared the gateway course success of 10,703 exempt students in 2014 and 2015 to the success of 8,644 students who would have been exempt had the law been in effect when they completed their gateway courses in 2012 and 2013. Data were collected from three FCS institutions. Using Astin and Astin's 1992 Input-Environment-Outcome model (Astin & Astin, 1992), independent variables included demographics, such as race and Pell grant eligibility, and prior academic performance, as well as enrollment status and remedial course decisions and performance.

The study found the policy to have a statistically significant (α = .05) negative effect on student success in the gateway courses. The voluntary remediation policy that was in part enacted to improve college completion rates threatens to have the opposite effect. The results show that fewer proportions of students were successful (grade of C or higher) in both courses once remediation became voluntary (12.8% decrease for English; 19.3% decrease in math). The study revealed a need for further research to investigate the degree of this impact on minority and low-income students. The results also suggested a need for more research to learn which students are likely to benefit, or not, by taking a remedial course. Of the students in the study who voluntarily took a placement test and scored below credit level, 11.3% chose remediation before taking ENC1101 and 24.5% chose remediation before taking MAT1033. Of those students, most who earned an A or B in the remedial course were successful in the credit courses; most who did not earn at least a B in the remedial course were unsuccessful at the credit level. Results were significant (α = .05), and effect sizes were moderate (.344 for English; .430 for math).

DEDICATION

My work is dedicated to my father, Ronald Wayne Butler, whose memory I hold dear as a reminder of my past; to my precious grandchildren, Kadence Leeanne Hallett, Lillie Rose Hallett, and Peter Michael DiGiovanni, all the reasons I need to hope for the future; and to my husband Stephen, everything I could ask for to enjoy the present.

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TABLES

FIGURES

1. INTRODUCTION

Current events in higher education and Florida legislative policy have prompted the need for the study. Specifically, research published during the last decade has illuminated the low college completion rates and high costs of remediation offered at the college level. Institutions, governments, and organizations have scrambled to address the issues. The combination has invoked a national dilemma that now mandates significant and swift change, and the hope is for improved completion rates among undergraduate college students. Exactly how to summon such change remains a topic of debate among, and sometimes between, politicians, researchers, and educators. In Florida, legislators look toward state mandated changes as a solution for the completion and cost issues surrounding remediation. Senate Bill (SB) 1720 was passed in May of 2013 and included a new remediation exemption for many students who were, based on previous policy, required to enroll in developmental education (DE) to remediate deficient skills. Students are now exempted from this requirement if they entered a Florida public high school in 2003-2004 or later and subsequently graduated with a standard diploma or if they are active duty members of the military (Florida Senate, 2013). Many exempt students are minorities and receiving financial aid (Hughes & Scheuch, 2011; Parke & Scheuch, 2013b). It is important to consider the results of this legislation because of the many potential implications, not the least of which is the fact that this bill, as stated by the president of Complete College America, Inc., Stan Jones, “may foreshadow many of the things that are about to happen around the country” (Fain, 2013).

Statement of the Problem

Developmental education is a national issue that demands attention and solutions. Florida legislators addressed the challenge by enacting SB 1720 in 2013, which made remediation voluntary for many students, and several factors combine to present a problem that is complex. One primary component of SB 1720, voluntary remediation (VR), is not well researched, appears to be unsuccessful, has the potential to adversely affect minority and low-income students, conflicts with greater expectations of college faculty, and may yield to a greater problem long-term.

The law invoked VR for exempt students entering Florida public community and state colleges. Students are exempt if they entered a Florida public high school in the 2003-2004 academic year and then graduated with a standard high school diploma, and exempt students represent approximately 65% of incoming college students (Division of Florida Colleges, 2013). Active duty members of the United States military are also exempt. A history of the bill shows that supporting research includes Complete College America, Inc., with evidence of improved success and saved funding when students are accelerated into their credit courses (Professional Staff of the Committee on Education, 2013). A literature review verifies such evidence, but some of the other concerns may not have been considered as the legislation was penned.

Little research is available to guide the implementation of VR, and what is available suggests it is not successful; few students choose to remediate when it is not required, and when they do participate, they often withdraw from or fail the programs (Maggio, White, Moldstad, & Kehr, 2005; Zeitlin & Markus, 1996). Additionally, high percentages of minority students, especially African-Americans, and low-income students

have historically needed remediation (Cohen & Brawer, 2008; Crisp & Delgado, 2013) and are now exempt from remediation under the Florida law. Academic risk for these students in particular may be increased without the added support of DE courses. Another issue is that, simultaneous to the SB 1720 discussions, lawmakers were pressing community college board members to require faculty to demonstrate measurable gains in student learning (Florida Department of State, 2013). In other words, greater demands for student performance and weakened expectations for student preparedness were imposed at the same time, a concern that presents conflicting expectations on college faculty. It must be considered also that the law did not simply exempt students who had graduated within a certain parameter, such as, for example, within the last five years. Instead, it exempts students who graduated after entering high school in 2003 or later, meaning that over time, older returning students will also be exempt.

These factors combine to force a close watch on the results of VR as mandated by SB 1720 in Florida; studies such as this one to investigate the impact of VR will become critical in the months and years ahead. However, the study was no way intended to dispute or disprove the need for solutions to address the large proportions of unprepared or underprepared students entering Florida colleges. Such a need is clear. Remediation is offered at the college level in DE programs throughout the United States (Cohen & Brawer, 2008), and despite the benefit of these programs for large numbers of students, a review of the literature proves that DE programs are very expensive and proportionally, few students graduate college when they begin in these programs (Hodara & Jaggars, 2014; Jaggars & Stacey, 2014). However, the Florida push to exempt students who are currently recent graduates of public high schools in the state must be carefully studied,

immediately and over time, to ensure that students who would benefit from DE courses are supported and encouraged to enroll in them and to ensure that unintended consequences are not imposed upon these students.

Background. Much attention was given during the first decade of the 21st century to college completion in American higher education. More specifically, much has been written about the low success and high cost of DE as a college remediation program and the contribution of remedial needs to low college completion rates. For example, Bailey, Leinback, and Jenkins (2006) found that in a cohort of students studied from 1995 to 2001, only 36% of the students who started specifically at the community college level had obtained an associate's or bachelor's degree after six years. This is 10 percentage points lower than the rate for all students in the cohort obtained from the National Center for Education Statistics (NCES) in 2003. In 2007, NCES data showed that among students who needed four remedial courses, only 19% had completed a certificate or degree program after eight years; for students who required only one or two remedial courses, only 29% had completed (Strong American Schools, 2008). The problem has persisted and by 2014, Hodara and Jaggars suggested that the "majority of developmental students" were not completing their education, and that "only a small proportion ever enroll in college-level math or English" (p. 247).

Research in the last decade was prompted in part by the high numbers of students who enter higher education without sufficient academic preparation. Many incoming freshmen—about half—required at least one remedial course (Strong American Schools, 2008). Some states far exceeded that percentage, such as Oklahoma where more than 80% of college students were enrolled in remedial courses in 2007 (Strong American

Schools, 2008). In Florida, 65% of students entering the state's community colleges in 2001 needed remediation (Windham, 2005) and between 2009 and in 2011, still 64% were not academically prepared (Parke & Scheuch, 2013a).

The issue of remediation is aggravated by the high costs associated with the delivery of DE programs in the United States. Prior to the 2008 report by Strong American Schools, the annual cost of remedial education was approximately two billion dollars but has now increased now to an estimated seven billion dollars annually (Jaggars & Stacey, 2014; Scott-Clayton, Crosta, & Belfield, 2012). This cost is being absorbed in large part by state and federal aid. In Florida, 118.3 million dollars was spent on DE in 2004-2005 (Office of Policy and Procedure Analysis and Government Accountability, 2006), and by 2011, annual costs were up to 168 million dollars (Torres, 2012).

The low completion rate among remedial college students and the high cost to deliver remedial courses at the college level has institutions and governments struggling to find solutions that will improve national college completion and reduce associated costs. Recommendations to address the issues of high cost and low success in DE programs include accelerated or co-requisite remediation, learning communities, and in-context presentation, but not VR (American Association of Community Colleges [AACC], 2012; Complete College America, Inc., 2012; Hodara & Jaggars, 2014; Tinto, 2007; Venezia & Hughes, 2013).

Lacking Research on Voluntary Remediation. Most studies on remediation or DE compare students who need remediation to those who are academically prepared to succeed in credit courses, or the studies focus on the effect of remediation on college completion rates. Almost no research has been conducted to compare the benefit of

remediation for students who need it and get it to those who need it but do not receive it (Bailey et al., 2006; Goudas & Boylan, 2013; McMillan, Parke, & Lanning, 1997). The few studies that do address VR are not favorable (Zeitlin & Markus, 1996). Getting students to volunteer is challenging, and students who initially volunteer to remediate are likely to withdraw from, stop attending, or fail their college level courses (Maggio et al., 2005; Zeitlin & Markus, 1996). Researchers of DE programs purport that remediation must be mandatory to be successful (Boylan & Saxon, n.d.; Roueche & Roueche, 2000).

Additionally, the literature has much to say about the influence of institutional interaction, aspiration, motivation, and goal commitment in college completion, suggesting all of these contribute to students' success and persistence to completion (Bandura, 1977; Berger, 1997; Bremer et al., 2013; Crisp & Delgado, 2013; Grimes & David, 1999; Levine & Dean, 2012; Pajares, 2012; Schunk & Zimmerman, 2012; Tinto, 2007; Umoh, Eddy, & Spaulding, 1994). Developmental education programs most often address these non-academic factors (Goudas & Boylan, 2012; National Association for Developmental Education [NADE], 2013), but if the students do not volunteer for DE courses, they will miss out on these important influences and interactions as well as the academic remediation.

Potential Affect on Minority and Low-income Students. Minority and low-income students may be at increased risk because large proportions of students in these populations need remediation (Crisp & Delgado, 2013). Additionally, large proportions of these students attend the lower-division colleges both historically and today (AACC, 2012; Cohen & Brawer, 2008; Tinto, 2007; Zeitlin & Markus, 1996), and lower-division institutions are the ones directly affected by SB 1720. The current mission of the Florida

College System (FCS) clearly includes the continued delivery of remedial services and an open door admissions policy, which means students may enroll in an FCS institution regardless of academic ability (Division of Florida Colleges, 2012). It follows then, that if large proportions of unprepared minority and low-income students enroll in the FCS and do not volunteer to remediate, large proportions of these students will also be at increased risk of failing their credit courses. For all students, failure at the onset of their college education results in an immediately decreased grade point average, a factor known to contribute to college persistence (Tinto, 2007). This result could affect many minority and low-income students as larger proportions of African-American students continue to need remediation and as most students who need remediation are also on financial aid (Parke & Scheuch, 2013b), a possible indicator of low socioeconomic status. Allowing an open door policy and not requiring proven readiness is counterintuitive and not supported by available research. In contrast, research does suggest that DE may have great benefit for minority students (Crisp & Delgado, 2013).

Increased Problem in the Long-term. Implementation of SB 1720 is still new, but even if short-term results prove VR is a success, the current provisions of the bill may not allow for an equivalent long-term result. The bill exempts many Florida public high school graduates from placement testing and remediation if they entered a Florida public high school in the 2003-2004 school year or later or if they are in the military (Florida Senate, 2013). For most students, this means they are exempt if they graduated with a standard diploma from a Florida public high school in 2007 or later. Over time, then, students who have not been in school for several years, and have lost academic skills as a result, may enter the FCS without any requirement of academic preparation. Older

returning students are another demographic known to need remediation, and in fact they are the least prepared of all students in Florida (Hughes & Scheuch, 2011). Yet in time, because of SB 1720, Florida students who have graduated Florida public high schools in 2007 or later, but who choose not to go to college until several years after high school graduation, will be able to enroll directly into classes for which they are likely to be unprepared. If this happens, any short-term gains in completion will quickly be threatened, as will the success of those older returning students.

Purpose of the Study

The purpose of the study was to investigate the potential impact of VR in Florida on student performance and success in two college gateway courses, ENC1101 and MAT1033, to consider these results for minority and low-income students, and to contribute to methodological approaches to studying the new VR policy, by meeting four research objectives (Creswell, 2012). The study was designed to (1) compare the overall gateway course success of similar students in FCS institutions before and after the policy change to VR; (2) compare gateway course success rates of all sampled students based on demographic and academic variables before and after the policy change to VR; (3) compare gateway course success rates of students based on their remediation choices, demographic variables, and academic variables when it is known that all sampled students have deficient English or math skills; and (4) determine the relationship, if any, between remediation decisions and demographic or academic variables.

Research Questions

RQ1. Is there a difference in mean student grades for ENC1101 or MAT1033 in the periods before and after Florida remediation requirements were made voluntary for exempt students?

RQ2. Is there a relationship between the proportion of students who succeed in ENC1101 or MAT1033 (grade of C or higher) and the remediation policy?

RQ3: Is there a relationship between the independent variables and the proportion of successful (grade of C or higher) ENC1101 or MAT1033 students based on the remediation policy?

RQ4: Is there a difference in mean ENC1101 or MAT1033 grades for students who did and did not complete corresponding voluntary remediation before taking ENC1101 or MAT1033 given that all students had deficient composition or computation skills based on P.E.R.T scores?

RQ5: Is there a relationship between grades earned during voluntary remediation and success in ENC1101 or MAT1033 (grade of C or higher)?

RQ6: Is there a relationship between the independent variables and the proportion of successful ENC1101 or MAT1033 students who did and did not voluntarily remediate before taking a gateway course?

RQ7: Is there a relationship between the independent variables and students' decisions to voluntary remediate deficient skills before taking ENC1101 or MAT1033?

Limitations of the Study

The study was limited in scope because, while the results verify that VR is resulting in lower student performance in Florida gateway courses, the analyses do not

explain why this is true. There are many aspects to VR, such as student motivation and faculty behaviors, as well as institutional and legislative policies that govern how VR is implemented. The results of this study do not explain how these combinations interact to contribute to the unsuccessful nature of a VR policy.

The variables selected further limited the study. The accuracy of data for some of the variables are dependent on self-reported information, meaning a student may report partial, inaccurate, or even no information. Additionally, there is some inconsistency in how and what data are reported by institutions. For example, some colleges report ethnicity as race, and not every record had data for every variable. This became a limitation because it would have been desirable to develop a predictor model, but missing data precluded this option. Instead, the study was limited, based on the data provided, to individual tests of relationships between the given variables and success in the credit course.

Delimitations of the Study

The researcher notes the following delimitations to the study:

- Success rates before and after the remediation policy change were compared using only spring semester data; fall semester performance may differ, and as such, overall proportions of successful students as well as mean grades may vary if full academic calendars are considered.
- Institutions have options regarding how SB 1720 is implemented; individual responses to SB 1720 by the sample institutions were neither collected nor analyzed, and “institution” was not an independent variable. Institutional treatment of students with weak skills and institutional compliance with SB 1720

may have an effect on the data but was not part of the analyses because there was no intent to compare individual colleges or treatments.

- The study did not investigate the impact of SB 1720 on active members of the military, a population who is also exempt from placement testing or remediation even if needed.
- The study did not include the influence of non-academic factors, such as motivation, that contribute to decisions and success in college.

All of these data would be informative but are beyond the scope of the study and, instead, some will become recommendations for future study.

Significance

The study contributes to the body of knowledge in four ways. First, the results provide quantitative data regarding the impact of VR on overall success rates in first-level college credit writing and math classes in FCS. Second, the results provide some insight on the impact of VR on minority and low-income students, at least in as much as they are like other students who are affected by the remediation policy. Third, the study helps fill a moderate gap in the literature as it relates to comparing students who receive remediation to those who do not when it is known that the students have deficient skills. Finally, the study presents a methodology that allows for multiple comparisons when dealing with small effect size. Additions to the literature such as these are necessary as SB 1720 is implemented because of the implications it has for Florida colleges and the students who attend.

Definitions

Developmental education – often referred to as "prep" or remedial education although it is more comprehensive than just remediation (Goudas & Boylan, 2013); context typically determines use, but terms are used interchangeably in the study

Gateway Courses – classes that a majority of students must pass in order to advance in the required course work to obtain a degree; research will include only first credit level writing, ENC1101, and intermediate algebra, MAT1033

Postsecondary Education Readiness Test (P.E.R.T.) – the placement test used by Florida colleges to assess credit course readiness of non-exempt students; the P.E.R.T. was also used during the mandatory remediation policy to assess college readiness of all incoming students without current and adequate college entry test scores

Socioeconomic status (SES) – for the purpose of the study, SES will be differentiated only by whether or not a student was eligible for a Pell grant, previously known as Basic Education Opportunity Grants and awarded based first on financial need (United States Department of Education, 2014)

Success – grade of C or better; grades of "C-" or less will not be considered successful, nor will grades that indicate withdrawal or any other non-graded status, for example, an "audit" or "incomplete"

Chapter Summary

Chapter 1 provided an introduction to the study and explained why VR in Florida colleges is a problem to be studied. The problem was put into context with background information such as the high cost and low success of DE that prompted Florida lawmakers to pass SB 1720 in 2013, changing the way DE programs and courses can be

offered in FCS institutions. The chapter discussed the complexities of the problem, specifically, a lack of research, a potential threat to minority and low-income students, and increased problems over time. The purpose of the study, research questions, limitations, and delimitations were provided in Chapter 1, and finally, the significance of the study and important definitions were included.

2. REVIEW OF THE LITERATURE

The need for this study was impelled by current events in American higher education and recent Florida legislative policy, but both are the result of long-standing issues that some might argue have gone unchecked for decades. Societal and government pressures since at least the 1990s have spawned much research about the low success and high cost of DE, and recently, findings have been catapulted into the political spotlight. The overarching purpose of the study is to investigate the impact of VR as SB 1720 eliminated developmental course requirements for many students entering the FCS beginning 2013. As such, this literature review provides context for the legislation by reviewing the history of DE, and by describing the students served, the success, and the cost of DE. Additionally, there will be a discussion regarding the success of VR and its potential impact on minority and low-income students. Finally, the most recent research on VR is presented.

Historical Perspective

Although there has been significant emphasis placed on remediation in recent years, its history in the United States traces back to at least 1828 when "tutoring" was reportedly an "indispensable" function of Yale College (O'Hara, 2012). By the end of the 19th century, remedial courses had been formally introduced at the college level (Cross, 1976). In the early part of the 1900s, remediation had become prevalent as gaps persisted between high school and college curriculum, but it was not initially well studied nor of great concern (Cohen & Kisker, 2010; Cross, 1976). Post-war and open admission

enrollment surges in the 1950s and1960s resulted in greater needs for remediation, and, as evaluation and research methods became better developed, issues began to arise that are not unlike those observed today.

Cross (1976) reported that students were entering college with fifth to ninth grade skill levels, describing research that showed nearly three quarters of students in 1964 and 1965 failed college entrance exams when enrolling in open-door colleges. She added, "…problems were not only broad, in the sense that they were widespread, but they were deep as well, in the sense that some students were *seriously* behind in skill development" (Cross, 1976, p. 28). Additionally, she discussed the realization in the 1960s that non-academic factors, in particular, socioeconomic status (SES), played a role in the need for remediation. The academic decline and conditions that were noted in the 1960s persisted in the literature through the later part of the 20th century, including such publications as *A Nation at Risk: The Imperative for Educational Reform* (National Commission on Excellence in Education, 1983); the impetus for increased expectations and accountability had begun (Cohen & Brawer, 2008; Cross, 1976; National Commission on Excellence, 1983). These conditions spurred efforts to improve both academic and non-academic support and a more holistic approach emerged that, in the 1970s, became what is now known as DE (Cross, 1976; NADE, 2013).

Developmental educators began to formally organize in 1976, evolving into the National Association for Developmental Education (NADE) with about 3000 members today throughout the United States and abroad. Developmental education extends far beyond tutoring services as it attempts to serve a large percentage of college students nationally (Charles A. Dana Center, Complete College America, Inc., Education

Commission of the States, & Jobs for the Future, 2012; National Center for Education Statistics [NCES], 2013a; Strong American Schools, 2008). Developmental education is often used interchangeably with remedial education (AACC, 2012; Bailey, Jaggars, & Scott-Clayton, 2013; Goudas & Boylan, 2012, 2013; Zeitlin & Markus, 1996), but in reality, remediation is actually a subset of DE programs nationally.

Despite its prominence in higher education, DE as a program has not been without controversy. In fact, since inception, DE program effectiveness has been in question (Cohen & Kisker, 2010). State lawmakers and educational boards have for years debated DE as a political issue, especially the related matter of compulsory testing and placement (Grimes & David, 1999; Ignash, 1997a, 1997b; Jenkins & Boswell, 2002; McMillan et al., 1997). The pressures present in current legislation were also evident near the end of the 20th century as Grimes and David (1999) wrote that DE was "increasingly under attack" (p. 2).

The extent to which legislators and board members have become involved varies (Grimes & David, 1999; Ignash, 1997b; Jenkins & Boswell, 2002; McMillan et al., 1997), and specifically what issues they select for their involvement is telling. Jenkins and Boswell (2002) highlight findings of a 2001 Education Commission of the States (ECS) survey in which 47 of the 50 states participated. In their report, disparate practices were evident.

- Twenty states had policies established by the legislature or educational boards.
- Twenty-one states, including Florida, required remediation when warranted, and seven specifically required placement testing.
- Three states reported advising students into remediation but with no requirement

to participate.

- Maryland, but no other state, required all developmental courses to be completed before enrolling in any general education courses.
- Six states imposed limits on the amount of time to complete remediation, and seven limited the number of attempts or the funding on additional attempts for a given remedial course.

Additionally, and indicative of the politically sensitive nature of DE, Jenkins and Boswell (2002) reported that during the two years leading up to the 2001 ECS survey, legislators had debated but not acted upon several remediation topics.

- Limiting or eliminating remedial programs in college had been debated in 11 states with no action.
- Changes in the K12 system to better align with college curriculum had been debated in 14 states with action by only one.
- The need to serve students with severe deficiencies had been debated in 16 states with action by only one.

As a final note, to illustrate the prevalence of concerns related to how students enroll in remedial courses, the topic of mandatory remediation (MR) had been debated in six states while action was actually taken in nine states. Legislative history in Florida includes the removal of DE from universities, except for Florida Agricultural and Mechanical University, and, from 1984 until SB 1720 in 2013, the policy required mandatory placement testing and DE when students did not meet the established credit course criteria (Windham, 2005).

Describing the evolution of community colleges at the turn of the century, Grimes

and David (1999) wrote that it had "become a microcosm of society…more representative of American society than four-year colleges and university populations" representing students who "frequently enter college less academically prepared" (p. 1). Continued review verifies that well into the 21st century, trends of diversity remain constant in DE programs. In particular, the need among Black and Hispanic students in Florida continues to exceed the need among their White counterparts (Crisp & Delgado, 2013; NCES, 2013a; Parke & Scheuch, 2014), and the need for remediation among students of lower socioeconomic status (SES) remains high (Parke & Scheuch, 2014).

Students Served by Developmental Education

With the exception of older returning students who need math remediation, students who enroll in remedial courses are most often 25 years or younger, and DE programs serve large percentages of minority and low-income students. Nationally and since at least 1989, DE has enrolled a higher percentage of minority students than non-minority students (Crisp & Delgado, 2013; NCES, 2013a). More specifically and since at least 1999, remedial programs have helped Blacks and Hispanics more than other demographic groups (Grimes & David, 1999; NCES, 2013a).

In the first decade of the 2000s, the need for remediation was increasing among Blacks and Hispanics as shown in NCES data on percentages of students who have taken a remedial course in selected years and by race (NCES, 2013b). Increases from 2003-2004 to 2007-2008 were notable. For Black students, the percentage increased from 41.2% to 45.1% and for Hispanic students, the increase was from 37.5% to 42.7%. In contrast, slight decreases were observed among White, Asian, and Pacific Islander students, as well as those who are of two or more races.

Trends in Florida are also noted. Overall, students are becoming slightly better prepared for college level courses, but for minorities, the numbers remain worse than national averages. For example, Hughes and Scheuch (2011) reported that in the FCS in 2009-2010, 51.7% of Black students needed writing remediation and 74.8% needed math remediation. Two years later, Parke and Scheuch (2013b) wrote that African-Americans were still "over-represented in development education" in 2011-2012 as 47.7% enrolled in remedial courses, more than twice as many as White students (22.5%). They also reported that 76.9% of the African-American and 66.7% of Hispanic students in DE received financial aid compared to 55% of White students. Sixty-five percent of FCS students served by DE in 2011-2012 received financial aid (Parke & Scheuch, 2013b). This is not to say that all students who receive financial aid are of low SES, nor is to argue that students in DE need financial assistance more often than non-DE students; however, the numbers do show that most students in DE receive financial assistance, and those who receive assistance include those who receive it based on financial need.

Students who were 19-23 years old enrolled in remedial courses in 2003-2004, and again in 2007-2008, more than students in any other age group (NCES, 2013a). Age groups are reported differently in Florida, but there are clearly large percentages of younger students who need remediation and are served by DE programs. In 2009-2010, 48.8% of 17-19 year olds and 80% of 20-25 year olds needed math remediation. The largest percentage of students needing math remediation, however, was the 26-35 year old group (85.5% needed math remediation). Reading and writing deficiencies were not as severe, but still apparent as 50.9% of 20-25 years olds needed reading remediation and 43.8% needed writing remediation. In both cases, it was either the 17-19 or the 20-25

year old students who were the highest percentage of students served by DE programs in Florida (Hughes & Scheuch, 2011).

Remedial courses are offered in community and state colleges to serve mostly younger and minority students, and students receiving financial aid, and most colleges offer only institutional credit for these courses, meaning that the courses will count toward full-time status for the purpose of receiving financial aid but will not count toward graduation (Cohen & Kisker, 2010). There is much in the literature to examine the success of students in these courses and the cost to deliver the DE programs.

Success and Cost of Developmental Education Programs

Scrutiny in recent years has found DE programs to be unsuccessful. Bailey et al., (2006), for example, used data from the NCES that tracked a 1995 cohort over six years to show that only 36% of all students who started specifically at the community college level, where most remediation occurs, had obtained an associate's or bachelor's degree after six years. This is lower by 10 percentage points than that for all students in the data over the same time period (NCES, 2003). In another study, a Strong American Schools (2008) report showed that among students who needed four remedial courses, only 19% had completed a certificate or degree program after eight years. For students who required only one or two remedial courses, the rates were minimally better yet still only 29%. In 2014, Hodara and Jaggars suggested that the "majority of developmental students" are not completing their education, and that "only a small proportion ever enroll in college-level math or English" (p. 247). Complete College America, Inc., (2014) describes worse conditions for Florida college students in 2011, reporting that only

22.3% of students who require remediation are able to complete those courses and the corresponding credit courses in two years, and only 9.4% were projected to graduate.

It is important to note that the research about college completion by remedial students, while compelling, has not gone completely unchallenged and that other factors may contribute to low completion. For example, Bremer et al. (2013) wrote about the higher probability that students who begin college with strong math skills are more likely to complete college than students who have weak math skills. Given that most students who need remediation need it in math specifically (NCES, 2013a), it is inherent that students in DE may not complete college at a rate similar to their peers who do not need remediation. Tinto (2007) in particular is well known for his work regarding factors other than academic ability that lead to student attrition. Other researchers also write about the influence of institutional interactions, aspiration, motivation, and goal commitment, all of which contribute to students' persistence to completion (Berger, 1997; Bremer et al., 2013; Crisp & Delgado, 2013; Grimes & David, 1999; Levine & Dean, 2012; Pajares, 2012; Pascarella & Terenzini, 1991; Umoh et al., 1994).

Goudas and Boylan (2013) argued some of the research of the highly cited Community College Research Center at Teachers College, Columbia University. Specifically, they claim the regression discontinuity (RD) method that is often used is misleading and that the purpose of DE is not fully taken into consideration in the research. In the RD research, very often two groups are compared who inherently may not be that different: students who barely miss cut-off scores on placement tests and have to take at least one remedial class are compared to students who surpass the same cut-off scores with very little margin yet do not have to remediate. These results are sometimes

cited as evidence that DE is ineffective, but Goudas and Boylan (2013) and Hodara and Jaggars (2014) warned findings should not be generalized because they really only apply to those students who fall just below the cut-off scores. Such comparisons receive much attention today but are not new (McMillan et al., 1997).

Goudas and Boylan (2012) also challenged the frequent "misunderstanding" (p. 2) of the DE purpose, reminding readers that it is not to help developmental students perform better in credit courses, retention, completion, and job placement than their peers who required no remediation, as seems to be expected. In contrast, they suggested that DE serves to improve the chance of success for students who need remediation and take it when compared to those students who have deficient skills but do not remediate.

The research has indeed and for years compared students who need and don't need remediation as Goudas and Boylan claimed (Bailey et al., 2013; Cohen & Kisker, 2010; Jaggars & Stacey, 2014; McMillan et al., 1997). Crisp and Delgado (2013) attempted to mitigate this concern in their study to investigate persistence and transfer among developmental students. Analyzing longitudinal data, they compared students who were thought to need remediation but did not enroll in remedial courses (non-developmental students) to those who did enroll in remediation (developmental students). They found that developmental students persisted slightly better than non-developmental students, 79% compared to 77%. However, they did confirm that fewer developmental students transferred (35%) when compared to non-developmental students (44%), pointing out that the students in the study self-reported an intention to transfer to a university.

The completion issue is made worse because of the high costs associated with the delivery of DE programs in the United States. Costs were estimated to be approximately two billion dollars annually in the early to mid-2000s (Strong American Schools, 2008) and have now increased to about seven billion dollars annually (Scott-Clayton, et al., 2012; Jaggars & Stacey, 2014). This cost is being absorbed in large part by state and federal aid. In Florida, the cost had risen to 168 million dollars per year in 2011 (Torres, 2012), up from 118.3 million dollars spent on DE in 2004-2005, 53% of which was paid for by the state (Office of Policy and Procedure Analysis and Government Accountability, 2006).

Policy makers at the local, state, and national level are trying to address the complexities of DE as efforts are made to improve completion rates among undergraduate college students (AACC, 2012; Complete College America, Inc., 2012). There is much in the literature about best practices such as accelerated scheduling, learning communities, contextual instruction, and making remediation a co-requisite instead of a pre-requisite to credit course work (AACC, 2012; Complete College America, Inc., 2012; Hodara & Jaggars, 2014; Tinto, 2007; Venezia & Hughes, 2013). Senate Bill 1720 includes some of these as options for remediation for exempt students, but what sets the legislation apart is the fact that it allows exempt students to bypass remediation even when it is warranted. It is prudent to consider the bill and its potential implications.

Senate Bill 1720

In Florida, legislators look toward state mandated changes as a solution for the college completion and cost issues surrounding remediation. Senate Bill 1720 was passed

in May of 2013, putting into effect new parameters for the delivery of DE in the 28 state and community colleges in the public system (Florida Senate, 2013). The Florida bill formally defines DE to mean "instruction through which a high school graduate who applies for any college credit program may attain the communication and computation skills necessary to successfully complete college credit instruction" (Florida Senate, 2013, p. 13). The legislation restricts delivery of DE courses to modularized, compressed, or contextualized formats, and co-requisite courses (Florida Senate, 2013, p. 27). An additional constraint of the new law is that, as of October 31, 2013, institutions in the FCS may no longer require exempt students to take remedial courses in math, English, or reading. Exempt students are those who entered ninth grade in 2003-2004 or later and subsequently graduated with a standard diploma from any public high school in Florida. Additionally, institutions are not permitted to require active members of the military to enroll in remedial courses (Florida Senate, 2013, p. 30). The law also disallows the practice of required placement testing for students in these populations.

The policy change is a departure from the nearly 30-year old practice of mandatory placement testing and DE when warranted for all students entering the FCS. The change is based on cited findings by Complete College America, Inc. (2012) and the "Core Principles for Transforming Remedial Education: Joint Statement" by the Charles A. Dana Center, Complete College America, Inc., the Education Commission of the States, and Jobs for the Future (Professional Staff of the Committee on Education, 2013). The cited findings consider college completion rates and recommendations by the named organizations.

Data to support SB 1720 may also include the decreased need for remediation among recent Florida high school graduates. Parke and Scheuch (2013b) reported the need for remediation among FCS students in 2011-2012 was down 5.4% compared to students who need remediation one year earlier. Further, the need for remediation among students in the cohort was down 9.9% over a cohort five years earlier and it was concluded, "…recent high school graduates were least likely to need developmental education" (Parke & Scheuch, 2013b, p. 1). However, the sentence that follows discusses only those students who enrolled in DE: "During 2011-12, 14% of students enrolled in dev. ed. were less than 20 years of age. (21,371/152,389)" (Parke & Scheuch, 2013b, p.1). It is not clear if the writers intended to suggest that a need for remediation upon high school graduation is synonymous for enrollment in college remediation, but it is important to realize that such a scenario is not the case in Florida.

Using American College Testing (ACT) data, the Alliance for Excellent Education (2013), reported that in the 2012-13 year, only 18% of current high school graduates in Florida were college ready, an indication that the majority of high school graduates in Florida are unprepared for college level courses. Of particular concern, only five percent of African American students and only 14% of Hispanic students demonstrated college readiness in all core subjects tested by the ACT. Overall, this means that 82% of students graduating high school were not ready for credit-bearing college course work, but according to the FCS Annual Report (Division of Florida Colleges, 2013), only 176,286 out of 879,948 students actually enrolled in remedial education that year, or about 20% of all students. It follows then, that a large percentage of Florida high school graduates are either not matriculating into the FCS or they need

remediation but are not enrolling in DE. In either case, it does not follow that a need for remediation translates to DE enrollment.

It remains to be seen whether exempt students will volunteer to remediate when necessary or whether VR will produce systemic improvements, but a continued review of the literature does not support the probability.

Success of Voluntary Remediation

Zeitlin and Markus (1996) described a study at Grossmont Community College in which 67% of students in a VR program withdrew, dropped out or failed their college level courses. McMillan et al. (1997) reported a correlation found by Roueche, Baker, and Roueche between success of remediation and program characteristics including mandatory entry-level testing and placement. Roueche and Roueche (2000) and Boylan and Saxon (n.d.) agreed that remediation must be required to be successful, and McCabe (2000) recommended both mandatory testing and required placement. Contributing to the lacking success is the fact that if students view voluntary courses as extra course work, they will typically select only those courses that will be required for their degree or program completion (Cohen & Brawer, 2008). Further, the same legislation that has made DE voluntary for Florida exempt students, establishes a concept called meta-majors in which students must decide early a broad scope of study that will easily perpetuate them through a course of study and completion. One section of the law requires colleges to "counsel students into college credit courses as quickly as possible, with developmental education limited to that content needed for success in the meta-major" (Florida Senate, 2013, p. 32). These facts give rise to the question of whether or not students are likely to volunteer for non-credit courses designed only to help them

improve deficient skills if those courses are not required for program completion and if they are dissuaded from participating (Jenkins & Boswell, 2002; NCES, 1991).

Senate Bill 1720 requires that exempts students entering the FCS have the option to enroll in DE or alternatives, namely, "tutoring, extended time in gateway courses, free online courses, adult basic education, adult secondary instruction, or private provider instruction" (Florida Senate, 2013, p. 25). In 2012, the American Association of Community Colleges (AACC) outlined best practices for remediation, as did the Charles A. Dana Center, Complete College America, Inc., Education Commission of the States, & Jobs for the Future in a 2012 joint statement. All of these groups provide options that are similar to those mandated by SB 1720, but in contrast, none of the recommended practices included the implementation of VR. There is little research to show that VR is a good solution to the challenges facing American community and state colleges. Boylan and Saxon (n.d.) suggested, "Even though large numbers of the weakest students will become victims of attrition under systems of mandatory placement, more will survive than if they had not received any remediation at all" (p. 7).

In Florida, evidence for Boylan and Saxon's assertion may be found in the fact that about one-third (33.8%) of FCS graduates in 2011 had also completed DE courses and that these FCS graduates continued their education and were employed at the same rates whether or not they had completed DE courses (Parke & Scheuch, 2013b). This may indicate that students who need remediation and complete it do indeed benefit, and the possibility warrants additional research such as this study.

In addition to not working for students, VR may have a profound and negative effect on faculty. Although such an investigation is beyond the scope of this study, it is

worth noting because faculty behaviors, which are known to generally influence student success (Pascarella & Terenzini, 1991; Tinto, 2007), may be especially important for students who need remediation (Boylan & Saxon, n.d.; Roueche & Roueche, 2000; Umoh et al., 1994). Berger (1997) wrote of English faculty experiences as they encountered diverse viewpoints on policy changes related to mandatory testing and placement at their community college in San Diego:

> Faculty were often in a quandary regarding what final grade to give a student who would have been appropriately enrolled in a lower level but who had made significant progress over the course of a semester. If the student had still not achieved the goals of the course he or she was enrolled in, a failing grade penalized hard work and accomplishment, but a passing grade inaccurately signaled the student's level of competence...faculty began to lose their own sense of standards at each level of the curriculum...The situation was particularly troubling to the large numbers of part-time faculty, who feared that if they failed large numbers of students or had unusually high attrition rates, their jobs would be in jeopardy. (p. 35-36)

This example illustrates that faculty behaviors may be affected by their knowledge and beliefs about policy or pressures caused by threat of job loss. Additionally, the example shows one way that behavior may in turn contribute to outcomes for students who are impacted by VR, adding another layer of complexity to the discussion and providing another reason to study the effects of VR.

Allowing students to elect or decline to remediate deficient skills is historically unsuccessful. This poses an additional problem in Florida because remediation occurs

almost exclusively at the state or community college level (Windham, 2005). Minority and low-income students are more likely to enroll in these lower division institutions (AACC, 2012; Cohen & Brawer, 2008; Tinto, 2007; Zeitlin & Markus, 1996), so it is appropriate to consult the literature to learn the potential impact of VR on these demographic groups as they enroll in FCS institutions.

Potential Impact of Voluntary Remediation on Minority and Low-income Students

Senate Bill 1720 makes no attempt, in theory at least, to repudiate the mission of the FCS, a system comprised of community and state colleges. According to its current strategic plan (Division of Florida Colleges, 2012), the FCS mission includes the continued delivery of remedial services and a continued open door admissions policy, inclusions that are both because of previous legislation that is not negated or overwritten by SB 1720. Florida's intent to have its colleges maintain an open door policy while allowing a large population of students to engage only voluntarily in diagnostic testing and remediation may worsen success among underprepared students, including minorities and students with low SES. This point is made in a return to the earlier discussion regarding the students served by DE programs. Sixty-five percent of students in DE in 2011-2012 were also on financial aid (Parke & Scheuch, 2013b) and as such, may be of lower SES. Additionally that year, Florida remedial course enrollments included higher proportions of Black (47.7%) and Hispanic students (29.8%) than White students who were represented at only 22.5% (Parke & Scheuch, 2013b). It is important to remember that these percentages are of the students who enrolled, but the numbers do not necessarily represent all students who needed remediation. Greater proportions of students demonstrate the need for remediation upon high school graduation than those

who actually enroll in college DE programs (Alliance for Excellent Education, 2013; Hughes & Scheuch, 2011).

Developmental education programs may benefit minority students especially because they are already at higher risk of not completing college, "independent of their remediation experiences" (Crisp & Delgado, p. 111, 2013). While some argue that it may further stratify groups because of policies that require completion of remediation before credit work (Cohen & Brawer, 2008; Hodara & Jaggars, 2014), it is also suggested that remediation is necessary to bridge the gap (Hodara & Jaggars, 2014; Zeitlin & Markus, 1996). Academic equity between prepared and underprepared students may be threatened, and inequities may be exacerbated among minority students if they do not elect to participate in remediation when it is needed.

Academic inequities are a problem for minority and low SES students because, among other reasons, the inequities have long resulted in lower completion rates for these groups (AACC, 2012; Cohen & Brawer, 2008; Zeitlin & Markus, 1996). Specifically, it is known that Black male students historically complete college at rates far less than their White peers. Harper (2006) found that Black males completed college far less often (44.3% completed in 2004) than their White male peers (61.4% completed in 2004). He also found that between 1977 and 2003, degree attainment among Black males represented almost negligible percentages of degrees earned in the United States. Further, he noted the gender gap increased during the same interval, and that in 1998, Black males graduated at a rate "lowest among both sexes and all racial/ethnic groups in higher education" (p. 5).

Some researchers contend that the academic threat to minority students is even a threat to the nation and its democracy. The AACC said in its 2012 report that the low completion rates "threaten the American future" (p. 14), a sentiment that echoes thoughts expressed years earlier by Zeitlin and Markus (1996) when they cited a 1986 report that read, "Without quality education, the nation loses strength. Without equity in education, democracy ceases to function." The Zeitlin and Markus references are important because, based on their research on VR specifically, they believed that "when remediation is required, it is effective. In order to preserve the mission of the college, while allowing true access to higher education, mandatory remediation must become an integral component of the college curriculum" (p. 2). Hodara and Jaggars (2014) reminded readers that secondary education is not always adequate for low SES students, and it is DE that seeks to "overcome this deficit" (p. 247).

Emerging Research

Since the Florida legislation was passed, administrators in Florida colleges have begun to deal with perhaps unintended, but not unforeseen consequences. Decreased enrollment in DE of up to 50% is being counterbalanced by increased enrollments in gateway courses (Mangan, 2014; Smith, 2015; Travis, 2014). For example, within the first year of the new law, DE enrollments dropped by 41% at Palm Beach State College, 50% at Broward College, and about 30% at Miami Dade College (Travis, 2014). By June 2015, Miami Dade continued to report reduced DE enrollments compared to numbers before SB 1720: 42% decrease in math, 44% in writing, and 46% in reading (Smith, 2015). While numbers in the DE courses continue to decline, credit enrollments are increasing in ENC1101 and MAT1033, the two credit courses included in this study.

Smith (2015) reported that credit math enrollments were up 30% and English enrollment was up 10% at Miami Dade College.

The law has also results in changed enrollment patterns in the DE and credit courses. Florida State University's Center for Postsecondary Success leads the way in the much-needed current research, and, although results are slow to emerge, early indications are that many students who are advised into DE are bypassing the VR and the corresponding credit course as well (Hu et al., 2015). In fact, the recent findings are that nearly 36% of sampled students did not take any math at all after being advised to take a DE math course, and more than 41% did not take any English courses after being advised to take DE based on their writing skills. For students in the study who were advised to take DE based on poor reading skills, just under eight percent opted for the DE course; 36% enrolled in college-level English instead, and 56.2% did not enroll in an English course at all (Hu et al., 2015).

In addition to the research that has begun at the Center for Postsecondary Success, some colleges have started to conduct internal research. Smith (2015) wrote of institutional research undertaken at St. Petersburg College. Using an in-house predictor model, advisors at St. Petersburg College counsel students based on high school transcript information. Among students who have been advised to enroll in DE courses before credit English or math, those who took the DE course first fared better in the credit course, and the opposite was true. Specifically, those students who bypassed the opportunity to remediate passed the credit courses at only a 50% rate in English, and a 20% rate in math (Smith, 2015). New research by Hu et al. (2015) suggests that results are similar statewide.

Thomas Bailey is an active researcher who for years has contributed to the literature on the challenges, costs, and lacking success of DE programs (Community College Research Center, 2015). Having started the Community College Research Center at Teachers College in 1992, much of his research has been published by Columbia University in the years since. Bailey himself questioned VR as a solution, telling a reporter in December of 2014 that while he acknowledged the insufficiencies of DE, he was unsure that making it voluntary would have been his recommendation (Mangan, 2014). Similarly, Mangan (2014) wrote that the president of Complete College America, Inc., an organization that is pushing for national reform of DE, thought that SB 1720 was too extreme.

The review of the literature makes it clear that while problems with DE have persisted for years and solutions are needed, more research is necessary before it can be said that VR is the answer.

Chapter Summary

Developmental education has long been a source of controversy and contention in higher education. Its current high cost and low success has prompted Florida legislators to pass SB 1720, making remediation voluntary for exempt students entering colleges in the FCS. Exempt students are those who entered a Florida public high school in 2003-2004 or later and graduated with a standard high school diploma or those students who are active duty members of the military. Limited literature about VR suggests it is not typically successful. Further, many minority and potentially low-income students are often over-represented in DE and are therefore at greater risk of academic disenfranchisement without the support that DE in particular offers underserved

populations. Educators must pay close attention to the overall success of credit classes as unprepared and underprepared students can now enroll in these classes without remediation; due attention must be given to watch for any disproportionate and adverse effect specifically on minority and low-income students as Florida colleges forge onward with VR.

3. METHODOLOGY

Introduction

The overall purpose of the study was to examine the effect of VR on student success in gateway English (ENC1101) and math (MAT1033) courses in Florida public colleges. As the study is described, VR is used interchangeably with DE programs and courses. This is not to say that VR is exactly the same thing as DE, when in fact DE is more comprehensive and holistic than merely addressing deficient academic skills (Goudas & Boylan, 2012). However, because DE includes remediation, the 2013 Florida law which made DE optional for the majority of students entering Florida public colleges also makes remediation of deficient skills before taking college credit courses optional for these students.

The study was organized based on research objectives as suggested by Creswell (2012). Specifically, four objectives helped shaped the methodology, that is, the design and methods selected. First, it provided for an investigation of changes in success as measured by both mean grades and the proportion of students in the gateway courses who earned grades of C or higher before and after the change from MR to VR. Second, the methodology allowed for the exploration of potential relationships between changes in gateway course success and demographic or academic variables when the remediation policy changed to VR. Third, it provided for an examination of gateway course success based on students' VR actions when it was known that all sampled students had deficient composition or computation skills. Finally, the study made it possible to investigate the

potential value of variables in predicting students' decisions to voluntarily remediate weak skills.

A quantitative approach was used in which a secondary database was created from student records obtained from three institutions in the FCS. In all cases, although no human subject research was being conducted, the researcher took ethical considerations seriously. First, a formal application was made to the Institutional Review Board (IRB) at Florida Atlantic University, the supervising institution, to verify its agreement that the study did not constitute human subject research and to obtain approval for the study as appropriate. Second, the approval by the IRB at FAU was submitted with each data request as part of subsequent IRB or equivalent applications to the FCS institutions, and clear communication in the data request ensured that students in the study would not be personally identifiable to the researcher. Finally, the researcher submitted the results with a draft report to administrators at each institution when requesting permission to include college names in the study; names are included in the study with permission of high-level administrators at each college (see Appendix A).

Reliability and validity were considered as the data were collected. The data were received directly from researchers at each college, and in their roles as institutional researchers, they share in the responsibility to protect data. As each is a staff member of an office of institutional research, they must, to the best of their ability, safeguard the integrity and accuracy of the data provided by those offices. When the data were received, all records were examined individually to ensure that each record met the criteria of the study. Demographic variables and prior academic records were selected based on the literature review that suggests the relevance of these constructs to this study.

The data were analyzed using inferential statistics; the analyses were conducted with *Statistical Package for the Social Sciences (SPSS),* Version 22. Tests selected for the study included independent samples t-tests to compare means and cross-tabulations with Chi-Square analyses to examine relationships of the variables.

In this chapter, the research questions and hypotheses are presented, and the design, setting, sample, data collection, variables, and statistical analyses are described.

Research Questions and Hypotheses

Seven questions were developed for the study with two corresponding hypotheses for each question. In each case, one hypothesis addressed ENC1101 and the second addressed MAT1033.

RQ1. Is there a difference in mean student grades for ENC1101 or MAT1033 in the periods before and after Florida remediation requirements were made voluntary for exempt students?

$H_0$1: There is no difference between the mean student grades in ENC1101 in the periods before and after Florida remediation requirements were made voluntary for exempt students.

$H_0$2: There is no difference between the mean student grades in MAT1033 in the periods before and after Florida remediation requirements were made voluntary for exempt students.

RQ2. Is there a relationship between the proportion of students who succeed in ENC1101 or MAT1033 (grade of C or higher) and the remediation policy?

$H_0$3: There is no relationship between the proportion of successful ENC1101 students and the remediation policy (mandatory or voluntary).

$H_0$4: There is no relationship between the proportion of successful MAT1033 students and the remediation policy (mandatory or voluntary).

RQ3: Is there a relationship between the independent variables and the proportion of successful (grade of C or higher) ENC1101 or MAT1033 students based on the remediation policy?

$H_0$5: There is no relationship between the independent variables and the proportion of successful ENC1101 students in based on the remediation policy.

$H_0$6: There is no relationship between the independent variables and the proportion of successful MAT1033 students based on the remediation policy.

RQ4: Is there a difference in mean ENC1101 or MAT1033 grades for students who did and did not complete corresponding voluntary remediation before taking ENC1101 or MAT1033 given that all students had deficient composition or computation skills based on their P.E.R.T. scores?

$H_0$7: There is no difference between the mean ENC1101 grades for students who did and did not complete voluntary remediation before taking ENC1101 given that all students had deficient English skills based on their P.E.R.T. scores.

$H_0$8: There is no difference between the mean MAT1033 grades for students who did and did not complete voluntary remediation before taking MAT1033 given that all students had deficient math skills based on their P.E.R.T. scores.

RQ5: Is there a relationship between grades earned during voluntary remediation and success in ENC1101 or MAT1033 (grade of C or higher)?

$H_0$9: There is no relationship between grades earned during voluntary remediation and success in ENC1101 (grade of C or higher).

$H_0$10: There is no relationship between grades earned during voluntary remediation and success in MAT1033 (grade of C or higher).

RQ6: Is there a relationship between the independent variables and the proportion of successful ENC1101 or MAT1033 students who did and did not voluntarily remediate before taking a gateway course?

$H_0$11: There is no relationship between the independent variables and the proportion of successful ENC1101 students who did and did not voluntarily remediate before taking ENC1101.

$H_0$12: There is no relationship between the independent variables and the proportion of successful MAT1033 students who did and did not voluntarily remediate before taking MAT1033.

RQ7: Is there a relationship between the independent variables and students' decisions to voluntary remediate deficient skills before taking ENC1101 or MAT1033?

$H_0$13: There is no relationship between the independent variables and students' decisions to voluntary remediate deficient English skills before taking ENC1101.

$H_0$14: There is no relationship between the independent variables and students' decisions to voluntary remediate deficient math skills before taking MAT1033.

Design of the Study

To meet the research objectives and answer the questions posed, a quasi-experimental quantitative design was developed. According to Creswell (2012), this is appropriate when groups need to be studied that cannot be randomly created. The study required groups of students who had enrolled in ENC1101 or MAT1033 (credit courses) both before and after Florida remediation policy changed from mandatory to voluntary. It also required groups of students who had voluntarily taken the P.E.R.T., scored below the recommended level for direct enrollment in the credit courses, and then had to decide whether or not to voluntarily complete a corresponding DE course before enrolling in ENC1101 or MAT1033. A quasi-experimental approach allows for "assignment, but not random assignment of participants to groups" (Creswell, 2012, p. 309). The "participants" in this case were students who were unknown to the researcher and had already completed ENC1101 or MAT1033, so random assignment was not possible. The three FCS institutions provided original data, and a secondary database of 26,691 records was created from the data received. The database became the source file for the study and was managed in an Excel file where data subsets were organized and imported into SPSS for the statistical analyses.

Theoretical framework. Variables were selected based on a conceptual framework adapted from Astin and Astin's "Input-Environment-Outcome" (I-E-O) Model (1992). This model purports that "inputs" such as demographic characteristics and prior academic records, combined with "environment" such as, in the case of this study, enrollment status and academic decisions, will influence "outcomes" such as, in the case of this study, credit course success (Astin & Astin, 1992; Buzynski, 2011; Hu & Kuh,

2003). Astin and Astin (1992) describe a design in which input variables are systematically considered in a regression model that allows the researcher to identify relationships between the input or environment variables and the outcome and to consider the interactions among the variables. The design of this study was not regression, but because the researcher was interested in the relationships between the outcome and input or environment variables, an adaptation of the I-E-O model was appropriate (see Figure 1).

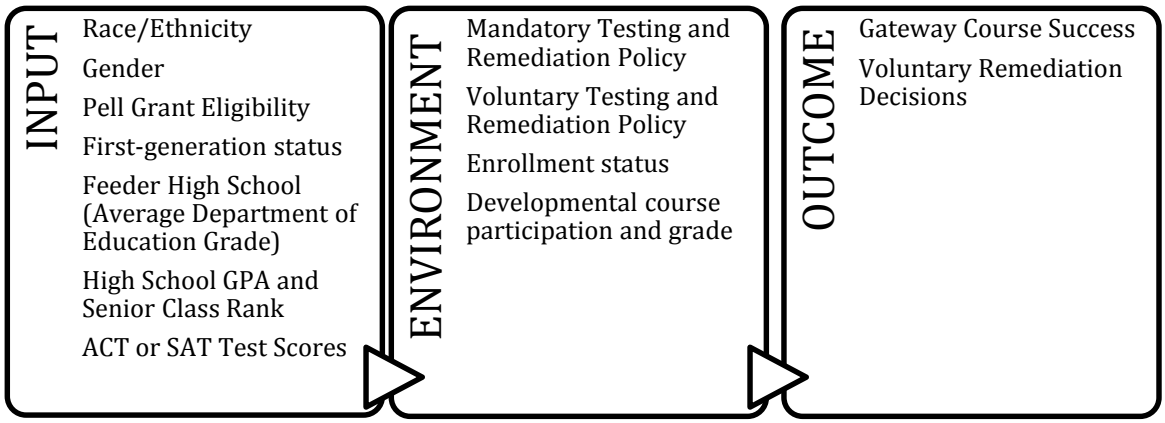


Figure 1. Conceptual framework based on Astin and Astin's 1992 I-E-O Model.

Setting. The research site was comprised of three institutions from the FCS: Daytona State College, Palm Beach State College, and Polk State College. The institutions are regionally accredited by the Southern Association of College and Schools Commission on Colleges and offer associates and bachelor's degrees as well as certificates and trade programs. Each has a rich history within its respective community. Daytona State College was established in 1965, and the medium-sized four-year college (Carnegie Foundation, 2015) now has six campuses serving communities in the central east coast area of Florida (Daytona State College, 2015b). Palm Beach State College, a very large four-year college (Carnegie Foundation, 2015) and the state's first public two-

year college, was founded in 1933. It has four campuses and serves southeastern coastal communities and areas inland toward the center of the state (Palm Beach State College, 2015). Finally, Polk State College opened its doors in 1964 (Polk State College, 2014a). This large four-year college (Carnegie Foundation, 2015) serves rural areas in central Florida and has two campuses (Polk State College, 2014a). Combined, the institutions have an annual unduplicated headcount of approximately 95,000 students.

Before the setting was selected, all 28 FCS colleges were reviewed to compare compositions of Black, Hispanic, and White students, as well as gender, Pell grant eligibility, and full-time enrollment status. The racial demographics were considered specifically because the literature is clear in that Blacks and Hispanics have historically had higher needs for remediation and financial assistance than White students (Cohen & Brawer, 2008; Grimes & David, 1999; Parke & Scheuch, 2013a). Thus racial composition of the sample was one important part of the study. A setting was desired that would provide a large sample and, as closely as possible, reflect the composition of FCS students statewide in order to maximize any generalizability of the results. Specifically, that composition is such that proportions of Black and Hispanics students are very similar to each other, 24.1 and 24.9% respectively in credit courses in 2011-2012, with a greater representation (60.7% in 2011-2012) of White students (Parke & Scheuch, 2013a). Percentages exceed 100 because “Hispanic” is considered an ethnicity, and therefore Hispanic students may be of any race.

Additionally, it was desired that the sample reflect the statewide composition of gender balance (59% female), Pell grant eligibility (46.7%) and full-time enrollment

status (37%), as was the case for the statewide FCS population in 2011-2012 (Division of Florida Colleges, 2013; Parke & Scheuch, 2013a, 2014).

When combined, fall 2013 enrollment data for the sample colleges showed that students in these institutions were 34.7% Black and 35.1% Hispanic, representations that are very similar to each other, and there were greater proportions (76.1%) of White students (NCES, 2014). Together, these three institutions could provide a large sample and best reflect the statewide population of students enrolled in FCS colleges, and thus, the institutions collectively became the research site.

Sample. The sample was comprised of students who were either exempt from remediation because of the 2013 Florida legislation, SB 1720, or who would have been exempt if the law had been in effect when they were enrolled in ENC1101 or MAT1033. All students in the sample graduated from a Florida public high school in 2007 or later and enrolled in ENC1101 or MAT1033 in one of the research site colleges during the spring semesters of 2012, 2013, 2014, or 2015, or in the fall semester 2014. Records of students who were enrolled in both the English and the math class were analyzed separately; enrollment in both courses was not a variable in the study. The graduation year criterion is selected because it most closely matches the high school graduation criterion established in SB 1720 for exempt students, that is, those who entered a Florida public high school in 2003 or later and subsequently graduated from a Florida public high school with a standard diploma. This criterion provides similar comparison groups by ensuring the inclusion of students who had deficient skills both when remediation was required (before SB 1720) and when remediation was voluntary (after SB 1720). Students who came from private high schools were eliminated, as were students from feeder

schools that offered alternative diplomas unless the type of high school diploma was also verified as a standard high school diploma. After the examination of all records and elimination of some data based on the feeder high school information, data from the institutions were aggregated into a single file to create the secondary database of 26,691 available records. The file included 14,614 available records of English students and 12,077 available records of math students, and two data sets were pulled from this sample (see Figure 2). In each set, students were assigned to groups for comparison, and as each set was created for analyses, the percentage of students with selected demographic characteristics was monitored.

Data Set 1. This data set was comprised of 19,347 records of students from the database who enrolled in one or both of the gateway courses, ENC1101 (N=10,245) or MAT1033 (N=9,102), in one of the spring semesters between 2012 and 2015. It was used to compare mean grades and success (grade of C or higher) in each course before and after the Florida college remediation policy was made voluntary. Data Set 1 was also used to examine relationships between success and demographic or academic variables during MR and VR periods (RQ1, RQ2, and RQ3).

Records in this data set were grouped based on when the ENC1101 or MAT1033 courses were taken. Students enrolled in the spring semesters of 2012 or 2013 were assigned to the group enrolled during MR. This group had 4,770 English students and 3,874 math students. Students enrolled in the spring semesters of 2014 or 2015 were assigned to the group enrolled during VR. This group had 5,475 English students and 5,228 math students.

Data Set 2. This data set was created to answer RQ4, RQ5, RQ6 and RQ7. This set was comprised only of those students in the database who met three criteria: they had taken the P.E.R.T. between November 1, 2013, and June 1, 2014; they scored below the

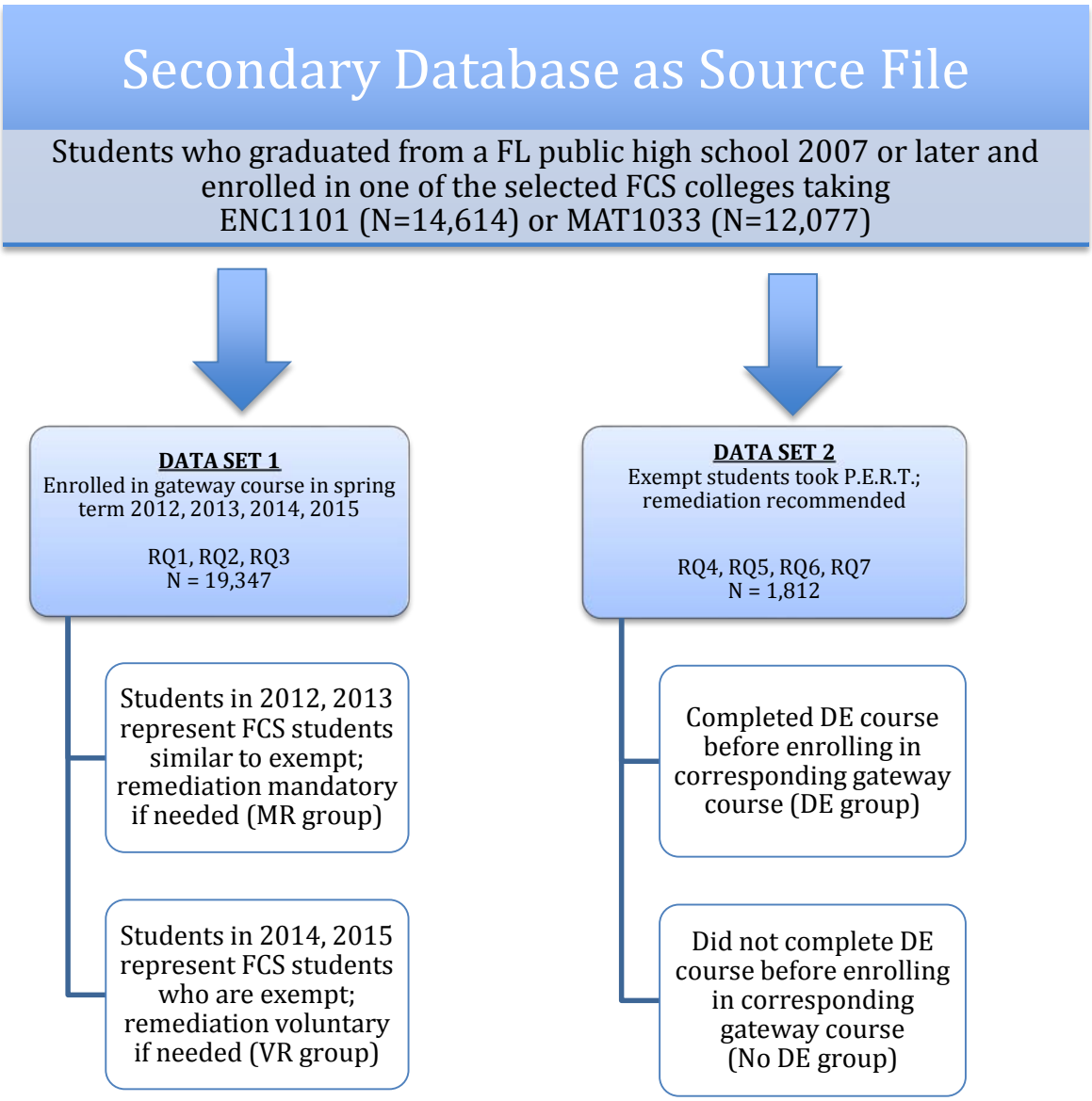


Figure 2. Sampling procedure.

credit course threshold (106 in reading, 103 in writing, and 114 in math); and they enrolled in ENC1101 or MAT1033 in fall 2014 or spring 2015. These particular dates ensured that students who took the test did so voluntarily as exempt students, and the

dates ensured that if test results indicated deficient composition or computation skills, students had at least one semester to voluntarily complete a developmental course before taking ENC1101 or MAT1033 in the fall 2014 or spring 2015 semester. There were 1,812 records in Data Set 2 of which 1,200 were English students and 612 were math students.

Students in Data Set 2 were assigned to two groups based on their VR action. They were assigned to the "DE" group if they completed the corresponding developmental course before taking ENC1101 or MAT1033; this group had 135 English students and 150 math students. All other students in Data Set 2 were assigned to the "No DE" group, students who did not voluntarily remediate before the credit course; this group had 1,065 English students and 462 math students.

Maximizing generalizability of the sample. It was desired that demographic composition of the sample reflect statewide FCS characteristics as closely as possible, so the composition of each data set was monitored as it was created. The percentage of students in each group was mostly consistent except for Pell grant eligible students and those with an unknown or unreported race (see Table 1). The most recent FCS annual report and online accountability reports were used to retrieve statewide percentages (Division of Florida Colleges, 2013; Parke & Scheuch, 2013a, 2014) and institutional data were pulled from online reports from each college (Daytona State College 2015a; Palm Beach State College, 2014b; Polk State College, 2014b).

Data collection. Archival data sets were requested electronically from the research departments of each of the three institutions that comprised the research site. Grade distributions in ENC1101 and MAT1033, the defined FCS gateway courses, were requested for students who graduated from Florida public high schools in 2007 or later

and enrolled in the gateway courses at the three institutions in spring semesters between 2012 and 2015 or in the fall semester 2014. Demographic variables such as race, ethnicity, gender, and SES were requested, as were academic variables such as high school grade point averages (GPA), test scores, and class rank. Additionally, colleges were asked to provide dates and grades for the most recent attempt of the highest-level DE course for each student that completed DE courses, as well as dates and scores for the P.E.R.T., if taken. Available data were provided to the researcher by the end of May, 2015, and at that time, the data were prepared and organized for analysis as recommended by Creswell (2012).

Table 1

Percentage of Students in Demographic Groups Statewide in the Florida College System Compared to the Sample and Two Data Subsets

Characteristic	FCS	Full Sample N=26,691	Data Set 1 N=19,347	Data Set 2 N=1,812
Race (2011-2012)				
American Indian	0.4	0.4	0.4	0.3
Asian	3.0	2.0	2.1	1.8
Black/African American	24.1	27.1	28.2	28.3
Pacific Islander	0.2	0.3	0.3	0.2
Multiple Races	1.1	3.0	2.9	3.4
Unknown or Not Reported	8.1	13.3	13.2	12.2
White (2013)	45.0	48.0	47.2	46.1
Hispanic (may be any race)	24.9	27.9	27.2	30.1
Female	59.0	55.1	54.8	56.7
Pell Grant Eligible	46.7	66.4	68.3	68.8
Enrolled Full-time	37.0	43.3	43.9	38.4

Data analysis and statistical techniques. Independent t-tests, cross-tabulations, and chi-square analyses, were used to complete the research. Independent t-tests were used to examine potential differences between mean grades in the gateway courses (ENC1101 and MAT1033) before and after the legislation (RQ1) as well as with and without remediation (RQ4). Cross-tabulations and chi-square analyses were performed to investigate changes in the proportion of successful students in the gateway courses based on the independent variables and remediation policy (RQ2, RQ3) as well as with and without remediation (RQ5, RQ6). Cross-tabulations and chi-square analysis were also performed to determine potential value of the independent variables in predicting students' remediation decisions by the variables (RQ7).

Preliminary bivariate correlations were performed before the statistical analyses were conducted. Some variables are correlated, for example ACT writing scores are moderately and significantly correlated to SAT verbal scores (.324, $p < .001$), and the review of the literature is a reminder that many categories overlap. For example, students who are Pell eligible may also be first-generation and of a minority race. For that reason, all cross-tabulations were performed and analyzed separately, and no subjects were in more than one category per test.

When running multiple chi-square analyses, it is appropriate to adjust the Pearson Chi-Square (X^2) value when tests are performed on multiple categories of a single variable (Filliben, 2012; Sheehy, 2015) as was done in analyses for some of the questions. This technique was utilized specifically to answer research question three. Adjustments were made and compared to the original chi-square results. Specifically,

categorical X^2 values were calculated by first finding the difference between the observed (O) and expected value (E) for the category, then by squaring that difference, and finally by dividing the squared difference by the expected value, or as a formula, $\frac{(O-E)^2}{E}$. After this was completed for each category, the results (squares divided by expected values) were summed for a total adjusted X^2 for the variable as follows: $\Sigma \frac{(O-E)^2}{E}$. Confidence intervals were retrieved from a X^2 distribution table (Hays, 1973, p. 886-887), and each category was reviewed to see whether or not the adjusted X^2 was within the 95% confidence interval.

Operational Definitions and Coding of Study Variables

Dependent variables. The study has two dependent variables (DV). The mean numerical grade in the credit course (ENC1101 or MAT1033) was the DV for RQ1 and RQ4. Success in the credit course (ENC1101 or MAT1033) was the DV for RQ2, RQ3, RQ5, and RQ6, and success was defined as a grade of C or higher. The file was "split" in SPSS for separate analyses so that results for English and math were displayed and could therefore be reported separately.

1. CRGRNUM is the Credit Grade Numerical Value, representing the numerical value of the letter grade earned in the credit course. It is an interval variable with values between 0 and 4; letter grades were recoded using the following scale: A = 4.00, A-=3.67, B+=3.33, B=3.00, B-=2.67, C+=2.33, C=2.00, C-=1.67, D+=1.33, D=1.00, D-=0.67, and F=0.00.
2. CRSUCCES is Credit Success. It answers the question, "Was student successful (grade of C or higher) in credit course?" It is a dichotomous variable where 0=Successful and 1=Not Successful.

Independent variables. Several independent variables were selected for the study. Demographic variables, such as race and ethnicity, Pell grant eligibility, and first-generation status were important to the study because of the challenges faced in college by minority and low-income students (Cohen & Brawer, 2008; Grimes & David, 1999; Parke & Scheuch, 2013a) and students who are the first in their families to attend college (Pascarella, Pierson, Wolniak, & Terenzini, 2004). Pell grant eligibility was selected as a means of capturing students who were potentially low-income; there were no other measures common to each institution to associate with income levels. Other variables selected included enrollment status, full-time or part-time, as well as high school GPA, class rank, and scores on the college-entry SAT and ACT exams.

Finally, annual "grades" of feeder high schools were considered and included as a variable. In Florida, all schools are assigned an annual letter grade by the state Department of Education (DOE) to represent a variety of metrics. These metrics have been expanded over time and currently include four performance-based measures and four measures of learning gains (Florida Department of Education, 2008, 2014b). The grades assigned by the DOE were collected from the Florida School Grades website (Florida Department of Education, 2014a) for each graduation year of students in the sample (2007 through 2014). An Excel file with these letter grades was downloaded from the website, and the data were then recoded into numeric values (4-point scale) using the statistical software so that average numerical grades from 2007 through 2014 could be assigned to each school for the purpose of the study. This variable and the others included are listed below with labels, coding schemes, and operational definitions.

1. CRCOURSE is Credit Course, a nominal dichotomous variable with values

ENC1101 and MAT1033. This variable was used to split the file for separate analysis on English and math.

2. CRRMPOL is Remediation Policy during Credit Course. This nominal dichotomous variable was recoded into a numerical variable where 0=Mandatory and 1=Voluntary.
3. RACE is a nominal variable recoded into numerical values (alphabetically) where 1=American Indian, 2=Asian, 3=Black, 4=Hispanic, 5=Pacific Islander, 6=White, 7=Multiple Races, and 8=Unknown or Not Reported.
4. HISPANIC is a nominal variable to answer the question, "Is student identified as Hispanic?" It was recoded into numerical values where 0=Yes and 1=No.
5. GENDER is a nominal variable recoded into numerical values where 1=Male, 2=Female, and 3=Unknown or Not Reported.
6. PELL is a nominal variable to answer the question, "Is student identified as Pell grant eligible?" It was recoded into numerical values where 0=Yes and 1=No.
7. FIRSTGEN is a nominal variable to answer the question, "Is student identified as first-generation?" It was recoded into numerical values where 0=Yes and 1=No.
8. PTFT is a nominal variable to describe the enrollment status of the student during the credit course semester. It was recoded into numerical values where 1=Full-Time, 2=Part-Time, and 3=Unknown or Not Reported.
9. HSGPACAT is a continuous variable to indicate a student's high school GPA on a 4-point scale. It was recoded into an ordinal variable where 1=Very Low GPA (<0.99), 2=Low GPA (1.00-1.99), 3=Mid-range GPA (2.00-2.99), and 4=High GPA (3.00-4.00).

10. HSRKCAT is a continuous variable to indicate, as a percentage, where a student ranked among peers from the same high school graduating class. It was recoded into an ordinal variable where 1=Top 20% of class, 2=Moderate Class Rank (61st-80th percentile), 3= Mid-range Class Rank (41st-60th percentile), 4=Low Class Rank (21st-40th percentile), and 5 = Lowest 20% of class.
11. HSDOEGR is a continuous variable on a 4-point scale to indicate the average annual DOE grade assigned over the eight-year period (2007-2014) in which students in the study graduated. It was recoded into an ordinal variable where 1=Very Low DOE Average Grade (<1.00), 2=Low DOE Average Grade (1.00-1.99), 3=Mid-range DOE Average Grade (2.00-2.99), and 3=High DOE Average Grade (3.00-4.00).
12. SATMACAT is a dichotomous variable to indicate whether an SAT math score met the threshold for credit math recommendation of 440. It was recoded from the continuous score so that 0=440 or greater and 1=less than 440.
13. SATVBCAT is a dichotomous variable to indicate whether an SAT verbal score met the threshold for credit English recommendation of 440. It was recoded from the continuous score so that 0=440 or greater and 1=less than 440.
14. SATRECAT is a dichotomous variable to indicate whether an SAT reading score met the threshold for credit English recommendation of 440. It was recoded from the continuous score so that 0=440 or greater and 1= less than 440.
15. ACTMACAT is a dichotomous variable to indicate whether an ACT math score met the threshold for credit math recommendation of 19. It was recoded from the continuous score so that 0=19 or greater and 1=less than 19.

16. ACTRECAT is a dichotomous variable to indicate whether an ACT reading score met the threshold for credit English recommendation of 19. It was recoded from the continuous score so that 0=19 or greater and 1=less than 19.
17. ACTWRCAT is a dichotomous variable to indicate whether an ACT writing score met the threshold for credit English recommendation of 18. It was recoded from the continuous score so that 0=18 or greater and 1=less than 18.
18. ACTENCAT is a dichotomous variable to indicate whether an ACT English score met the threshold for credit English recommendation of 18. It was recoded from the continuous score so that 0=18 or greater and 1=less than 18.
19. VRACTION is a dichotomous variable to indicate whether or not a student voluntarily completed a developmental course before enrolling in ENC1101 or MAT1033. This variable was coded so that 0= VR and 1=No VR.
20. DEGRADE is a nominal variable to indicate the letter grade earned in the corresponding developmental course when a student voluntarily completed it before enrolling in ENC1101 or MAT1033. Values included A, A+, B, B+, C, C+, D, D+, F, W, N, S, FX, and WX.
21. DERESULT is an ordinal variable recoded to indicate developmental course history, specifically, whether a student succeeded, did not succeed, or did not take a DE course. It was recoded from DEGRADE with values 1=Success in DE Course (C or higher), 2=Unsuccessful in DE Course, and 3=No DE Course. (This variable was also used as the dependent variable for the last research question.)

Chapter Summary

This chapter explained the research design of the study conducted to investigate the impact of VR as mandated by Florida legislation in 2013. The primary aims of the study were to examine student performance in the gateway courses in Florida colleges that are most affected by the new policy, namely, credit English, ENC1101, and intermediate algebra, MAT1033, and to investigate potential relationships between success in the credit courses and independent variables, including input variables which considered race, ethnicity, gender, Pell grant eligibility, first-generation status, feeder high school information, and prior academic performance (high school GPA, class rank, and college entry test scores). Also considered were college environment variables of enrollment status, developmental course history, and VR decisions. The chapter described the research site, data collection, sampling plan, sample, and inferential statistics that were used to answer the seven research questions in the study.

4. RESULTS OF THE STUDY

Overview of the Chapter

Chapter 4 presents the results and five key observations as they relate to the hypotheses. First, there were observable increases in ENC1101 and MAT1033 enrollment and statistically significant decreases in success for both courses when remediation became voluntary (VR). As investigated by research question (RQ) one, differences in success were found between mean grades during MR and VR semesters. There were also differences in the proportion of successful students earning at least a grade of C (RQ2), and in some cases, the proportion of successful students by categorical variables (RQ3). These results help answer questions about overall success in the two gateway courses as tests compared credit success during MR, spring 2012 and spring 2013, to credit success during VR, spring 2014 and spring 2015.

Second, a low percentage of students chose to remediate deficient skills by completing a developmental course before enrolling in the credit course. Third, the degree to which a student succeeds in a developmental course before taking the credit course is significantly related to credit success (RQ4, RQ5). Fourth, there are few significant relationships by input and environmental variables between VR and credit success (RQ6). Finally, there are few significant relationships between input variables and VR decisions (RQ7). These results help answer questions related to success and remediation decisions specifically of exempt students who voluntarily took the P.E.R.T. and tested below the recommended score for direct enrollment the credit course.

Comparisons are made based on developmental (DE) course history, meaning whether or not students completed a corresponding DE course before enrolling in the credit course, and, where applicable, the degree of success students had in the DE course.

Independent samples t-tests, cross-tabulations, and chi-square statistics were used to analyze the data collected, and tests were performed in *Statistical Package for the Social Sciences* (SPSS). As appropriate, chi-square values were adjusted in the case of multiple tests (Filliben, 2012).

Increased Enrollment and Decreased Success in Both Credit Courses with the Policy Change to Voluntary Remediation

Although no research questions were included in the study to consider enrollment, the observation related to increased enrollment in both credit courses is an important component of the results. Therefore, results regarding enrollment are also presented.

Increased enrollment. An increased number of students enrolled in credit English and math when the remediation policy changed from MR to VR. In the English course, there was a 14.8% increase in enrollment, from 4,767 in the first two semesters (spring 2012 and 2013), to 5,474 in the second two terms (spring 2014 and 2015). Similarly, in math there was a 35% increase, from 3,874 (spring 2012 and 2013) to 5,228 (spring 2014 and 2015). This is consistent with at least two other schools in Florida, as St. Petersburg College and Miami Dade College both noted increased enrollments in the gateway English and math courses with the change in policy (Smith, 2015). For example, MAT1033 enrollments were up from 16,000 before SB 1720 to 20,000 in 2014-2015 at Miami Dade College (Smith, 2015).

Increased enrollment, however, is inconsistent with overall registration and enrollment patterns at the colleges that comprise the research site. To verify these patterns at each institution, spring 2013 (MR) was compared to spring 2014 (VR). Of the three colleges with students in the sample, two reported increases of only 1.0% and 2.3%, and the third institution recorded a decrease of 2.9% (Daytona State College, 2015a; Palm Beach State College, 2014a; Polk State College, 2015).

Decreased success as measured by mean grades. In the first two spring semesters after VR was implemented, decreased success was found to be statistically significant for both mean grades and the proportion of students who had earned grades of C or higher in each course. An independent t-test was used to analyze the mean grades, pulling from the database a sample of 19,347 students (Data Set 1) who completed the English or math courses in spring 2012 or 2013 (remediation was mandatory) or spring 2014 or 2015 (remediation was voluntary). The file was split to report results for ENC1101 (N=10,245) and MAT1033 (N=9,102) separately. Equal variance was not assumed for either test (Levene's Test for Equality of Variances showed $p < .001$ in both analyses), but the statistical software adjusted for this finding so the results may still be interpreted.

For students in ENC1101, the mean grade went from 2.14 when remediation was mandatory and decreased to 1.88 when remediation was voluntary. This finding was significant with $p < .001$, but the effect size was weak using Cohen's *d* (0.19). Cohen's *d* is a reasonable statistic for calculating effect size, which gives insight into the practicality of results (Creswell, 2012; Fields, 2009). The difference in the mean grades for students in ENC1101 based on the remediation policy was .264, and this difference is within the

95% confidence interval of .208 to .319 (see Table 2). Therefore, $H_0$1 is rejected because there is a statistically significant difference between the mean student grades in ENC1101 in the periods before and after Florida remediation requirements were made voluntary for exempt students.

For students in math, the mean grade went from 1.71 when remediation was mandatory to 1.44 when remediation was voluntary. The finding was significant with $p < .001$, but the effect size was again weak using Cohen's *d* (0.20). The difference in the mean grades for students in MAT1033 based on the remediation policy was .275, and this difference is within the 95% confidence interval of .218 to .332 (see Table 3). Therefore, $H_0$2 is also rejected because there is a statistically significant difference between the mean student grades in MAT1033 in the periods before and after Florida remediation requirements were made voluntary for exempt students.

Research question one. The first question in the study was, "Is there a difference in mean student grades for ENC1101 or MAT1033 in the periods before and after Florida remediation requirements were made voluntary for exempt students?" This question can be answered affirmatively and confidently. There is in fact a statistically significant difference ($p < .001$) in mean student grades for both courses.

Table 2

Comparison of Mean Student Grades in ENC1101 based on a Mandatory (MR) or Voluntary (VR) Remediation Policy

	N	Mean Grade	SD	Cohen's *d*	Sig.	Difference in Means	95% CI
MR	4,767	2.14	1.38	.19	$p < .001$	.264	Lower: .208
VR	5,474	1.88	1.46				Upper: .319

Table 3

Comparison of Mean Student Grades in MAT1033 based on a Mandatory (MR) or Voluntary (VR) Remediation Policy

	N	Mean Grade	SD	Cohen's *d*	Sig.	Difference in Means	95% CI
MR	3,874	1.71	1.36	.20	$p < .001$	.275	Lower: .218
VR	5,228	1.44	1.40				Upper: .332

Decreased success as measured by proportions of successful students. The same sample of students (N=19,347) was used to analyze proportions of students who had earned grades of C or higher in each course, both during MR and VR. Cross-tabulation and chi-square tests were used for the analysis, and again the file was split to report results for ENC1101 (N=10,245) and MAT1033 (N=9,102) separately.

The proportion of successful students, that is, students who earned a grade of C or higher in ENC1101, decreased from 72.4% in 2012 and 2013 to 63.1% in 2014 and 2015 when the remediation policy had become voluntary, a 12.8% overall decrease.

Conversely, the proportion of students who did not earn at least a C increased from 27.6%, when remediation prior to ENC1101 was required if needed, to 36.9% when remediation had become voluntary. The observed count of successful students (3,454) exceeded what was expected (3,217) when remediation was required if needed. Similarly, the observed count of successful students (3,455) after remediation had become voluntary was less than expected (3,692).

The overall results of the analysis are significant based on the Pearson Chi-Square statistic ($p < .001$), meaning a relationship exists between the proportion of successful ENC1101 students and the MR or VR policy (see Table 4). Specifically, it is more likely that the decreased proportion of successful students in ENC1101 is related to the changed remediation policy than it is a chance event. The Phi Coefficient is .099 and significant ($p < .001$), which means there is a weak association.

Similar results are observed in the math course. The proportion of successful students (grade of C or higher) in MAT1033 decreased from 61.1% in 2012 and 2013 to 49.3% in 2014 and 2015 when the remediation policy had become voluntary, a 19.3% overall decrease in success. The proportion of students who did not earn at least a C increased from 38.9% unsuccessful when remediation was required if needed, to 50.7% unsuccessful when remediation had become voluntary. The observed count of successful students (2,368) exceeded what was expected (2,106) when remediation was required. In contrast, the observed count of successful students (2,579) after remediation had become voluntary was less than expected (2,842). Additionally, once remediation had become voluntary for students and they could enroll directly in MAT1033, the proportion of students who were successful was less than half (49.3%) of all students in the sample.

The overall results of the MAT1033 analysis are significant based on the Pearson Chi-Square ($p < .001$), meaning a relationship exists between the proportion of successful math students and the MR or VR policy (see Table 5). It is more likely that the decreased proportions are related to the change to VR and did not occur by chance. However, the Phi Coefficient is .117 and significant ($p < .001$), so a weak association exists.

Research question two. The second question in the study was related to whether or not a relationship exists between the proportion of students who succeed in ENC1101 or MAT1033 (grade of C or higher) and the remediation policy. The chi-square analysis of cross-tabulations has shown there are statistically significant relationships between successful students and the remediation policy in both courses. In both courses, the analyses showed it was more likely that students would be successful if they had completed the credit courses during MR and that it was more likely the decreased proportions of successful students during VR was because of the changed policy, not chance. Therefore, $H_0 3$ is rejected because there is a statistically significant relationship between the proportion of successful ENC1101 students and the remediation policy (mandatory or voluntary). Similarly, $H_0 4$ is rejected because there is a statistically significant relationship between the proportion of successful MAT1033 students and the remediation policy (mandatory or voluntary).

Table 4

Chi-Square Analysis of ENC1101 Success and Remediation Policy

	Observed N	Expected N	Percent Success	X^2	df	Sig.	Phi
				100.528	1	p < .001	.099
Mandatory	3,454	3,216.9	72.4%				
Voluntary	3,455	3,692.2	63.1%				

Table 5

Chi-Square Analysis of MAT1033 Success and Remediation Policy

	Observed N	Expected N	Percent Success	X^2	df	Sig.	Phi
				124.770	1	p < .001	.117
Mandatory	2,368	2,105.5	61.1%				
Voluntary	2,579	2,841.5	49.3%				

Decreased success by categorical variable: relationships between success and remediation policy. Analysis showed several statistically significant relationships between success (grade of C or higher) and the remediation policy when the relationships were examined by the categorical variables in the study. Results are presented for cross-tabulations and chi-square tests that were used to determine whether or not there was a difference in the proportion of successful students based on the remediation policy by each of 17 independent variables for which data was available for ENC1101 and MAT1033. In addition to the 34 cross-tabulations performed in SPSS, adjusted chi-

square (X^2) values were calculated manually (using an Excel spreadsheet) as appropriate to compensate for multiple categorical tests (Filliben, 2012; Sheehy, 2015).

Differences between observed and expected values were noted for all variables. When drilling down through the categories of each variable, the observed counts of successful students in either course during MR were greater than expected counts. In contrast, once the policy became voluntary (VR), observed counts were often lower than expected. These are indications that a relationship exists that would make it more likely than chance that proportions of successful students during VR would be lower. Many of the results are statistically significant (α = .05) with the original cross-tabulation analyses, and some remain significant with the adjustment to the X^2 statistic (see Table 6-Table 8). The effect size in all cases is weak to small. Although there is some correlation between the variables and some variables may overlap, each cross-tabulation was performed as a separate test so no subjects were in more than one category in any given analysis.

Creswell (2012) suggests separate tables to report results, so for clarity, tables for every test were created; however, for efficiency, most of the tables are presented in appendices. Tables 15 through 18 report the Pearson Chi-Square statistic, degrees freedom, p-values, and the Phi Coefficient with Cramer's V by variable (see Appendix B). Tables 19 through 52 report observed and expected values, proportions of successful students by category, and the percent change from MR to VR success (see Appendix C). Smaller tables are included in this chapter when appropriate.

Decreased proportions of successful students by input demographic variables. Input variables included Race, Hispanic, Gender, Pell Grant Eligibility, and First-

Generation Student. Additionally, as students do not typically have control over where they attend high school, the feeder school information is also considered a demographic input variable. Specifically, a variable was created to represent the average grade assigned to each feeder school by the Florida DOE during the graduation years (2007-2014) of students in the sample.

The proportion of successful students (grade C or higher) by variable in ENC1101 and MAT1033 decreased in every case when the policy changed to VR, except for the lowest category of grades for the feeder high schools. In this case, the total *n* was only nine, representing a very small percentage of this part of the sample. There were fewer observed counts than expected for 13 of the 21 demographic categories in English, and for 11 of 21 categories in math. The results were significant with $\alpha = .05$ for all variables based on the Pearson Chi-Square statistic, with weak to small associations for one or both credit courses (see Table 6). However, based on the adjusted X^2 statistics and confidence intervals, only Race, Gender, and Feeder High School remained significant (see Table 7 and Table 8). Significant relationships between credit success and the remediation policy varied as the results were examined (see Appendix B, Tables 15 through 18). The proportions of successful students during each remediation policy (MR or VR) were compared for each variable.

Race. In English, proportions decreased most for American Indian, a 34.1% decrease, but with only 40 in the sample, and for Black students (-16.1%).

Table 6

Statistically Significant Relationships between Variables and Successful Proportions of Students during Voluntary Remediation Periods (Spring 2014, 2015) in ENC1101 or MAT1033; No Adjustment to Chi-Square Statistic for Multiple Tests on the Variables

Variable	ENC1101		MAT1033	
	Sig.	ES	Sig.	ES
Race	< .001	0.118	< .001	0.083
Hispanic	< .001	0.049	0.02	0.03
Gender	< .001	0.071	< .001	0.08
Pell Grant Eligible	< .001	-0.042		
First-Generation	< .001	0.049	0.018	0.033
Feeder High School	< .001	0.103	< .001	0.05
High School GPA	< .001	0.184	< .001	0.2
High School Grade	< .001	0.202	< .001	0.21
ACT English Scores			0.007	0.205
DE History	< .001	0.097	< .001	0.191

Comparatively, proportions of successful White students decreased by 12.9%. In groups with multiple races, or when race was unknown or not reported, proportions decreased by 5.0% and 7.3% respectively. Percent decreases were greater in the math analysis with Asian, Black, and White proportions decreasing by 17.8%, 18.5%, and 19.1% respectively. American Indian and Pacific Islander proportions decreased by larger amounts (-47.4 and -44.4% respectively), but with small sample sizes of only 40 American Indian students and 24 Pacific Islander students (see Appendix C, Tables 19 and 20).

Table 7

Statistically Significant Relationships between Variables and Successful Proportions of Students during Voluntary Remediation Periods (Spring 2014, 2015) in ENC1101 with Adjustment to Chi-Square Statistic for Multiple Tests on the Variables

Variable	Categories	df	Adjusted Chi-Square	CV range (p=.05)
Race	8	7	28.02660	1.690 - 16.013
Gender	3	2	10.04516	.051 - 7.378
Feeder High School	4	3	19.39747	.216 - 9.348
High School GPA	3	2	26.05121	.051 - 7.378
High School Class Rank	5	4	30.20197	.484 - 11.143
DE History	3	2	19.17202	.051 - 7.378

Hispanic, first-generation, gender. Regardless of the course, little difference was noted between students who were or were not identified as Hispanic (see Appendix C, Tables 21 and 22). The same result held true in proportions of students who were and were not identified as first-generation (see Appendix C, Tables 27 and 28). The proportions of successful male students decreased slightly more than it did for female students in both ENC1101 and for MAT1033 (see Appendix C, Tables 23 and 24).

Pell grant eligibility. The percent decrease for students who were eligible for a Pell grant (-13.6%) was greater than for non-Pell students (-11.4%) in English, and the opposite was true in math (Pell had an 18.7% decrease, non-Pell had a 20.8% decrease in the math course). See Appendix C, Tables 25 and 26.

Table 8

Statistically Significant Relationships between Variables and Successful Proportions of Students during Voluntary Remediation Periods (Spring 2014, 2015) in MAT1033 with Adjustment to Chi-Square Statistic for Multiple Tests on the Variables

Variable	Categories	df	Adjusted Chi-Square	CV range (p=.05)
Race	8	7	18.43580	1.690 - 16.013
Gender	3	2	16.92153	.051 - 7.378
High School GPA	3	2	44.00814	.051 - 7.378
High School Class Rank	5	4	47.44823	.484 - 11.143
DE History	3	2	96.28859	.051 - 7.378

Feeder high schools' average Department of Education grade. Excluding the lowest-score category from both ENC1101 and MAT1033 (n is negligible in both cases at seven and nine respectively for grades <1.00 or 1.00-1.99), decreased proportions of successful students were greatest at 14.4% in English among students from high schools with mid-range DOE grades (2.00-2.99 average over the eight years) and for math, the greatest decrease (22.0%) is among students from the highest-scoring schools (average 3.00-4.00 over the eight years). See Appendix C, Tables 29 and 30.

Input variables: prior academic performance. These variables included High School GPA, High School Class Rank, and college-entry test scores (SAT and ACT). There were fewer observed counts than expected for half (11 out of 22) of the prior academic performance variables for both English and math. The results were significant

(α = .05) for High School GPA and Class Rank, as well as for ACT English scores, using the Pearson Chi-Square statistic, with weak to small associations. Based on the adjusted X^2 statistics and confidence intervals, High School GPA and Class Rank remained significant.

High school grade point average. Proportions of successful (grade of C or higher) students in English were greater for students with a mid-range High School GPA (2.00-2.99 on a 4-point scale). There was a 16.9% decrease in this category when the remediation policy changed to voluntary (VR), compared to a 7.2% decrease in the category for the highest GPA (3.00-4.00). No GPA records were less than 1.00, and there were only eight records in the low category of 1.00-1.99 for English. A similar situation was evident in math. Successful proportions in the mid-range category (2.00-2.99) decreased by 27.7% when the remediation policy became voluntary (see Appendix C, Tables 31 and 32).

High school class rank. In comparing categories of High School Class Rank, in English, there was a steady growth in the decreased proportions as the category ranks got lower. Proportions in the top tier (top 20% of high school class) decreased by 6.3% with the change to the VR policy, the second tier (61st to 80th percentile) had a 7.0% decrease, and then 12.9, 16.5, and 17.2% decreases for the next three levels (41st-60th percentile, 21st-40th percentile, and lowest 20% of high school class). Among the math students, there was no such pattern. The largest decreases were again among the lowest ranked students with those in the lowest tier dropping by 30.2%. The proportion of successful math students from the 21st-40th percentile category had a 31.7% decrease during VR. However, in math, the proportion of successful credit math students among the highest

ranked students (top 20% of high school class) also had a large decrease (25.3%). See Appendix C, Tables 33 and 34.

College entry tests. Students with college entry test scores were grouped dichotomously. Students were placed in the higher category if SAT or ACT scores were at least the minimum required for a credit course recommendation (440 for all SAT tests, 19 for ACT math and reading, 18 for ACT writing and English), and they were placed in the lower category otherwise. Results of the cross-tabulations for all college-entry test scores were in line with other results, that is, proportions decreased in almost every category. However, the decreases were larger in the lower categories. For example, proportions of successful students in the SAT Math Test high-scoring group decreased by 7.0 and 5.1% respectively in ENC1101 and MAT1033. The percent decrease in the lower-scoring group for ENC1101 was more than twice as much (-16.1%) as it was for the higher-scoring group (-7.0%), and it more than tripled in math (down 16.4% compared to -5.1%). There is an exception in the SAT Reading Test group where in English, the percent decrease was nearly three times greater in the high-scoring group (13.7% decrease) compared to a 4.8% decrease in the low-scoring group. In math, the proportion of successful students in the high-scoring group actually went up during VR with a 5.5% increase (see Appendix C, Tables 35 through 48).

Environment variables. There were two environment variables in the study, namely, Enrollment Status (during credit course) and Developmental Course (DE) History. A nominal number of records did not have enrollment status information, so "Not Provided" was added to full-time and part-time for a total of three categories for this variable. In DE History, categories included students who were either successful or

unsuccessful in the DE course or who had not taken a DE course, so there were also three categories for this variable. During VR, there were fewer observed counts than expected for part-time students, and for students who had been unsuccessful in DE or not taken DE. Observed counts were greater than expected counts during MR for full-time students and for successful DE students, and these counts held true in both the English and math courses (see Appendix C, Tables 49 through 52). Results were significant with $\alpha = .05$ for DE History using the Pearson Chi-Square statistic, with a stronger association for math than English (see Appendix B, Table 18). Developmental Course History remained significant based on the adjusted X^2 statistics and confidence intervals.

Enrollment status during credit course. There was a decrease in the proportion of successful students (grade of C or higher) for both full-time and part-time categories during VR. The decrease was greater among full-time students than it was for part-time students. This was true regardless of the course. In English, the proportion of successful full-time students was 75.1% during MR, and dropped to 64.3% when the policy changed to VR. This is a 14.4% decrease, compared to a 9.8% decrease for part-time students. Similarly, the proportion of successful students in math went from 63.8% (MR) to 51.1% (VR), a decrease of 19.9% for the full-time category. In comparison, the proportion of successful students in the part-time category decreased by 16.9%.

Developmental course history. For this final comparison, proportions of successful students during MR and VR were compared based on whether they had been successful (grade of C or higher) or unsuccessful in a corresponding developmental (DE) course before completing the credit course, or whether they had never taken a DE course. Results were mixed. In English, 2,066 students had successfully completed a

developmental reading, writing, or English course (as required or recommended by their college), and the proportion of successful credit students from this group was 72.4% during MR and 70.8% during VR, one of the smallest decreases among all categories. In contrast, there were 234 students who had been unsuccessful in the corresponding DE course. The proportion of successful credit English students from this group was higher (41.3%) during VR than it was during MR (37.3%) with a 10.7% improvement. The proportion of successful students in credit English who had not taken a DE course before ENC1101 went from 73.1% to 62.2%, a decrease of 14.9% when the policy changed to VR. In math, the decreases were greater. The proportion of successful math students from the successful DE math group decreased by 8.1% during VR. There were 663 students who were unsuccessful in a developmental math course before taking the MAT1033. The proportions of successful credit math students from this group was 48.2% during MR – less than half – but was only 23.4% during VR and representing a 51.5% decrease. Finally, the proportions of successful credit math students from the group that took no developmental math course were 61.3% during MR and 49.3% during VR, a decrease of 19.6%. Overall, the decreased proportion of successful students when the policy changed was greatest in English for the group that took no DE, and in math, it was for the group who had been unsuccessful in the DE course.

Overall results for decreased success as measured by categorical variable relationships between success and remediation policy. When categories are compared for all variables when the remediation policy was voluntary, 27 out of 49 categories had fewer observed counts than expected in ENC1101, and 24 out of 49 counts were less than expected for math, but in almost all categories, the proportions of successful students

decreased once the policy was voluntary. Most of the p-values were significant (α = .05). For example, Race (p <.001 for both English and math), Hispanic (p < .001 for English; p = .02 for math), Gender (p < .001 for both English and math), and Pell for English (p = .002) were all significant as was First-Generation (p <.001 for English; p = .018 for math). High school GPA, class rank, and developmental course history were all significant with p < .001 for both English and math. The Phi Coefficient and Cramer's V ranged from -0.042 to 0.210, indicating existing associations were very weak to small. Additionally, when sums of the adjusted X^2 value were compared to the confidence interval (α = .05) for df = 48, the combined results are greater than the upper range of the interval, indicating that taken as a whole, the null can be rejected with 95% confidence for both ENC1101 and MAT1033.

Research question three. The null hypotheses states that there is no relationship between the independent variables and success based on remediation policy; as it applies to individual variables, based on both the Pearson Chi-Square statistic from the original SPSS analyses and the secondary analysis of the adjusted X^2 statistics and critical values, the null is rejected for Race, Gender, High School GPA and Class Rank, and DE Course History. In these cases, there is a statistically significant relationship between credit course success and the remediation policy. Specifically, it is more likely that the decreased proportions are related to the change to VR and did not occur by chance for at least these variables. Therefore, it can be said that a relationship exists between the proportions of successful students in each credit course based on the remediation policy and by variable, so $H_0$5 (ENC1101) and $H_0$6 (MAT1033), which claim no relationships exist, are both rejected.

Low Proportions of Students Voluntarily Enroll in Developmental Courses despite Deficient Skills

In the database, 1,812 students were identified who completed the English or math courses in fall 2014 or spring 2015 semesters, and who had previously and voluntarily taken the P.E.R.T. to determine academic preparedness for those courses (Data Set 2). In all cases, the P.E.R.T. results indicated students were underprepared for college-level writing and math. Specifically, 1,200 records were of students who had deficient composition skills (scores below 106 in reading or 102 in writing). There were 612 records of students with deficient computation skills (scores below 113 in math). All 1,812 students were exempt by law from DE, so remediation was voluntary. The file was split to report results for ENC1101 (N=1,200) and MAT1033 (N=612) separately.

Of the 1,200 students who tested below college-level English, 135 (11.3%) of them completed a DE course to remediate their skills before taking ENC1101. Numbers were higher in math but still low. Of the 612 students who tested below the college-level readiness threshold for math, 150 of them (24.5%) enrolled in a DE math course before taking MAT1033. These results are both consistent (Smith, 2015) and inconsistent (Hu et al., 2015) with newly emerging research and will be revisited in a discussion in the last chapter.

The Degree of Success in Developmental Education Courses is Significantly Related to Credit Course Success

Mean grades and the proportion of successful students (grades of C or higher) were compared among students who had voluntarily remediated by completing a DE course before enrolling in the corresponding credit course. All students were exempt,

meaning a DE course was optional, but they had all previously and voluntarily taken the P.E.R.T. and scored below the threshold for credit course recommendations. In other words, no students were academically prepared for the credit courses based on the results of the P.E.R.T., and all students had to decide whether or not to complete a DE course before enrolling in the corresponding credit course.

Difference in mean grades. An independent t-test was performed to compare the mean grades earned in credit English and math courses. Students in the study who voluntarily enrolled in a DE course before taking the corresponding credit course (DE group) had a lower mean grade than students who bypassed the remediation option (No DE group). This finding is inconsistent with current institutional research at St. Petersburg College (Smith, 2015) and will be revisited in a discussion of the results in the next chapter.

In English, the difference in mean grades was .207, with students who had bypassed the DE course averaging grades slightly higher than the equivalent of a C (numerical mean 2.034). Students who had taken a DE course averaged just below the equivalent of a C in the credit course (numerical mean 1.827).

In math, the difference in mean grades was negligible at .019; students who did and did not remediate before taking MAT1033 averaged barely more than the equivalent of a D, at 1.227 for the those who remediated and 1.245 for those who did not. The differences are not statistically significant for English or math. Homogeneity of variance is assumed in both cases with Levene's Test for Equality of Variance at $F = .142$, $p = .706$ for the ENC1101 sample and $F = .241$, $p = .623$ for the MAT1033 sample. Effect size is better in English than in math but weak in both tests (see Table 9 and Table 10).

Research question four. There is not enough evidence to suggest that there is a difference in the mean grades of credit students based on their completion, or not, of a corresponding DE course. Therefore, $H_0$7 is not rejected because there is not a statistically significant difference in the mean grades for students in ENC1101 based on whether or not they remediated before completing the credit course. $H_0$8 is not rejected because there is not a statistically significant difference in the mean grades for students in MAT1033 based on whether or not they remediated before completing the credit course.

Table 9

Comparison of Mean Student Grades in ENC1101 based on Voluntary Remediation

	N	Mean Grade	SD	Sig.	Cohen's *d*	t	95% CI
DE	135	1.8279	1.3257	.098	0.154	-1.658	L: -.453
No DE	1,065	2.0343	1.3738				U: .038

Table 10

Comparison of Mean Student Grades in MAT1033 based on Voluntary Remediation

	N	Mean Grade	SD	Sig.	Cohen's *d*	t	95% CI
DE	150	1.2266	1.2856	.878	0.015	-0.154	L: -.257
No DE	462	1.2453	1.2924				U: .220

Difference in proportions of successful credit students based on the degree of success in a corresponding developmental course. Cross-tabulations were performed with chi-square analyses to compare students who were and were not successful in a developmental course to their success in the corresponding credit course. Success was

defined as a grade of C or higher for both the developmental and credit levels. Subsequent analyses were completed to examine similar relationships based on actual DE course grades instead of just the dichotomous categories of success. Records were included in the analyses only if students had voluntary completed a DE course before enrolling in the corresponding credit course. For English, 135 students met the criteria, and in math, there were 150 students.

First, the relationship between success (at least a C) in the DE course to prepare for credit English or math and subsequent success (at least a C) in the corresponding credit course was considered.

In English, 67.2% of students who were successful in the DE course also succeeded in ENC1101. Among those who were unsuccessful in the DE course, half (50%) succeeded in ENC1101. There were nominal differences in observed and expected counts, and the results were not significant (see Table 11).

In math, observed counts were higher than expected for students who were successful at both levels and for students who were unsuccessful at both levels. Counts were lower than expected for students who were successful in the DE math course yet unsuccessful in MAT1033 or who were unsuccessful in the DE math course but successful in the credit course. Students who were successful in the DE math course were equally successful (50%) or not successful (50%) in MAT1033. However, among students who were not successful in DE math, 85% of them were also unsuccessful in the credit course. The results for math were significant ($p < .001$), and the Pearson Chi-Square value was 12.160 with a small to medium association at .285 (see Table 12).

Table 11

Chi-Square Analysis of Developmental Course (DE) Success and ENC1101 Success among Exempt Students

	Successful DE	Unsuccessful DE	X^2	df	Sig.	Phi
			1.219	1	0.269	0.095
Successful Credit						
Observed	84	5				
Expected	82.4	6.6				
Percent	67.2%	50.0%				
Unsuccessful Credit						
Observed	41	5				
Expected	42.6	3.4				
Percent	32.8%	50.0%				

These results led to an additional test to examine the extent to which the grade earned in the developmental course might affect success in the credit course. Only the grades actually earned were included in the analysis. All grades equivalent to failing the course were recoded as F, and all grades equivalent to a withdrawal were recorded as W.

In English, 90% of students who earned an A were also successful in ENC1101. For students who earned a B or B+, the proportion decreased to 69.2%, and further to less than half (48.8%) of the students who earned a C or C+. Of the nine students who failed the DE course, four succeeded in ENC1101, and the one student who withdrew from the DE course succeeded in ENC1101. Conversely, of the students who earned an A or earned a B or B+, only 10.0% and 30.8% respectively did not succeed in the credit

Table 12

Chi-Square Analysis of Developmental Course (DE) Success and MAT1033 Success among Exempt Students

	Successful DE	Unsuccessful DE	X^2	df	Sig.	Phi
			1.216	1	< .001	0.095
Successful Credit						
Observed	59	5				
Expected	50.3	13.7				
Percent	50.0%	15.6%				
Unsuccessful Credit						
Observed	59	27				
Expected	67.7	18.3				
Percent	50.0%	84.4%				

course. Observed counts were higher than expected for students who earned an A, B, or B+ but lower for those who earned a C, C+, or F in the DE course and succeeded in ENC1101. The relationship between grades earned in a DE course and subsequent success or failure in the corresponding credit course is not likely to be a chance relationship. The results are statistically significant with a medium association (see Table 13).

Similar results are observed among students who completed a DE math course. Among students who earned an A in the developmental course, 75.0% were also successful in MAT1033. For students who earned a B or B+ in the DE math course, 54.1% also succeeded in the credit course. Less than one-third of students (29.7%) who

earned a C or C+ were successful in MAT1033, and five of the 32 students with grades of D, F, or W, in the DE math course succeeded in the credit course. Observed results were higher than expected for students with a grade of A, B, and D in the developmental course. Based on the results, as was the case for students in English, it appears that students who earn at least a B in the developmental math course are likely to succeed in MAT1033, and this relationship not likely due to chance. There is a stronger association (.430) and results are significant with $p < .001$ (see Table 14).

Research question five. There is evidence of a relationship between grades earned during VR and credit course success. Specifically, grades of A or B in a DE course are associated with greater proportions of successful credit course students, and evidence suggests it is not a chance relationship. $H_0$9 is rejected because there is a statistically significant relationship between developmental course grades in a course to prepare students for ENC1101 and their subsequent success (grade C or higher) in ENC1101; students who earn at least a B in the developmental course are likely to succeed in the credit English course. $H_0$10 is rejected because there is a statistically significant relationship between developmental course grades in a course to prepare students for MAT1033 and their subsequent success (grade C or higher) in MAT1033; students who earn at least a B in the developmental course are likely to succeed in the credit English course. On page 82, Figure 3 illustrates results for both English and math. In both cases, it is clear to see that proportions of successful students decline steadily as grades earned in the corresponding DE course decline.

Table 13

Chi-Square Analysis of Developmental (DE) Course Grades and ENC1101 Success among Exempt Students

	Successful ENC1101	Not Successful ENC1101	X^2	df	Sig.	Phi
			15.948	4	.003	0.344
A in DE Course						
Observed	27	3				
Expected	19.8	10.2				
Percent	90.0%	10.0%				
B or B+ in DE Course						
Observed	36	16				
Expected	34.3	17.7				
Percent	69.2%	30.8%				
C or C+ in DE Course						
Observed	21	22				
Expected	28.3	14.7				
Percent	48.8%	51.2%				
F in DE Course						
Observed	4	5				
Expected	5.9	3.1				
Percent	44.4%	55.6%				
W in DE Course						
Observed	1	0				
Expected	0.7	0.3				
Percent	100.00%	0.0%				

Table 14

Chi-Square Analysis of Developmental (DE) Course Grades and MAT1033 Success among Exempt Students

	Successful MAT1033	Not Successful MAT1033	X^2	df	Sig.	Phi
			27.693	5	< .001	0.43
A in DE Course						
Observed	15	5				
Expected	8.5	11.5				
Percent	75.0%	25.0%				
B or B+ in DE Course						
Observed	33	28				
Expected	26	35				
Percent	54.1%	45.9%				
C or C+ in DE Course						
Observed	11	26				
Expected	15.8	21.2				
Percent	29.7%	70.3%				
D in DE Course						
Observed	2	1				
Expected	1.3	1.7				
Percent	66.7%	33.3%				
F in DE Course						
Observed	3	21				
Expected	10.2	13.8				
Percent	12.5%	87.5%				
W in DE Course						
Observed	0	5				
Expected	2.1	2.9				
Percent	0.0%	100.0%				

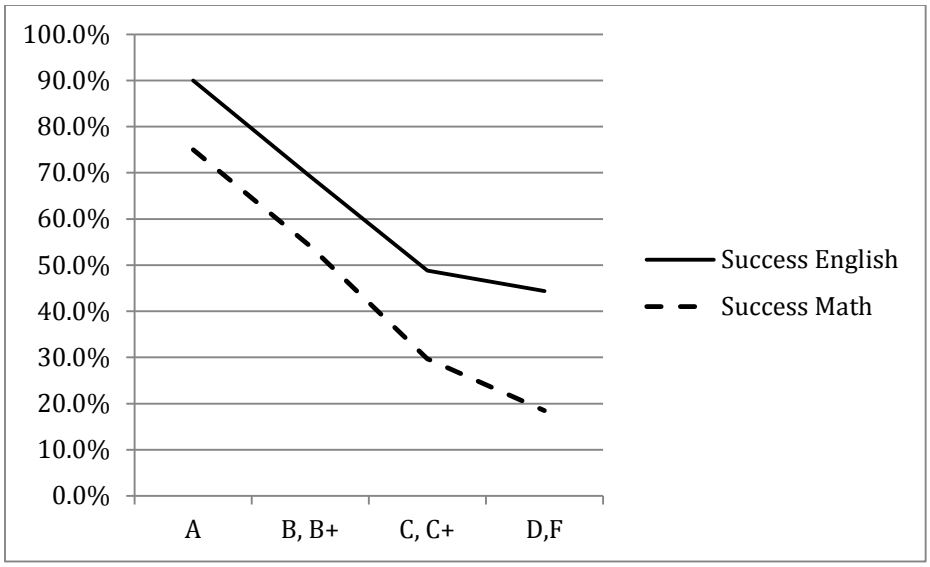


Figure 3. Relationship between letter grade in DE course and proportion of successful students in credit English and credit math.

Mixed Success as Measured by Relationships between Developmental Course History and Credit Course Success by Input Categorical Variables

Cross-tabulations and chi-square analyses were performed for demographic variables (Race, Hispanic, Gender, Pell Grant Eligibility, First-Generation, and Feeder High School) and prior academic performance variables (High School GPA and High School Class Rank). These variables were selected for analysis based on earlier results that showed significant relationships for these categorical variables between proportions of successful students during MR and VR semesters. Students in those tests were not necessarily exempt from remediation. These additional tests were run to determine whether or not similar relationships exist and are significant among the 1,812 students in the database who are known to be exempt with skills that are below college-level English or math based on P.E.R.T. scores.

Missing values were excluded from cross-tabulations by variable; each analysis was performed only on the records with available data for the variable. In addition to testing for statistical significance of the potential relationships between credit course success (grade of C or higher) and remediation among these variables, the cross-tabulations were used to analyze the percentage increase or decrease in credit course success by variable when students are known to be academically underprepared for that credit course. As it is expected that all cells in a chi-square analysis contain at least five values (Field, 2009), not all categories had sufficient values for the analysis because the number of students who voluntarily remediated (DE group) was small (135 in English, 150 in math).

Proportions of successful ENC1101 students by variable and based on whether or not a developmental course was completed before enrolling in the credit course. Results from the tests are mixed. In English, none of the results were significant for VR; all except Pell Grant Eligible were significant for MR. Associations were all weak to small (see Appendix D).

There were 17 categorical cells with at least the five values expected for the analysis, and of these, comparisons of observed and expected counts are inconsistent. To say that there is a relationship between VR and course success for exempt students who opt for VR, one would look for observed counts to be greater than expected for those who chose to remediate (DE group), and lower than expected for students who declined remediation (No DE group). However, that only occurred three times and with sparse differences. For Black students, the observed and expected counts were 30 compared to 29.7 for DE, and 186 compared to 207.6 for No DE in English (see Appendix E, Table

57). For students who were not identified as first-generation, observed counts were 57 compared to 55.4 for DE and 525 compared to 539.8 for No DE in English (see Appendix E, Table 65). For students with a mid-range high school GPA, observed and expected counts were 44 compared to 42.3 for DE and 201 compared to 225.3 for No DE, again, in English (see Appendix E, Table 67). Without drilling down to course grades in the developmental course, there is not sufficient evidence to suggest there is more than a chance relationship by variable between completing a DE course and succeeding in credit English when it is known that students lack composition skills.

Six of the 17 results for English showed better proportions of successful students in the credit course after voluntarily completing a developmental course, or viewed differently, worse results without remediation. In other cases, more students were successful when they chose not to remediate. The six categories that did worse without remediation were Black (-7.6%), students not Pell grant eligible (-2.3%) students not identified as First-Generation (-0.9%), students with mid-range high school GPA of 2.00-2.99 (-14.8%), and students in the lowest two tiers of High School Class Rank (-3.0% for students in the 21st-40th percentile, and -17.4% for students in the lowest 20% of their high school class). Appendix E provides tables by variable with the observed and expected counts, as well as the percent of students successful in each category and the percent change among students who did not remediate.

Proportions of successful MAT1033 students by variable and based on whether or not a developmental course was completed before enrolling in the credit course. Again, there are mixed results. In math, results for three variables were significant for the DE group: First-Generation, High School GPA, and High School Class

Rank. There were four variables that were significant for students who declined remediation (No DE group): Race, First-Generation, High School Grade Point Average, and High School Class Rank. Associations are all weak to small (see tables in Appendix E).

As in English, there were 17 categorical cells with at least the five values expected for the analysis, and of these, comparisons of observed and expected counts are inconsistent. Only one category had observed counts greater than expected for students who voluntarily remediated, and that was for students eligible for Pell grants. Observed counts were 43 compared to 41.4 expected for the DE group and 123 compared to 132.8 for No DE (see Appendix E, Table 64). Again, without drilling down to course grades in DE math, there is not sufficient evidence to suggest there is more than a chance relationship by variable between completing a DE course and succeeding in credit math when it is known that students lack computation skills (see tables in Appendix E).

Six of the 17 math results showed better proportions of successful students in the credit course after voluntarily completing a developmental course, or again viewed differently, worse results without remediation. In other cases, more students were successful when they chose not to remediate. The six categories that did worse without remediation were students whose race was unknown or not reported (-14.5%), students identified as Hispanic (-6.2%) students identified as First-Generation (down 11.9%), students eligible for a Pell grant (-6.2%), and students in the second highest and very lowest two tiers of High School Class Rank (-37.4% for students in the 61st-80th percentile and -1.4% for students in the lowest 20% of their high school class). Appendix E provides tables by variable with the observed and expected counts, as well as the

percent of students successful in each category and the percent change among students who did not remediate.

Research question six. While there are some weak to small associations between the success in the credit courses and VR by variable, few results for the DE group in English were significant, and few gains were noted in the proportion of successful credit students based on VR. Among the results for math, only three of the seven variables were significant for the DE group (First-Generation, $p = .008$; High School GPA and Class Rank both with $p = .018$). Comparisons of observed counts to expected counts yielded little meaning; several cells had fewer than five expected counts, and finally, observed counts for most categories are very low making the tests less robust than desired. Neither null hypothesis can be rejected. $H_0$11 is not rejected because the relationship between ENC1101 success and VR appears to be a chance relationship. $H_0$12 is not rejected because the relationship between MAT1033 success and VR appears to be a chance relationship.

Few Significant Relationships Exist between the Input Variables and Voluntary Remediation Decisions

The variables selected to examine relationships between input variables and students' decisions to voluntarily remediate were based on previous tests in which significant relationships by variable were discovered between credit success and the VR policy in effect. Specifically, those variables are Race, Hispanic, Gender, Pell Grant Eligible, First-Generation, and High School GPA. For this final part of the study, again records were included only of students who were known to be exempt based on high school graduation years (2007 or later), voluntarily took the P.E.R.T. and scored below

credit thresholds, and enrolled in a credit course in the spring of 2014 or 2015 (Data Set 2). Analysis showed few statistically significant relationships between VR decisions and the input variables. As in the previous test for relationships by variables, because multiple tests were performed, an additional step was taken to adjust the X^2 statistic.

Voluntary remediation decisions by variable in English. Five statistically significant relationships were found from the SPSS tests for students' decisions for VR before enrolling in ENC1101. The variables Race, Hispanic, Pell Grant Eligible, First-Generation, and High School GPA all had significant Pearson Chi-Square statistics using $\alpha = .05$. When the X^2 statistic was adjusted for each category and summed to compare to the confidence intervals, the relationships for Race, Pell Grant Eligible, and First-Generation remained statistically significant. Black students (13.0%) opted for VR more often than their White (8.5%) or Asian (4.3%) peers. Hispanic, Pell grant eligible, or first-generation students were all represented by larger proportions than those who were not identified as Hispanic, Pell grant eligible, or first-generation (14.5 compared to 9.8% for Hispanics, 13.0 compared to 6.9% for Pell, and 15.2 compared to 9.7 for first-generation students). Finally, it's noted that students who had a mid-range high school GPA or class rank opted VR in greater proportions than those with other ranges of GPA or class rank. These variables have a statistically significant relationship with the decisions students make regarding VR, so the relationships are not likely due to chance. The effect sizes are weak to small, so the results support only limited if any predictive value for these particular variables. Results show 19 categories with cell values of at least five, and of those, 11 observed counts are greater than expected. Conversely, eight are fewer than expected. Additionally, the adjusted X^2 values sum to 53.03743, which is

greater than the upper range of the confidence interval (14.573-43.195) so the null hypothesis will be rejected for English.

Voluntary remediation decisions by variable in math. In contrast with the results seen for English, there were no significant results for the variables when cross-tabulations were performed. This was true with the SPSS test as well as for the adjusted X^2 values compared to the confidence intervals for each category. When observed counts were compared to expected counts, six cells had fewer than five expected, another five cells had negligible differences (.9 or less), and of the remaining 14, exactly half had observed values greater than expected and half had values less than expected. Additionally, when the proportions of students in each category who chose to remediate are compared, there is little difference. Of all 612 students who tested below college-level math, 24.9% of them opted to complete a developmental math class before taking MAT1033. As each category is observed, it is noted that many of the proportions hover near this 25% mark; there are no results among the students in this sample that would indicate the variables have any predictive value for knowing who might opt for developmental math as a means to remediate before intermediate algebra.

Research question seven. There is a statistically significant relationship between some of the input variables, namely Race, Hispanic, Pell Grant Eligible, First-Generation, and High School GPA, and students' decisions to complete a developmental course before enrolling in ENC1101. The results suggest this relationship is not due to chance so $H_0$13 is rejected. However, there are no statistically significant relationships between the input variables and students' decisions to complete a development math course before

enrolling in MAT1033. $H_0$14 is not rejected because any relationships that exist between these math VR decisions and the variables are likely due to chance.

Chapter Summary

Chapter 4 presented the results of the study. Statistically important values were reported for each test, such as the mean, standard deviation, p-values, and Cohen's *d* for the independent t-tests. Also included were the observed and expected values, significance, effect size based on the Phi Coefficient or Cramer's V, and the Pearson Chi-Square statistic for the chi-square analyses for cross-tabulations.

5. SUMMARY, DISCUSSION, IMPLICATIONS AND CONCLUSION

Summary of the Study

The purpose of the study was to explore the potential impact of VR on the gateway course success and to investigate specifically that impact, if any, on minority and low-income students in Florida. Gateway courses identified for the study were English composition, ENC1101, and intermediate algebra, MAT1033. A quantitative approach was designed to meet four research objectives: (1) compare the overall gateway course success of similar students in FCS institutions before and after the policy change to VR; (2) compare gateway course success rates of all sampled students based on demographic and academic variables before and after the policy change to VR; (3) compare gateway course success rates of students based on their remediation choices, demographic variables, and academic variables when it is known that all students have deficient English or math skills; and (4) determine the relationship, if any, between remediation decisions and demographic or academic variables.

The need for the study was established in Chapter 1. Voluntary remediation became legislative policy in Florida in 2013 when lawmakers passed SB 1720 which exempted a large proportion of students from placement testing or DE. Exempt students are those who entered a Florida public high school in 2003 and subsequently graduated with a standard high school diploma. Active duty military members are also exempt from testing or DE. The Florida legislative departure from the previous policy of MR for students who could not demonstrate college readiness was intended to address the long-

standing issues of high cost and low success of DE programs in higher education and the low completion rates of DE students. However, several problems are presented with the advent of VR as enacted in Florida. First, little research is available to support VR as a solution to the challenges of DE. Very few studies have been conducted, and the minimal research found suggests that allowing students to volunteer to take DE courses is unsuccessful. Second, the law affects community and state colleges because in Florida, college remediation is only offered at this level, with the exception of Florida Agricultural and Mechanical University. This was presented as a problem because these colleges serve large populations of minority and low-income students, and large proportions of these students have historically needed remediation (AACC, 2012; Cohen & Brawer, 2008; Crisp & Delgado, 2013; Tinto, 2007; Zeitlin & Markus, 1996). Third, as presented in the law, even if VR is successful in the short term, it may not remain so in the years ahead. This was discussed as problematic because the oldest demographic of students exempted would have been approximately 24 years old when the law passed. Over time, if those students decide to return to college, SB 1720 exempts them from any placement testing or remediation. With added time since their last math or writing courses from high school, it is likely their composition and computation skills will have waned, but they will still not be required to remediate. Seven research questions were introduced in the first chapter, and limitations and delimitations were presented.

A review of the literature in Chapter 2 provided background information, discussed the controversy that surrounds DE, and illustrated the relevance of DE programs for minority and low-income students, suggesting that without the support DE

programs offer underserved populations, they are at increased academic risk. Chapter 2 also presented the deficiencies of VR, and introduced the most recent research available.

Chapter 3 outlined the methods used in the study. Mean grades and success rates were compared in ENC1101 and MAT1033 in the periods before and after the Florida remediation policy was changed to voluntary in 2013. Data were collected from three state colleges in FCS, and a secondary database of 26,691 records was created and became the source file for the study. Careful attention was given to the demographic composition of the sample, so that students in the study would as closely as possible reflect FCS students throughout Florida. An adaptation of Astin and Astin's 1992 Input-Environment-Output (I-E-O) model was the conceptual framework as the variables were considered. The model was appropriate because the variables in the study fit well as constructs for each of the three segments in the I-E-O model. Independent t-tests, cross-tabulations and chi-square analyses were performed on each of 17 variables to determine the existence of any statistically significant relationships between the variables and credit course success. Chi-square analyses were also used to screen for potential predictive value of selected variables as they might relate to students' decisions to voluntarily remediate.

Finally, the results of the study were presented in Chapter 4. Independent t-tests verified statistically significant differences in mean grades for students in credit English and math classes based on the remediation policy. Multiple chi-square analyses yielded several statistically significant results, indicating relationships between credit course success and the remediation policy. These tests further produced significant results between some independent variables and credit course success based on the remediation

policy. Increased enrollments in the credit courses were noted, as was low participation in VR. The results did not verify any predictive value of the variables to predict VR decisions. This chapter will discuss these results.

Discussion

The primary observation in the study was that VR is negatively impacting student gateway course success (grade of C or higher) in Florida colleges. Additional results are also discussed as they become vital to the implications of a VR policy.

Negative impact of voluntary remediation. Null hypothesis one claimed there was no difference between the mean ENC1101 grades in the periods before and after remediation became voluntary for exempt students. Null hypothesis two made the same claim for MAT1033. In both cases, the null was rejected as the differences were observed and were statistically significant with $p < .001$ ($\alpha = .05$). In the spring semesters 2012 and 2013, when remediation was mandatory (MR), the mean grades were higher in both English (.264 greater) and math (.275 greater) than they were in the spring semesters 2014 and 2015, when remediation had become voluntary (VR). The decrease in math in particular is disturbing when it was only 1.71 during MR, falling to 1.44 during VR. Further, $H_0$3 claimed there was no relationship between the proportion of successful students in ENC1101 and the remediation policy; $H_0$4 made the same claim for MAT1033. Again, both hypotheses were rejected. Cross-tabulations and chi-square analyses verified, with $p < .001$, a statistically significant relationship between the proportions of successful students and the remediation policy for both English and math. The proportion of successful students went from 72.4% to only 63.1% in English when the policy changed to VR. For math, the proportion went from 61.6% to below half at

49.3%. These numbers represent a 12.8% and 19.3% decrease respectively for proportions of successful students in ENC1101 and MAT1033 once remediation was voluntary.

To better understand why both the mean grades and the proportions of successful students decreased after SB 1720, it is helpful to first recall that the 8,644 students in the MR group (N = 4,770 in English; N = 3,874 in math) were required to take the P.E.R.T. to determine composition and computation skills. If their skills were below college level, they had to complete some DE, that is, remediation, before they could enroll in the English or math course. Students in the MR group are comparable to students in the VR group because the MR students would have been exempt from remediation had SB 1720 been in effect when they enrolled in their gateway courses. The 10,703 students in the VR group (N = 5,475 in English; N = 5,228 in math) were exempt students, and therefore were not required to take the P.E.R.T., nor were they required to remediate deficient skills even if warranted.

Second, it is important to consider that there were 12,766 students in the secondary database who had taken a gateway course in the fall 2014 and spring 2015 semesters, and all of them were exempt from placement testing and remediation by SB 1720. When percentages are examined of the students who voluntarily took the P.E.R.T. and then voluntarily enrolled in a DE course, there is reason for concern. Of the 12,766 exempt students in the study, 1,812 students (14.2%) voluntarily took the P.E.R.T. and scored below the credit level in reading, writing, or math, yet only 285 of these students enrolled in a DE course (135 in English, 150 in math) to remediate those weak skills. This means only 2.2% of 12,766 exempt students elected VR. Now consider that in 2011,

only two years before the legislation changed the testing and remediation policy, 64% of students were still testing into remedial courses (Parke & Scheuch, 2013a). This makes it quite possible that more than 60% of students enrolled in ENC1101 or MAT1033 in the spring of 2014 and 2015 would have previously been required to complete DE before enrolling. However, under the VR policy these students were permitted to enroll directly in the credit courses, and the proportion of successful students decreased by nearly 13% in ENC1101 and more than 19% in MAT1033.

With many of the statistical comparisons significant, it is plausible that a VR policy has a significant impact on the success of students in credit courses. At a minimum, the results verify that relationships exist between VR and decreased success and should be studied further.

In addition to changes in success, the study also found changed enrollment patterns. Increased enrollment was observed in credit courses as were very low percentages of students who voluntarily remediated when they knew they were unprepared: 24.5% in math and less than half that at 11.3% in English. These results are troubling, but they are consistent with the belief that students are more likely to admit they need help in math than in English. Administrators at St. Petersburg College are working on an internal model to help advise exempt students appropriately. Jesse Coraggio is the vice president of Institutional and Effectiveness and Academic Services at St. Petersburg College and is quoted by Smith (2015), “There’s a little bit of a social stigma. It’s easier for students to say they’re not good at math. It’s much harder to have conversations about having difficulty with writing or reading” (para. 18). The results are also consistent with the Smith (2015) report that Miami Dade College and St. Petersburg

College are both experiencing large drops in developmental enrollment. Since VR was mandated, for example, Smith (2015) wrote that Miami Dade was down by 42% in developmental math, with slightly greater decreases in developmental reading (-46%) and writing (-44%).

The results related to enrollment are, however, somewhat inconsistent with enrollment patterns reported by researchers at Florida State University's Center for Postsecondary Success. Hu et al. (2015) found approximately 42% of students enrolled in a developmental math course and 31% to 33% enrolled in some developmental course (reading or writing) to prepare for English (Hu et al., 2015). An explanation for the varied results might be attributed to the different categorizations of enrollment decisions. In the Florida State study, students' decisions included the DE course, the credit course, and no English or math course at all. In contrast, all students in the study reported herein had completed credit English or math; electing no credit course at all was not a variable in this study.

Reach of the negative impact. Null hypothesis five claimed there were no relationships between the independent variables and the proportion of successful ENC1101 students in based on the remediation policy. Similarly, $H_0$6 made the claim for MAT1033. The hypotheses were both rejected after analysis because statistically significant relationships were identified between decreased success and the VR policy for several variables, specifically, for Race, Hispanic, Gender, Pell Grant Eligibility, First-Generation, and Feeder High School, High School GPA, High School Rank, ACT English Scores, and Developmental Course History. For at least some categories of each variable, there were fewer proportions of successful students in the gateway courses in

the VR group than in the MR group. However, it is important to keep in mind that the variables are correlated to each other, and, although students were not in more than one category of any single test, overlap between tests existed because the same students were in fact used as each variable was considered. So while the results were statistically significant, they should be used to verify that VR has so far negatively affected students in all demographic groups and regardless of prior academic background. There is certainly reason to monitor the situation and watch for academic distress among marginalized students; they with all others are being impacted by VR. However, based on the variables employed in the study, the results point more to a need for future research than evidence to suggest that one group is, with statistical significance, affected worse than another.

Connecting to the conceptual framework. It is helpful at this point to recall Astin and Astin's 1992 I-E-O model to continue the discussion. Although regression was not integrated into the study, the model was adapted because Astin and Astin (1992) rely heavily on their prior research that suggests interaction between input variables and environment variables to affect an outcome, and as importantly, that input variables are strong predictors of student success (Astin & Astin, 1992). However, this study yielded different results. To be clear, while the degree of the effect varied, students in all demographics and regardless of prior academic success were affected by the environment variables, that is, the remediation policy. Specifically, it was evident with statistically significant results that fewer students were successful when the remediation policy became voluntary. Accordingly, if there is to be a single takeaway from this study, it should be that the change to a VR policy is having a significant and negative impact on

student success in ENC1101 and MAT1033 (see Figure 4). Discussions follow to consider the variables.

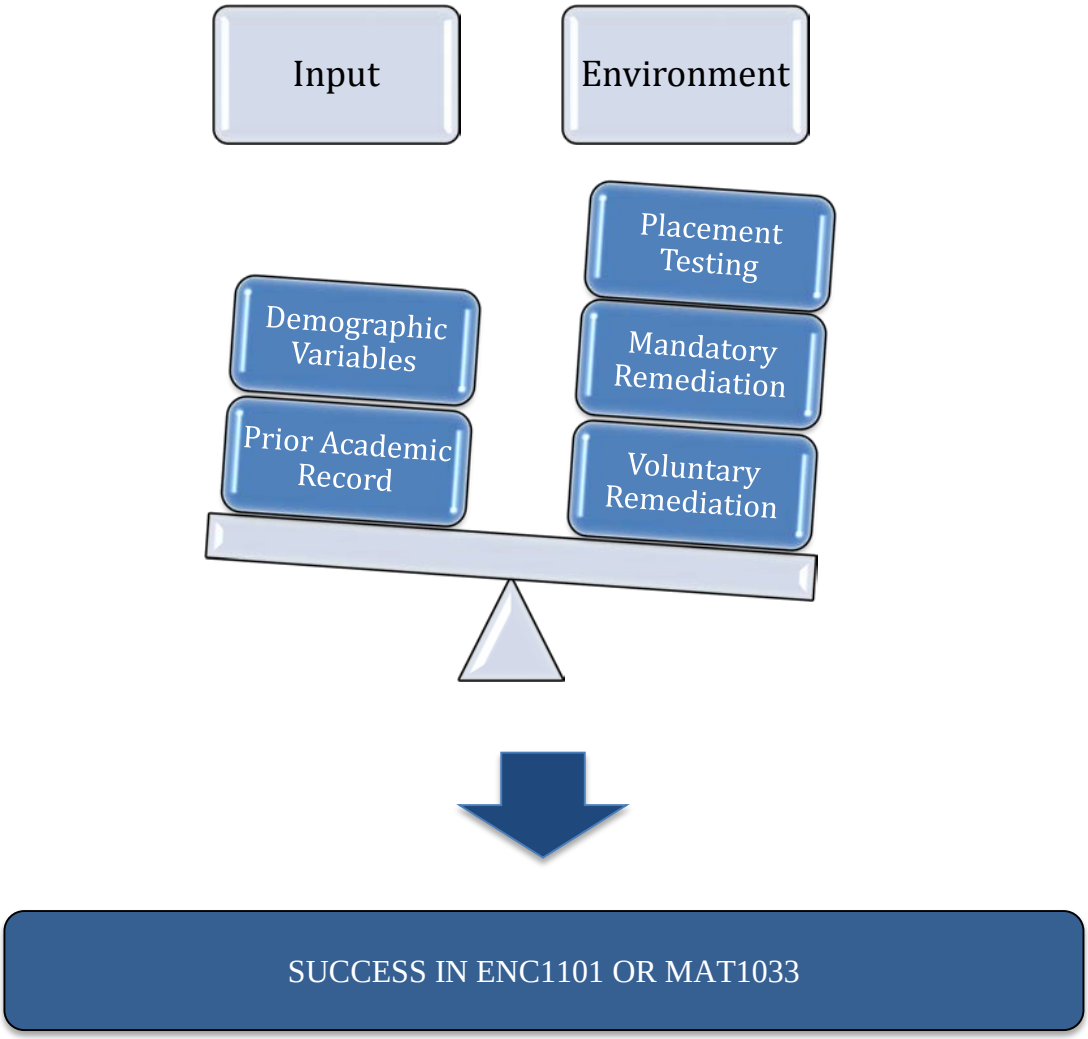


Figure 4. Conceptual framework for study results based on Astin and Astin's 1992 I-E-O Model.

The first variable considered was race. The literature review was clear regarding the academic inequities faced by minority students. It is not as apparent, based on this study, whether or not VR is perpetuating that disservice, but the results do suggest a need for more research to further investigate the implications for minority students. For example, in English, decreased proportions of successful American Indian and Black

students when the policy changed to VR was greater than White students. Successful American Indian students decreased 34.1% (85.0% to 56.0%) and successful Black students decreased by16.1% (68.9 to 57.8%). Comparatively, there was a 12.9% decrease in the proportion of successful White students during VR, down from 75.3% to 65.6%. The numbers were worse in math. The proportion of successful American Indian students dropped from 76.0 to 40.0% (47.3% decrease). Black students went from 55.6% in the MR group to only 45.3% in the VR group, an 18.5% decrease. Additionally, proportions of successful Pacific Islander students dropped from 75% to 41.7% (44.4% decrease). This means that fewer than half of the American Indian, Black, and Pacific Islander students in the study who were enrolled in math during the VR policy were successful. White students did better overall than Black students, with higher proportions of successful students in both MR and VR groups; however, there was a 19.1% decrease among White students (from 63.5% to 51.4%).

As other input variables are reviewed, patterns are not unlike the overall finding that VR negatively impacted the success rate, but some points should be made. Students identified as Hispanic or first-generation both did better by three to five percentage points than students not identified as Hispanic or first-generation regardless of the remediation policy. However, both groups were still negatively affected by the VR policy with large decreases of successful students in math. Successful Hispanic students decreased by 18.5% and successful first-generation students by 20.0% when the policy changed to VR.

Students identified as eligible for Pell grants had fewer proportions of successful students during VR by two to three percentage points in both English and math than students who had not been identified as Pell grant eligible. Female students had greater

proportions of successful students in both English and math than male students, and they had less of a decrease during the VR group than did male students.

Additional input variables included Feeder School DOE Grade in which students were grouped based on the average grade assigned to the feeder school over the 8-year period (2007-2014) representing the years of high school graduation for all students in the study. Letter grades were converted to a numerical value where A = 4.00, B = 3.00, etc. Students from feeder schools with higher average grades had greater proportions of successful students in both the MR and VR groups for English and math. However, as with almost all other variables, there were fewer successful students in the VR group, and there seems to be an inverse relationship between the average grades assigned by DOE and the decrease between the MR and VR groups in math. In other words, the decrease in the proportion of successful students who came from high-scoring schools was more than it was for students who came from schools that were not graded as well. This finding is interesting and could be related to the fact that college students tend to overestimate their skills and abilities, and they tend to underestimate the effort required for success (Levine & Dean, 2012). If students came from high schools of better quality, they may have had continual access to better support systems and resources that contributed to their success in high school with no need to seek out help. It is possible that as they began their college careers, they had come to expect such help would be automatic and simply failed to tap into available college resources. In contrast, students who graduated from schools graded lower by DOE may have been accustomed to asking for help and simply continued to do so when they entered college.

The other input variables were related to prior academic performance and yielded little surprising information. Students with higher GPAs or class ranks, or higher SAT or ACT test scores most often had greater proportions of successful students in both the MR and VR groups. It is, however, of some surprise that when the policy changed to VR, the only significant relationship between these variables and success in the credit courses was between ACT English scores and the proportion of successful students in MAT1033.

Finally, the environment variables are considered, that is, enrollment status and developmental course history. In both English and math, full-time students had greater proportions of successful students in the MR and VR groups, but they also showed greater declines in those proportions once the policy was voluntary, decreasing by 14.4% in English (compared to -9.8% for part-time students) and decreasing by 19.9% in math (compared to -16.9% for part-time students).

There was little change in the proportion of successful DE students in English, as this proportion decreased by only 2.2% from 72.4% to 70.8%, almost the smallest decrease observed among all categorical variables. In contrast, unsuccessful DE students actually did better in credit English with a 10.7% increase in the proportion of successful students. However, proportions rose only from 37.3% to 41.3%. Among math students who had been successful in a DE course before MAT1033, there was an 8.1% decrease in the proportion of successful credit students when the remediation policy became voluntary. Students who were unsuccessful in the DE course did very poorly when the policy changed to voluntary, decreasing by 51.5% the proportion of successful students in the credit course (from 48.2% during MR to 23.4% during VR). The purpose of the test that produced these results was to compare success of all students during the two

different remediation policies, so it is not known what proportion of students in this test needed remediation. Results based on only those students who were known to need remediation are discussed separately.

In staying "close to the data" (Heppner & Heppner, 2008, p. 329), it is important to not make more of the results than what is clearly evident. While there were several significant relationships based on variables, it is difficult to surmise exactly how VR is affecting minority or low-income students. Effect sizes were consistently small, so to say that any one group is affected to a greater degree may not be accurately reflective of the results, nor were the data collected for this particular study useful for a predictor model. Further research is warranted to investigate that possibility and will be recommended. However and of critical importance, evidence clearly shows one consistent and alarming pattern no matter how the data are tested. Specifically, every variable showed some decreased success in ENC1101 and MAT1033 once VR was implemented. The average decrease by variable was 16.4% (13.5% average decrease by variable for English; 19.3% average decrease by variable in math). Exactly how VR is affecting specific students may not be stated confidently, but all students are negatively affected to some degree. This is of particular concern with a reminder that many student pathways begin in DE courses. Those directions include pathways to science, technology, engineering, and mathematics (STEM) careers. The first level of college writing, ENC1101, is a critical foundation for students in their college careers; intermediate algebra, is a prerequisite course for many credit math courses that are required in many STEM programs. Failure in these courses can thwart a student's direction, yet SB 1720 now encourages students to enter these gateway courses unprepared. Knowing that low GPA contributes to low college

completion (Tinto, 2007), VR sets students up for failure and stifled pathways with a single poor decision as a failed gateway course results in worsened GPAs at a very early point in the college course work.

Developmental course grades are related to credit success. Additional results ensued from tests performed using only data from exempt students who were known to need remediation based on test scores. All students tested had previously volunteered to take the P.E.R.T. with results below the recommended scores to enroll in credit. In other words, based on their P.E.R.T. scores, students were unprepared for the credit courses and faced the need to decide whether or not to complete a DE course before enrolling in credit. Results of the study showed a statistically significant relationship between grades earned during VR and credit course success. Grades of A or B in the developmental course are associated with success in credit English, with $p = .003$ and a moderate effect size of .344. In math, the results are the same with $p < .001$ and a larger effect size of .430 ($\alpha = .05$ in both tests). The statistical results are based on chi-square analyses of cross-tabulations of grades in the DE courses with success in the corresponding credit course.

When results were analyzed, differences were apparent and significant. In fact, 90% of students who earned an A in a DE course to prepare for credit English succeeded in ENC1101. The proportion of students who earned a B or B+ and were also successful in credit English decreased to 69.2%. That proportion dropped quickly to 48.8% for students who earned a C or C+ in the DE course. There were nine students in the sample who failed the DE course, and four of these students succeeded in ENC1101, as did one student who had withdrawn from the DE course.

In math, similar results are observed. Seventy-five percent of students who earned an A in DE math were also successful in credit math. The proportion decreased to 54.1% for students who earned a B or B+ in the DE course. A large drop to 29.7% occurred for students who earned a C or C+ in the developmental course, and of the 32 students who earned less than a C (including one W), only five succeeded in MAT1033.

It is interesting to recall that before this finding was identified, an independent t-test was performed on the mean grades of students in the credit courses to compare grades of students who did and did not remediate, and there was not a significant difference in English or math. In English, both groups had mean grades that were near the equivalent of a C, but students who had bypassed remediation had the higher mean grade (2.034 compared to 1.827). In math, both groups had means that were nearly equivalent to a D with a negligible difference (VR group =1.245; No VR group = 1.227). Additionally, and again of critical importance, students who had been unsuccessful (did not earn at least a C) in the developmental course did worse in the cross-tabulation comparison than students who did not take DE at all. In fact, of the students who were unsuccessful in the DE course, half were also unsuccessful in credit English (compared to 30.8% of students who had bypassed English remediation), and 88% were also unsuccessful in credit math (compared to 55.2% of students who had bypassed math remediation). This means that students who were unsuccessful at the DE level did worse by about 20 to 30 percentage points than students who bypassed the remediation. These results were not statistically significant for English, but they were for math ($p = .002$).

It appears that for a student who elects VR and does well, success is probable in English or math. However, the converse is also true, meaning that if students do not do

well in the DE course, it is not likely they will succeed in the corresponding credit course. These results vary slightly from research included in the literature review that showed the ineffectiveness of DE programs (Bailey et al., 2006; Complete College America, Inc., 2012; Hodara & Jaggars, 2014). Specifically, this study showed that the value of DE courses is highly dependent on the degree of success in those courses. This study also showed, if the gage is higher proportions of successful students, that in some cases, more at-risk students in the sample benefited when they completed VR than when they did not. Specifically, in English, students benefited if they were Black or had low high school class ranks. In math, this was true for students who were Hispanic, eligible for Pell grants, first-generation, or in the lowest 20% of their high school class.

These results are important because when remediation is voluntary, a message is communicated to students that it is somehow less important and without value, but these results show this is not true for all students. Instead, the results support the claim by Boylan and Saxon (n.d.) that very weak students may fail even with DE, but more students will succeed with the support DE can offer. These results indicate that greater value should be placed on the ability of DE courses to prepare the right students; further research is needed, and will be recommended, to identify just who those "right" students are, especially since some of them may be the students who are at greatest risk coming in to college.

Combined, the results provide sufficient evidence to claim that the VR policy enacted by Florida lawmakers in 2013 has negatively impacted the success of students in the gateway courses in the study, namely, ENC1101 and MAT1033. With equal confidence, it can be said that the degree to which a student succeeds in a voluntarily

taken DE course relates to success in the corresponding credit course: specifically, students who earn at least a B in a DE course will probably succeed in the credit course, and if students do not earn at least a B in the DE course, they are unlikely to succeed in the credit course. This leads to the implications for practice, policy and future research.

Implications for Practice

Unless and until the implementation of VR is revised, students, faculty, and college leaders will feel the effects of the current policy buried within SB 1720.

Students. In this change to increased student choice, many students will enroll directly into the credit courses because they can, and possibly because of concerns that financial aid will run out if they use it on a non-credit course. Many students who would have succeeded under the MR policy will now fail. Early in their college career, their GPA will be decreased, and, because low GPAs are known to hinder college retention (Tinto, 2007), these students will be at higher risk for completion. Some students will opt out of both the DE courses and the corresponding credit courses (Hu et al., 2015; Smith, 2015), delaying the gateway courses altogether and taking longer to graduate, if in fact, they graduate. Finally, there are students who will opt for the DE courses, and for whatever reason, not succeed. The study showed that students who are unsuccessful when they voluntarily remediate are associated with reduced success in the credit course as well. Again, a failed credit course results in a very early college GPA that may be too difficult for some students to overcome. As these negative effects are considered, it appears the law that was intended to improve completion in Florida could easily have the opposite effect, with decreased completion rates on the horizon.

There are additional considerations for students over time. The law exempts students who enter a Florida public high school in 2003 or later and subsequently graduate with a standard high school diploma. Policy makers did not use language that would restrict exempt students to, for example, those who have graduated within five years of college application. Without a repeal or revision, the law will stand, as will the criteria for exemption. This means that even in say 2017 or 2027, students who graduated near 2007 and have been out of school for then 10 to 20 years, will be less prepared to take college courses. Senate Bill 1720, however, will allow them to do so with no requirement to test their skills at the current time. Herein lies a new challenge to deal with in time as some of these students delay college entry

Faculty. As students continue to bypass remediation and enroll directly into credit courses, faculty will continue to struggle to balance the needs of students who fill the classrooms. Currently, faculty members have been catapulted into situations in which they must address the needs of a much wider variety of preparedness than before SB 1720, with up to 60% or more seats filled by students who are not prepared for the gateway courses. At the same time, faculty are also pressed by other state legislation to demonstrate student learning with metrics that include student performance (Florida Department of State, 2013). Thus they are forced to balance desired rigor with an ability to prove adequate student performance for all students in their classroom, even when those students have widely dissimilar skills sets. Faculty behaviors are adversely affected by situations such as the one described in this study (Berger, 1997), and faculty behavior affects student success (Pascarella & Terenzini, 1991; Tinto, 2007), especially for students who are less academically prepared (Boylan & Saxon, n.d.; Roueche &

Roueche, 2000; Umoh et al., 1994). Again, this puts overall completion rates at risk in Florida.

College leaders. Staffing challenges will perpetuate and student advisement will become unmanageable. If students are not being properly advised, even more students will bypass remediation options, and if students continue to be unsuccessful in the credit courses as this happens, the value of college will be further questioned. In contrast, if students are advised into DE courses but for whatever reason are not good candidates for DE success, it is unlikely that the DE courses will be adequate preparation. Knowing which students to advise into DE courses is not immediately apparent and creates a dilemma for advising staff as well as decision makers. Scheduling courses and faculty to teach the courses, as well as staffing student and academic support services all become problematic when trying to anticipate student decisions and performance that are resulting because of the VR policy. If the results of this study are an indication of what lies ahead, college leaders in Florida will be forced to continually invest human and fiscal resources to solve the problems at the institutional level.

Implications for Policy

Accountability in education is characterized by metrics that focus on retention and timely college completion. Given this culture, it is likely that the long-term measure of successful voluntary remediation will be limited to reduced DE enrollments or time spent in DE courses with simultaneous improvement among exempt students in both credit course success rates and college completion rates. If such metrics are realized, a variety of implications will arise on the local level and beyond.

Local repercussions. Whether the VR policy succeeds or fails based on measures of how many students take DE courses and how well VR does or does not contribute to college completion, the results will be far-reaching in local communities. If the policy fails and students continue to be unsuccessful in gateway courses, they will face the larger decision of whether or not to stay in college. If the policy succeeds, it will likely mean that weaker students are simply no longer in the data. Students who leave or do not go to college in the first place will have lower-wage jobs than would be possible with a completed education, perpetuating a less-educated workforce and suffering economy. Local policies and resources in both the colleges and communities will be necessary to address these conditions.

Statewide consequences. Florida colleges will not be able to ignore the results of VR, no matter the outcome. If decreased success in gateway courses continues, DOE as a governing body will be forced to develop new policies to address the changed educational need. One policy change could be related to college entry, enacting for the first time in the history of the two-year institution, a policy that closes the door to many students who would have been previously admitted to college under an open-access policy. A closed-door policy has implications not only in Florida, but across the nation, and it threatens to limit educational opportunities for many students, in particular, those who are already disadvantaged economically and academically.

National implications. It is no secret that "all eyes are on Florida" (Fain, 2013), but as other states look to Florida to write their own legislation, the evidence presented in this study is reason to use strong caution against adopting VR as a policy. The high cost and low success of DE courses are what drove the development and implementation of

SB 1720. If this policy remains intact amidst student failure in gateway courses, it will be difficult to infer that reasons exist other than financial savings with decreased spending on DE course enrollment because any changes in college completion will take years to realize. Financial concerns and the very high cost of DE presented in earlier chapters are important. However, if the Florida solution saves money despite the fact that it undermines the success of students, other states may be tempted to replicate the legislation. If cost becomes the driving factor in community college policy, lawmakers embark on a national slippery slope that will potentially eliminate opportunity for weaker students across America. Without proper balance of access and metrics, already marginalized students who can succeed with the right help may be at risk of academic disenfranchisement as college doors begin to close to these students.

Federal considerations. Currently, federal financial aid in the form of Pell grants is available to students who enroll in DE courses, but ever-changing related policy limits the number of credits and length of time for which a student may receive this federal funding (United States Department of Education, 2004). It follows that SB 1720 and similar laws that may be adopted in other states will affect future policy related to Pell grant eligibility and awards. New restrictions on financial aid may further challenge students who already at greater risk of college failure.

Implications for Future Research

The results of the study point to a variety of future critical research opportunities and several recommendations have emerged.

- Research should be conducted to identify predictor variables for successful VR and successful completion of ENC1101 and MAT1033.

- Research should be conducted to identify predictor variables for VR decisions. It is not known why students choose to voluntarily remediate, but if VR remains a policy in Florida, it will become increasingly important for Florida college leaders to have this information.
- Correlations between college entry test scores and credit course success when remediation is voluntary should be investigated.
- Student motivation should be examined to find out why some students with weak skills can bypass remediation and succeed in a credit course and why some students who engage in VR are still unsuccessful.
- Research should be conducted to determine potential changes in faculty behaviors, classroom management, or teaching methodologies, and those changes, if they exist, should be mapped to student success or lack thereof to learn whether or not there are individual faculty behaviors that improve overall student success despite the VR policy.
- The effect of VR on low-income students should be investigated further.
- Institutional responses to SB 1720 should be researched and mapped to student success to determine the best methods of responding to the imposition of VR.
- The effects of VR on active duty members of the military should be explored as this population is currently exempt from placement testing and remediation in Florida.
- The influence of non-academic factors during a VR policy should be researched.

Recommendations for Community and State Colleges

Educators, researchers, and legislators have debated solutions for these challenges for decades (Grimes & David, 1999; Ignash, 1997a, 1997b; Jenkins & Boswell, 2002; McMillan et al., 1997), so even if a perfect solution were available immediately, it is unlikely the course would be corrected quickly. However, there are some recommendations for colleges to better cope with the challenges posed by VR.

Conduct institutional research. As institutional research is underway in at least two Florida colleges with promising results, specifically, at St. Petersburg College and Miami Dade College (Smith, 2015), community and state colleges should invest in institution-specific research to better understand what can work in their institution. If the legislation is not repealed and success rates do not improve, it will become increasingly important for personnel at community and state colleges to become knowledgeable about best practices and to recognize how such practices will be applicable to the students who attend their respective institutions.

Consider combined curriculum or curriculum revisions. Student life skills (SLS) courses can be revised or developed so that critical English and math skills are built into the curriculum in ways that will prepare students for the credit course to follow or that is being taken simultaneously. Credit course curriculum can be revised to incorporate first-day diagnostic assignments. Students who do poorly on such diagnostics can be strongly advised to opt into a developmental course either instead of or in addition to the credit course.

Invest in faculty members. In particular, invest in those faculty who teach affected developmental and credit courses so they can develop the best possible solutions

based on their expertise and experience. The literature verified that faculty members influence student success, both in general (Pascarella & Terenzini, 1991; Tinto, 2007) and in light of controversial legislation that affects college classrooms (Berger, 1997). It becomes critical then, to support those instructors who are teaching students in these courses. These instructors should be at the table when innovations are developed and decisions are made, and their professional development should be ensured as needed to implement promising classroom strategies.

Form partnerships. There are multiple opportunities to collaborate in the effort to maximize the possibility of overcoming the academic deficits that are resulting from VR.

1. Establish partnerships within the college. These should be collaborative teams of successful developmental and credit faculty who can work with administrators with decision-making authority and student services staff to assist with implementing non-academic strategies. These teams can consider pedagogical methods, scheduling options, mentorship, and professional development to expand successful practices to improve classroom success in ENC1101 and MAT1033. The study verified the need for academic improvement, and the literature review indicated the importance of non-academic factors in student success (Cross, 1976); the value of a cross-functional approach should not be overlooked nor underestimated. College faculty and staff are good at student advocacy; such an internal partnership provides another opportunity to find ways to protect the best interest of students.
2. Partner with feeder high schools. Results in this study showed some significant

relationships between the proportion of successful credit students and their feeder high schools based on the grades assigned to those schools by the Florida DOE. Research departments at the colleges should identify those schools that are sending students who are most successful in ENC1101 and MAT1033 despite the VR policy and reach out to the high schools to learn what interventions might be shared with other feeder schools.

3. Partner with other colleges. As all colleges in the FCS face the same challenges because of SB 1720, most colleges are actively seeking solutions, and some are finding success (Smith, 2015). If college administrators and faculty are willing to work together, models will be discovered that will ultimately benefit students and contribute to improved course success and, in turn, completion and retention.
4. Develop or strengthen partnerships with external organizations such as the Association of Florida Colleges (AFC). This organization in particular advocates for Florida colleges and has multiple "commissions" dedicated to improving a variety of institutional aspects. Perhaps there is room for an AFC commission to promote best practices to overcome the challenges that are resulting from the current legislation. A partnership with such an organization could prove beneficial to colleges as they look for ways to both revive success rates in the credit courses and also identify and reach more exempt students who would benefit from DE courses or other interventions.

Conclusion

There is no doubt that solutions are needed to resolve the persistent issues caused by unprepared college students, and Florida legislators were right to address the high

costs and low success of DE courses that prompted SB 1720. However, when SB 1720 exempted many Florida high school graduates and active duty members of the military from remediation of composition and computation skills regardless of academic weaknesses (Florida Senate, 2013, p. 30), it set students up to fail. The hope of the legislation is that completion rates will improve in Florida, but the reduced student success found in this study does not give such hope.

In medical studies and other human subject research, investigators are bound by ethical considerations that require the researcher to cease the study if early indications suggest significant ill effects for the patient. Florida lawmakers are amidst such conditions and are urged to take similar action. Policymakers should consider a data-driven decision to enact a moratorium on the VR portion of SB 1720 until a better-researched solution is identified. The results of this study revealed unintended consequences that equate to "ill effects" because of VR. It is disconcerting that both the mean grades and proportions of successful students in ENC1101 and MAT1033 have decreased in the new era of VR. It is equally distressing that potentially more than 60% of gateway course students do not have the skills necessary to succeed, forcing faculty to contend with widening gaps in the skill levels of their students.

In the open access mission of FCS community and state colleges, the outcome of VR broaches a devastating social injustice for Florida students, faculty, and colleges. Based on the evidence gleaned from the three institutions in this study, the VR policy of SB 1720 that was meant to put students on a fast track to college completion threatens to have the opposite effect and do more harm than good. The implementation of VR as mandated by SB 1720 should be revisited and revised without delay.

APPENDICES

Appendix A. Permission to Conduct Study and to Name Research Site Institutions

FAU
FLORIDA ATLANTIC UNIVERSITY

Institutional Review Board
Division of Research
777 Glades Rd.
Boca Raton, FL 33431
Tel: 561.297.0777
fau.edu/research/researchint

Michael Whitehurst, Ed.D., Chair

DATE:	December 15, 2014
TO:	Patricia Maslin-Ostrowski
FROM:	Florida Atlantic University Social, Behavioral and Educational Research IRB
IRBNET ID #:	667463-1
PROTOCOL TITLE:	[667463-1] Impact of Voluntary Remediation on Gateway Course Success Rates and Minority and Low-income Students in Florida Colleges
SUBMISSION TYPE:	New Project
ACTION:	DETERMINATION OF NOT RESEARCH
EFFECTIVE DATE:	December 12, 2014

Thank you for your submission of New Project materials for this research study. The Florida Atlantic University Social, Behavioral and Educational Research IRB has determined this project does not meet the definition of human subjects research according to federal regulations. Therefore, it is not under the purview of the IRB.

We will keep a copy of this correspondence on file in our office.

If you have any questions or comments about this correspondence, please contact Elisa Gaucher at:

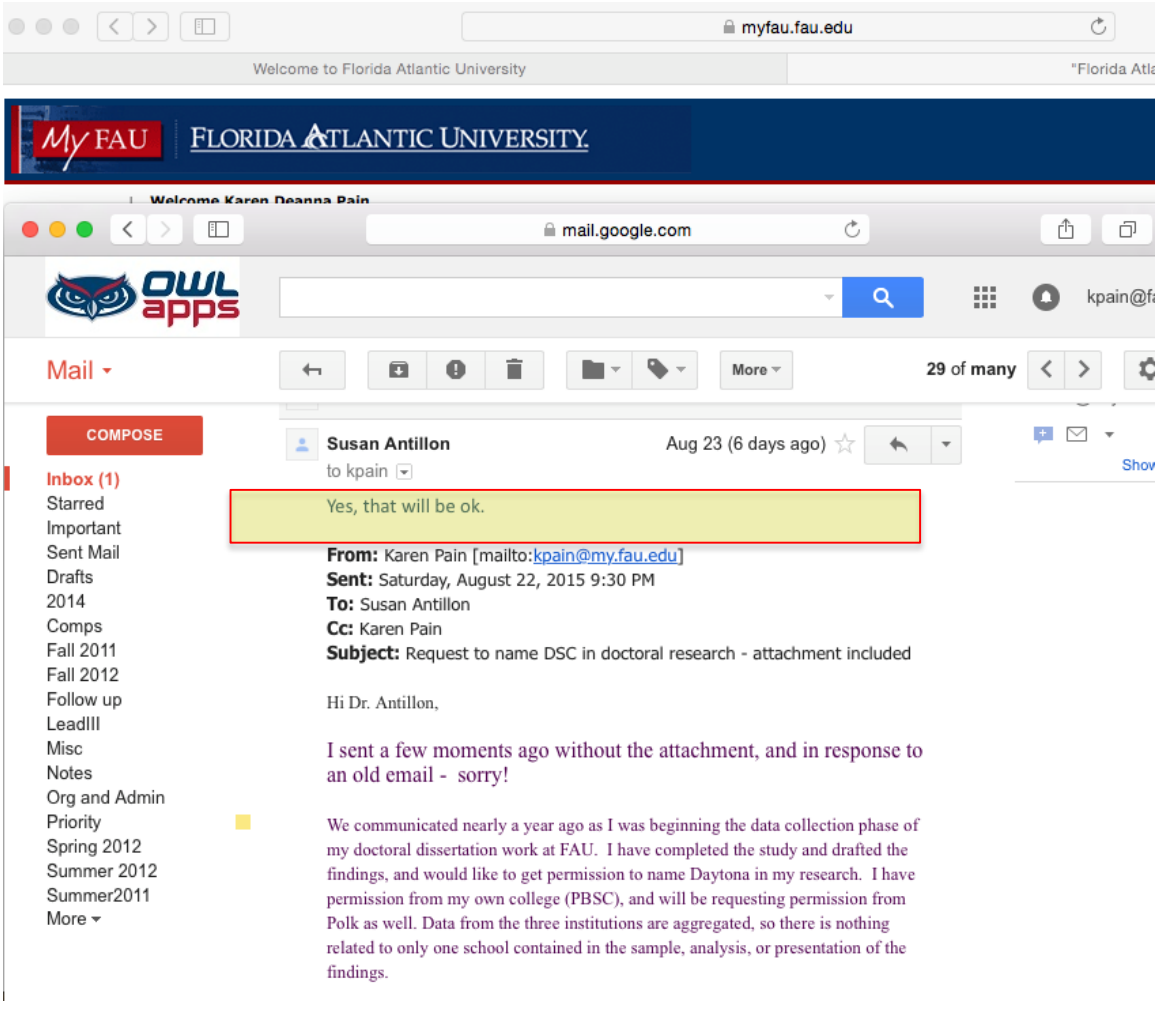
Institutional Review Board
Research Integrity/Division of Research
Florida Atlantic University
Bldg. 80, Rm. 106
Boca Raton, FL 33431
Phone: 561-297-0777

* Please include your protocol number and title in all correspondence with this office.

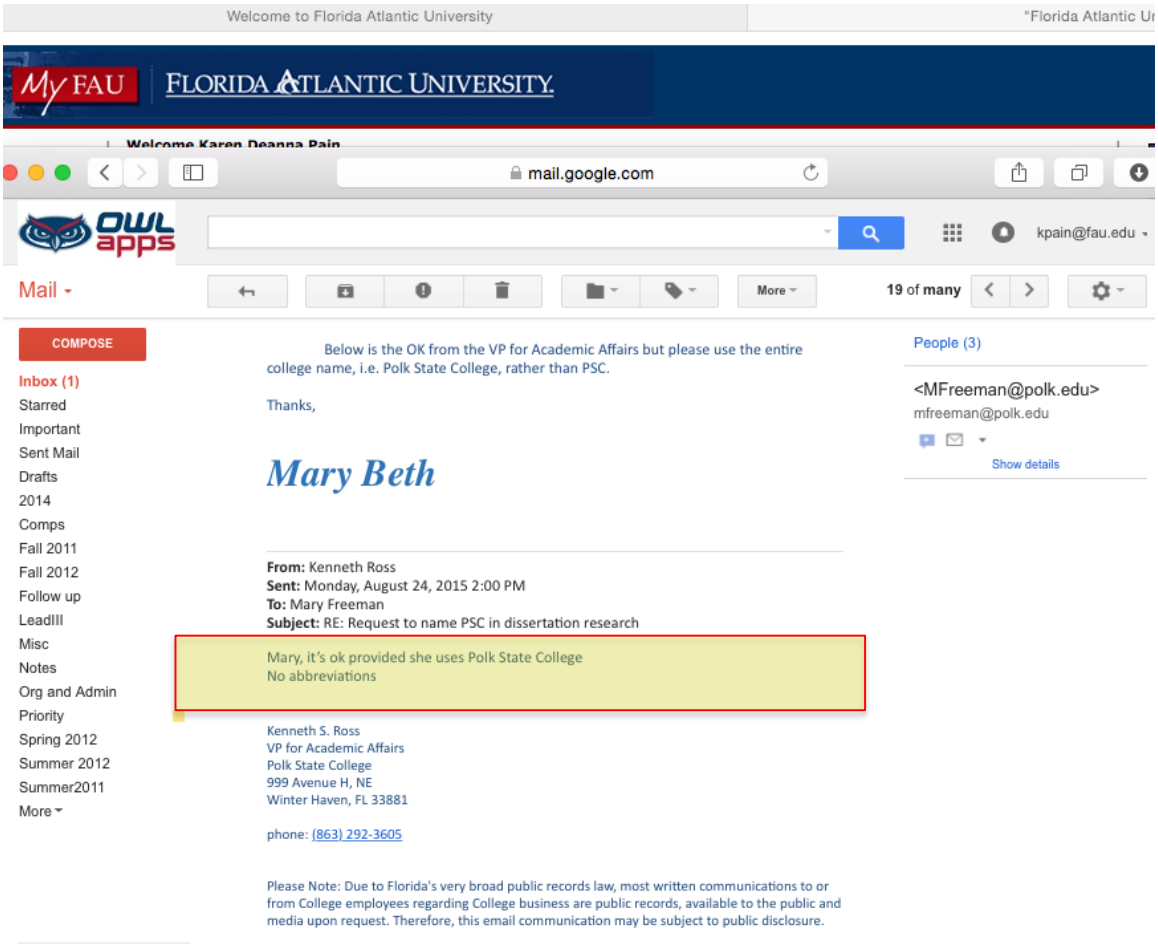
This letter has been electronically signed in accordance with all applicable regulations, and a copy is retained within our records.

Permission to name each college in the study was granted by high-level administrators at each institution, specifically, by the Dean of Institutional Research at Daytona State College, by the Executive Director of Institutional Research and Effectiveness at Palm Beach State College, and by the Vice President of Academic Affairs at Polk State College. Screen shots of each email are below.

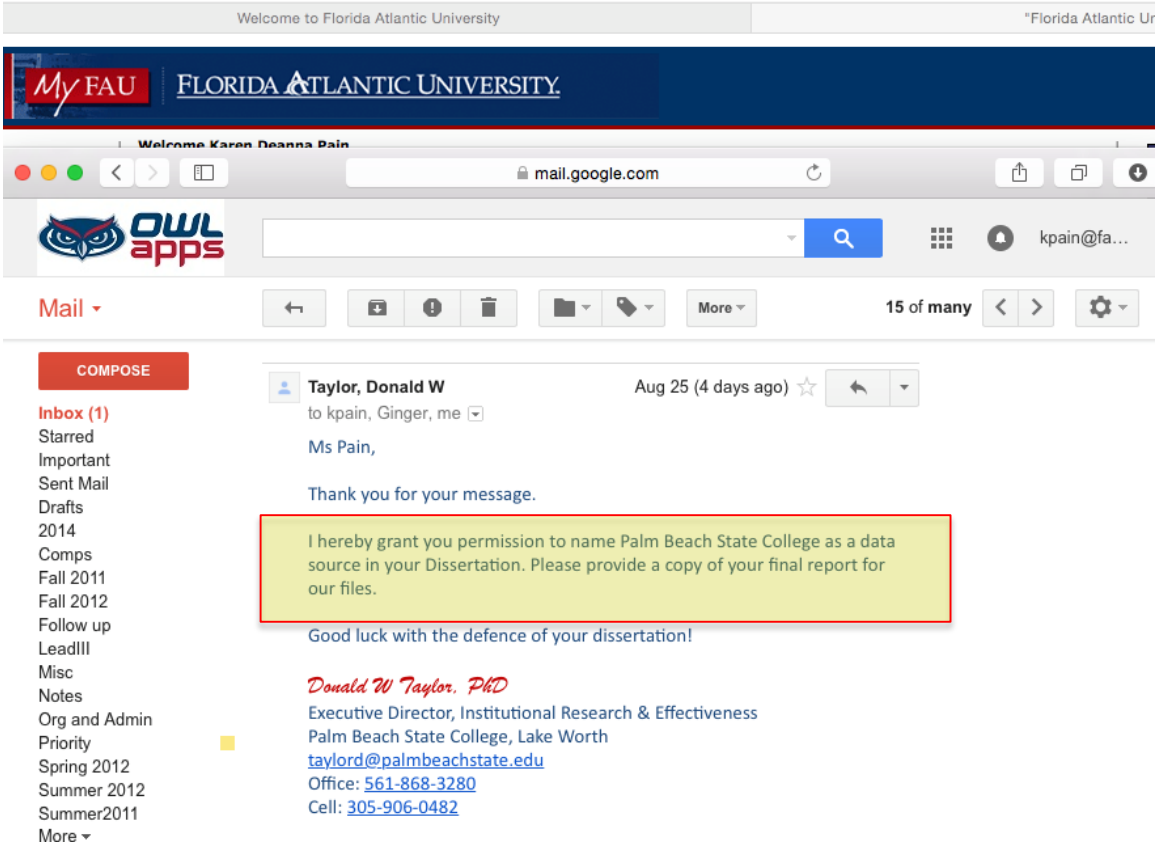
Daytona State College:



Polk State College:



Palm Beach State College:



Appendix B. Summary Tables of Degrees Freedom, Significance, and Phi Coefficient (ES) of Pearson Chi-Square Statistics for Cross-Tabulations between Success and Remediation Policy by Variable

Table 15

Demographic Variables: Summary of Chi-Square Results for Cross-Tabulations between Success and Remediation Policy

Variable		ENC1101			MAT1033		
	df	X^2	Sig.	ES	X^2	Sig.	ES
Race							
Mandatory	7	83.653	< .001	0.132	53.708	< .001	0.118
Voluntary	7	75.941	< .001	0.118	36.449	< .001	0.083
Hispanic							
Mandatory	1	11.351	0.001	0.049	3.809	0.05	0.03
Voluntary	1	13.252	< .001	0.049	13.252	0.02	0.03
Gender							
Mandatory	2	22.748	< .001	0.069	25.978	< .001	0.082
Voluntary	2	27.226	< .001	0.071	33.381	< .001	0.08
Pell Grant Eligible							
Mandatory	1	5.208	0.022	-0.033	1.528	0.216	-0.02
Voluntary	1	9.649	0.002	-0.042	9.649	0.794	-0.004
First-Generation							
Mandatory	1	15.226	< .001	0.056	3.939	0.047	0.032
Voluntary	1	13.401	< .001	0.049	5.554	0.018	0.033
Feeder High School							
Mandatory	3	65.519	< .001	0.122	39.315	< .001	0.102
Voluntary	3	56.853	< .001	0.103	12.736	< .001	0.05

Table 16

HS GPA and Class Rank: Summary of Chi-Square Results for Cross-Tabulations between Success and Remediation Policy

Variable		ENC1101			MAT1033		
	df	X^2	Sig.	ES	X^2	Sig.	ES
High School GPA							
Mandatory	2	45.441	< .001	0.154	39.646	< .001	0.178
Voluntary	2	84.189	< .001	0.184	92.792	< .001	0.2
High School Rank							
Mandatory	4	74.573	< .001	0.201	45.129	< .001	0.194
Voluntary	4	97.393	< .001	0.202	99.099	< .001	0.21

Table 17

SAT and ACT Scores: Summary of Chi-Square Results for Cross-Tabulations between Success and Remediation Policy

Variable		ENC1101			MAT1033		
	df	X^2	Sig.	ES	X^2	Sig.	ES
SAT Math Scores							
Mandatory	1	4.761	0.029	-0.057	8.841	0.003	-0.098
Voluntary	1	1.146	0.284	0.039	0.064	0.801	-0.01
SAT Verbal Scores							
Mandatory	1	4.443	0.035	-0.06	0.152	0.697	0.015
Voluntary	1	0.041	0.839	-0.008	1.361	0.243	0.051
SAT Reading							
Mandatory	1	0.019	0.89	-0.009	0.045	0.833	-0.013
Voluntary	1	0.611	0.434	-0.07	0.871	0.351	0.077
ACT Math Scores							
Mandatory	1	1.317	0.251	0.03	0.045	0.833	-0.013
Voluntary	1	1.548	0.213	0.035	0.871	0.351	0.077
ACT Reading							
Mandatory	1	4.792	0.029	-0.057	0.966	0.326	0.029
Voluntary	1	0.278	0.598	-0.015	3.071	0.08	0.052
ACT Writing							
Mandatory	1	1.306	0.253	-0.032	1.44	0.23	0.041
Voluntary	1	0.078	0.78	-0.009	1.534	0.216	0.04
ACT English							
Mandatory	1	0.157	0.692	-0.027	5.326	0.021	0.139
Voluntary	1	0.158	0.691	0.073	7.195	0.007	0.205

Table 18

Enrollment Status and DE Course History: Summary of Chi-Square Results for Cross-Tabulations between Success and Remediation Policy

Variable		ENC1101			MAT1033		
	df	X^2	Sig.	ES	X^2	Sig.	ES
Enrollment Status							
Mandatory	2	21.526	< .001	0.067	15.05	< .001	0.062
Voluntary	2	2.855	0.24	0.023	4.106	0.128	0.028
DE Course							
Mandatory	2	42.062	< .001	0.094	8.135	0.017	0.046
Voluntary	2	60.091	< .001	0.097	190.412	< .001	0.191

Appendix C. Categorical Observed and Expected Counts for Chi-Square Results with Percent Success and Percent Change by Variable when Remediation Policy Changed from Mandatory to Voluntary

Table 19

Success in ENC1101 by Race and based on Remediation Policy

	Observed N	Expected N	Percent Success	Percent Change
American Indian				
Mandatory	17	14.5	85.0%	
Voluntary	14	15.8	56.0%	-34.1%
Asian				
Mandatory	96	81.1	85.7%	
Voluntary	89	73.2	76.7%	-10.5%
Black				
Mandatory	913	959.4	68.9%	
Voluntary	948	1,034.9	57.8%	-16.1%
Pacific Islander				
Mandatory	9	10.9	60.0%	
Voluntary	11	13.3	52.4%	-12.7%
White				
Mandatory	1,723	1,656.8	75.3%	
Voluntary	1,580	1,518.9	65.6%	-12.9%
Multiple Races				
Mandatory	90	105.7	61.6%	
Voluntary	100	107.9	58.5%	-5.0%
Unknown/NR[a]				
Mandatory	478	454.0	76.2%	
Voluntary	552	493.5	70.6%	-7.3%

[a] Unknown or Not Reported

Table 20

Success in MAT1033 by Race and based on Remediation Policy

	Observed N	Expected N	Percent Success	Percent Change
American Indian				
Mandatory	19	15.3	76.0%	
Voluntary	6	7.4	40.0%	-47.4%
Asian				
Mandatory	62	48.3	78.5%	
Voluntary	60	45.9	64.5%	-17.8%
Black				
Mandatory	542	596.0	55.6%	
Voluntary	688	749.3	45.3%	-18.5%
Pacific Islander				
Mandatory	9	7.3	75.0%	
Voluntary	5	5.9	41.7%	-44.4%
White				
Mandatory	1,290	1,240.8	63.5%	
Voluntary	1,237	1,187.9	51.4%	-19.1%
Multiple Races				
Mandatory	49	52.0	57.6%	
Voluntary	72	77.0	46.2%	-19.8%
Unknown/NR[a]				
Mandatory	296	276.3	65.5%	
Voluntary	369	338.9	53.7%	-18.0%

[a] Unknown or Not Reported

Table 21

Success in ENC1101 by Ethnicity and based on Remediation Policy

	Observed N	Expected N	Percent Success	Percent Change
Hispanic				
Mandatory	970	924.0	76.0%	
Voluntary	1,072	1,012.8	66.8%	-12.1%
Not Hispanic				
Mandatory	2,484	2,530.0	71.1%	
Voluntary	2,383	2,442.2	61.6%	-13.4%

Table 22

Success in MAT1033 by Ethnicity and based on Remediation Policy

	Observed N	Expected N	Percent Success	Percent Change
Hispanic				
Mandatory	595	569.7	63.8%	
Voluntary	757	717.8	52.0%	-18.5%
Not Hispanic				
Mandatory	1,773	1,798.3	60.3%	
Voluntary	1,882	1,861.2	48.3%	-19.9%

Table 23

Success in ENC1101 by Gender and based on Remediation Policy

	Observed N	Expected N	Percent Success	Percent Change
Male				
Mandatory	1,469	1,540.9	69.0%	
Voluntary	1,562	1,651.5	59.7%	-13.5%
Female				
Mandatory	1,956	1,882.7	75.2%	
Voluntary	1,848	1,755.0	66.5%	-11.6%
Unknown/NR[a]				
Mandatory	29	30.4	69.0%	
Voluntary	45	48.6	58.4%	-15.4%

[a] Unknown or Not Reported

Table 24

Success in MAT1033 by Gender and based on Remediation Policy

	Observed N	Expected N	Percent Success	Percent Change
Male				
Mandatory	881	956.0	56.3%	
Voluntary	989	1,092.2	44.7%	-20.6%
Female				
Mandatory	1,467	1,394.9	64.3%	
Voluntary	1,551	1,450.8	52.7%	-18.0%
Unknown/NR[a]				
Mandatory	20	17.1	71.4%	
Voluntary	39	36.0	49.3%	-31.0%

[a] Unknown or Not Reported

Table 25

Success in ENC1101 by Pell eligibility and based on Remediation Policy

	Observed N	Expected N	Percent Success	Percent Change
Pell Eligible				
Mandatory	2,349	2,381.6	71.4%	
Voluntary	2,313	2,364.5	61.7%	-13.6%
Not Pell Eligible				
Mandatory	1,105	1,072.4	74.6%	
Voluntary	1,142	1,090.5	66.1%	-11.4%

Table 26

Success in MAT1033 by Pell eligibility and based on Remediation Policy

	Observed N	Expected N	Percent Success	Percent Change
Pell Eligible				
Mandatory	1,611	1,628.4	60.5%	
Voluntary	1,733	1,737.4	49.2%	-18.7%
Not Pell Eligible				
Mandatory	757	739.6	62.6%	
Voluntary	846	841.6	49.6%	-20.8%

Table 27

Success in ENC1101 by First-Generation Status and based on Remediation Policy

	Observed N	Expected N	Percent Success	Percent Change
First-Generation				
Mandatory	675	628.5	77.8%	
Voluntary	1,212	1,150.4	66.5%	-14.5%
Not First-Generation				
Mandatory	2,779	2,825.5	71.2%	
Voluntary	2,243	2,304.6	61.4%	-13.8%

Table 28

Success in MAT1033 by First-Generation Status and based on Remediation Policy

	Observed N	Expected N	Percent Success	Percent Change
First-Generation				
Mandatory	371	349.6	64.9%	
Voluntary	782	743.4	51.9%	-20.0%
Not First-Generation				
Mandatory	1,997	2,018.4	60.5%	
Voluntary	1,797	1,835.6	48.3%	-20.2%

Table 29

Success in ENC1101 by Feeder High Schools' Average Department of Education Grade, 2007-2014, and based on Remediation Policy

	Observed N	Expected N	Percent Success	Percent Change
3.00-4.00				
Mandatory	1,717	1,613.8	77.4%	
Voluntary	1,710	1,594.1	68.0%	-12.1%
2.00-2.99				
Mandatory	1,157	1,175.8	71.6%	
Voluntary	1,168	1,207.9	61.3%	-14.4%
1.00-1.99				
Mandatory	509	593.0	62.5%	
Voluntary	495	568.8	55.2%	-11.7%
0.00-0.99				
Mandatory	1	1.5	50.0%	
Voluntary	1	1.32	20.0%	-60.0%

Table 30

Success in MAT1033 by Feeder High Schools' Average Department of Education Grade, 2007-2014, and based on Remediation Policy

	Observed N	Expected N	Percent Success	Percent Change
3.00-4.00				
Mandatory	1,124	1,040.3	66.3%	
Voluntary	1,246	1,185.5	51.7%	-22.0%
2.00-2.99				
Mandatory	805	835.9	59.1%	
Voluntary	842	873.4	47.5%	-19.6%
1.00-1.99				
Mandatory	385	435.8	54.2%	
Voluntary	416	444.1	46.1%	-14.9%
0.00-0.99				
Mandatory	1	3.1	20.0%	
Voluntary	1	2.0	25.0%	25.0%

Table 31

Success in ENC1101 by High School Grade Point Average and based on Remediation Policy

	Observed N	Expected N	Percent Success	Percent Change
3.00-4.00				
Mandatory	501	449.9	90.0%	
Voluntary	464	379.6	84.4%	-6.2%
2.00-2.99				
Mandatory	1,068	1,118.5	78.0%	
Voluntary	1,253	1,334.2	64.8%	-16.9%
1.00-1.99				
Mandatory	1	1.6	50.0%	
Voluntary	1	4.1	16.7%	-66.6%
0.00-0.99				
Mandatory	0	n/a	n/a	
Voluntary	0	n/a	n/a	n/a

Table 32

Success in MAT1033 by High School Grade Point Average and based on Remediation Policy

	Observed N	Expected N	Percent Success	Percent Change
3.00-4.00				
Mandatory	269	227.7	82.5%	
Voluntary	352	257.5	71.8%	-13.0%
2.00-2.99				
Mandatory	609	648.2	65.6%	
Voluntary	865	958.9	47.4%	-27.7%
1.00-1.99				
Mandatory	0	2.1	0.0%	
Voluntary	3	3.7	42.9%	n/a
0.00-0.99				
Mandatory	0	n/a	n/a	
Voluntary	0	n/a	n/a	n/a

Table 33

Success in ENC1101 by High School Class Rank and based on Remediation Policy

	Observed N	Expected N	Percent Success	Percent Change
Top 20%				
Mandatory	116	100.5	94.3%	
Voluntary	106	82.1	89.1%	-5.5%
61st-80th percentile				
Mandatory	298	276.1	88.2%	
Voluntary	271	230.5	81.1%	-8.0%
41st-60th percentile				
Mandatory	406	391.3	84.8%	
Voluntary	402	379.6	73.1%	-13.8%
21st-40th percentile				
Mandatory	444	445.2	81.5%	
Voluntary	529	537.0	68.0%	-16.6%
Lowest 20%				
Mandatory	239	290.0	67.3%	
Voluntary	343	421.7	56.1%	-16.6%

Table 34

Success in MAT1033 by High School Class Rank and based on Remediation Policy

	Observed N	Expected N	Percent Success	Percent Change
Top 20%				
Mandatory	68	54.7	87.2%	
Voluntary	56	44.8	65.1%	-25.3%
61st-80th percentile				
Mandatory	163	140.8	81.1%	
Voluntary	215	166.8	67.2%	-17.1%
41st-60th percentile				
Mandatory	233	225.6	72.4%	
Voluntary	363	310.1	61.0%	-15.7%
21st-40th percentile				
Mandatory	242	253.6	66.9%	
Voluntary	322	366.9	45.7%	-31.7%
Lowest 20%				
Mandatory	132	163.3	56.7%	
Voluntary	213	280.4	39.6%	-30.2%

Table 35

Success in ENC1101 by SAT Math Scores and based on Remediation Policy

	Observed N	Expected N	Percent Success	Percent Change
Score at least 440				
Mandatory	724	739.8	80.0%	
Voluntary	337	330.6	74.4%	-7.0%
Score <440				
Mandatory	490	474.2	84.5%	
Voluntary	214	220.4	70.9%	-16.1%

Table 36

Success in MAT1033 by SAT Math Scores and based on Remediation Policy

	Observed N	Expected N	Percent Success	Percent Change
Score at least 440				
Mandatory	221	241.7	61.2%	
Voluntary	122	123.5	58.1%	-5.1%
Score <440				
Mandatory	395	374.3	70.7%	
Voluntary	272	270.5	59.1%	-16.4%

Table 37

Success in ENC1101 by SAT Verbal Scores and based on Remediation Policy

	Observed N	Expected N	Percent Success	Percent Change
Score at least 440				
Mandatory	570	583.8	81.2%	
Voluntary	247	248.1	74.0%	-8.9%
Score <440				
Mandatory	462	448.2	85.7%	
Voluntary	221	219.9	74.7%	-12.8%

Table 38

Success in MAT1033 by SAT Verbal Scores and based on Remediation Policy

	Observed N	Expected N	Percent Success	Percent Change
Score at least 440				
Mandatory	241	238.8	70.7%	
Voluntary	162	155.4	60.4%	-14.6%
Score <440				
Mandatory	205	207.2	69.3%	
Voluntary	143	149.6	55.4%	-20.1%

Table 39

Success in ENC1101 by SAT Reading Scores and based on Remediation Policy

	Observed N	Expected N	Percent Success	Percent Change
Score at least 440				
Mandatory	115	115.5	74.2%	
Voluntary	57	58.9	64.0%	-13.7%
Score <440				
Mandatory	66	65.5	75.0%	
Voluntary	25	23.1	71.4%	-4.8%

Table 40

Success in MAT1033 by SAT Reading Scores and based on Remediation Policy

	Observed N	Expected N	Percent Success	Percent Change
Score at least 440				
Mandatory	116	116.8	59.8%	
Voluntary	65	62.5	63.1%	5.5%
Score <440				
Mandatory	55	54.2	61.1%	
Voluntary	23	25.5	54.8%	-10.3%

Table 41

Success in ENC1101 by ACT Math Scores and based on Remediation Policy

	Observed N	Expected N	Percent Success	Percent Change
Score at least 19				
Mandatory	404	395.9	82.8%	
Voluntary	229	220.4	73.4%	-11.4%
Score <19				
Mandatory	795	803.1	80.3%	
Voluntary	639	647.6	69.7%	-13.2%

Table 42

Success in MAT1033 by ACT Math Scores and based on Remediation Policy

	Observed N	Expected N	Percent Success	Percent Change
Score at least 19				
Mandatory	134	142.3	65.4%	
Voluntary	93	82.6	63.3%	-3.2%
Score <19				
Mandatory	656	647.7	70.3%	
Voluntary	549	559.4	55.2%	-21.5%

Table 43

Success in ENC1101 by ACT Reading Scores and based on Remediation Policy

	Observed N	Expected N	Percent Success	Percent Change
Score at least 19				
Mandatory	523	539.4	78.6%	
Voluntary	405	409.2	69.9%	-11.1%
Score <19				
Mandatory	675	658.6	83.1%	
Voluntary	465	460.8	71.3%	-14.2%

Table 44

Success in MAT1033 by ACT Reading Scores and based on Remediation Policy

	Observed N	Expected N	Percent Success	Percent Change
Score at least 19				
Mandatory	395	387.4	70.8%	
Voluntary	325	310.3	58.9%	-16.8%
Score <19				
Mandatory	395	402.6	68.1%	
Voluntary	317	331.7	53.7%	-21.1%

Table 45

Success in ENC1101 by ACT Writing Scores and based on Remediation Policy

	Observed N	Expected N	Percent Success	Percent Change
Score at least 18				
Mandatory	303	310.1	80.6%	
Voluntary	188	189.8	70.7%	-12.3%
Score <18				
Mandatory	741	733.9	83.3%	
Voluntary	574	572.2	71.6%	-14.0%

Table 46

Success in MAT1033 by ACT Writing Scores and based on Remediation Policy

	Observed N	Expected N	Percent Success	Percent Change
Score at least 18				
Mandatory	195	187.7	74.7%	
Voluntary	153	144.6	60.0%	-19.7%
Score <18				
Mandatory	425	432.3	70.7%	
Voluntary	397	405.4	55.5%	-21.5%

Table 47

Success in ENC1101 by ACT English Scores and based on Remediation Policy

	Observed N	Expected N	Percent Success	Percent Change
Score at least 18				
Mandatory	61	62.3	71.8%	
Voluntary	41	38.3	70.7%	-1.5%
Score <18				
Mandatory	95	93.7	74.2%	
Voluntary	66	68.7	63.5%	-14.4%

Table 48

Success in MAT1033 by ACT English Scores and based on Remediation Policy

	Observed N	Expected N	Percent Success	Percent Change
Score at least 18				
Mandatory	90	80.7	68.7%	
Voluntary	51	42.3	64.6%	6.0%
Score <18				
Mandatory	80	89.3	55.2%	
Voluntary	41	49.7	44.1%	-20.1%

Table 49

Success in ENC1101 by Full-time/Part-time Enrollment Status and based on Remediation Policy

	Observed N	Expected N	Percent Success	Percent Change
Full-time				
Mandatory	1,901	1,832.7	75.1%	
Voluntary	1,172	1,150.4	64.3%	-14.4%
Part-time				
Mandatory	1,549	1,618.4	69.3%	
Voluntary	2,281	2,303.3	62.5%	-9.8%
Not provided				
Mandatory	4	2.9	100.0%	
Voluntary	2	1.3	100.0%	0.0%

Table 50

Success in MAT1033 by Full-time/Part-time Enrollment Status and based on Remediation Policy

	Observed N	Expected N	Percent Success	Percent Change
Full-time				
Mandatory	1,332	1,276.3	63.8%	
Voluntary	1,051	1,015.2	51.1%	-19.9%
Part-time				
Mandatory	1,034	1,090.5	58.0%	
Voluntary	1,527	1,562.8	48.2%	-16.9%
Not provided				
Mandatory	2	1.2	100.0%	
Voluntary	1	1.0	50.0%	-50.0%

Table 51

Success in ENC1101 by Developmental English or Writing History (DE) and based on Remediation Policy

	Observed N	Expected N	Percent Success	Percent Change
Successful DE				
Mandatory	799	776.8	72.4%	
Voluntary	682	640.0	70.8%	-2.2%
Unsuccessful DE				
Mandatory	25	47.2	37.3%	
Voluntary	69	111	41.3%	10.7%
No DE Taken				
Mandatory	2,630	2,606.8	73.1%	
Voluntary	2,704	2,741.9	62.2%	-14.9%

Table 52

Success in MAT1033 by Developmental Math History (DE) and based on Remediation Policy

	Observed N	Expected N	Percent Success	Percent Change
Successful DE				
Mandatory	1,486	1,471.6	61.6%	
Voluntary	1,122	978.8	56.6%	-8.1%
Unsuccessful DE				
Mandatory	54	68.4	48.2%	
Voluntary	129	272.2	23.4%	-51.5%
No DE Taken				
Mandatory	828	825.8	61.3%	
Voluntary	1,328	1,330.0	49.3%	-19.6%

Appendix D. Summary Tables of Degrees Freedom, Significance, and Phi Coefficient (ES) of Pearson Chi-Square Statistics for Cross-Tabulations between Success and Voluntary Remediation Action by Variable

Table 53

Demographic Variables: Summary of Chi-Square Results for Cross-Tabulations between Success and Voluntary Remediation Action (Exempt Students Only)

Variable		ENC1101			MAT1033		
	df	X^2	Sig.	ES	X^2	Sig.	ES
Race							
DE	7	7.091	0.419	0.229	4.343	0.630	0.170
No DE	7	19.219	0.008	0.134	17.215	0.016	0.193
Hispanic							
DE	1	0.155	0.694	0.134	1.199	0.273	0.089
No DE	1	6.426	0.011	0.078	0.365	0.546	0.028
Gender							
DE	2	4.005	0.135	0.172	2.401	0.301	0.127
No DE	2	12.396	0.002	0.108	3.849	0.146	0.091
Pell Grant Eligible							
DE	1	1.070	0.301	-0.089	0.310	0.577	0.045
No DE	1	3.623	0.057	-0.058	3.649	0.056	-0.089
First-Generation							
DE	1	0.369	0.543	-0.052	7.083	0.008	0.217
No DE	1	4.907	0.027	-0.068	4.215	0.040	0.096
Feeder High School							
DE	2	5.550	0.062	0.203	1.159	0.560	0.088
No DE	2	8.281	0.016	0.088	0.863	0.650	0.043

Table 54

HS GPA and Class Rank: Summary of Chi-Square Results for Cross-Tabulations between Success and Voluntary Remediation Action (Exempt Students Only)

Variable		ENC1101			MAT1033		
	df	X^2	Sig.	ES	X^2	Sig.	ES
High School GPA							
DE	2	1.896	0.388	0.161	5.644	0.018	-0.244
No DE	2	34.880	< .001	-0.285	16.900	< .001	0.249
High School Rank							
DE	4	1.400	0.844	0.141	11.881	0.018	0.361
No DE	4	28.646	< .001	0.266	14.497	0.006	0.237

Table 55

SAT and ACT Scores: Summary of Chi-Square Results for Cross-Tabulations between Success and Voluntary Remediation Action (Exempt Students Only)

Variable		ENC1101			MAT1033		
	df	X^2	Sig.	ES	X^2	Sig.	ES
SAT Math Scores							
DE	1	2.222	0.136	0.667		No values	
No DE	1	2.525	0.112	0.183		No values	
SAT Verbal Scores							
DE			No values			No values	
No DE	1	0.001	0.972	0.006	0.325	0.569	0.158
SAT Reading							
DE	1		No values			No values	
No DE	1	0.001	0.977	-0.005	0.178	0.673	-0.149
ACT Math Scores							
DE	1	0.004	0.948	0.015	0.275	0.600	0.127
No DE	1	0.086	0.769	0.023	0.531	0.466	-0.088
ACT Reading							
DE	1	0.020	0.888	0.032	0.554	0.457	-0.181
No DE	1	0.001	0.970	0.003	3.663	0.056	0.232
ACT Writing							
DE	1		No values		0.000	1.000	0.000
No DE	1	1.332	0.249	0.120	1.505	0.220	0.160
ACT English							
DE	1	1.406	0.236	0.395		No values	
No DE	1	0.008	0.930	0.011	2.723	0.197	0.550

Table 56

Enrollment Status: Summary of Chi-Square Results for Cross-Tabulations between Success and Voluntary Remediation Action (Exempt Students Only)

Variable		ENC1101			MAT1033		
	df	X^2	Sig.	ES	X^2	Sig.	ES
Enrollment Status							
DE	1	0.081	0.776	-0.025	1.368	0.242	0.095
No DE	1	0.712	0.399	0.026	0.035	0.851	-0.009

Appendix E. Categorical Observed and Expected Counts for Chi-Square Results with% Success and% Change by Variable when Exempt Students Did Not Remediate

Table 57

Success in ENC1101 by Race and based on Developmental Course History (DE)

Race	Observed N	Expected N	Percent Success	Percent Change
American Indian				
DE	1	1.3	50.0%	
No DE	2	1.4	100.0%	n/a
Asian				
DE	0	0.7	0.0%	
No DE	19	15.2	86.4%	n/a
Black				
DE	30	29.7	66.7%	
No DE	186	207.6	62.0%	-7.6%
Pacific Islander				
DE	0	0.7	0.0%	
No DE	1	0.7	100.0%	n/a
White				
DE	33	30.3	71.7%	
No DE	365	344.6	73.3%	2.2%
Multiple Races				
DE	4	3.3	80.0%	
No DE	21	23.5	61.8%	n/a
Unknown/NR[a]				
DE	17	17.1	65.4%	
No DE	92	87.2	73.0%	10.4%

[a] Unknown or Not Reported

Table 58

Success in MAT1033 by Race and Developmental Course History (DE)

Race	Observed N	Expected N	Percent Success	Percent Change
American Indian				
DE	0	0.4	n/a	
No DE	1	0.5	100.0%	n/a
Asian				
DE	2	1.7	50.0%	
No DE	6	2.7	100.0%	n/a
Black				
DE	13	16.6	33.3%	
No DE	54	58.1	41.9%	20.5%
Pacific Islander				
DE	n/a	n/a	n/a	
No DE	0	0.5	0.0%	n/a
White				
DE	36	34.6	44.4%	
No DE	101	95	47.9%	7.3%
Multiple Races				
DE	2	2.6	33.3%	
No DE	6	7.2	37.5%	n/a
Unknown/NR[a]				
DE	7	5.1	58.3%	
No DE	29	25.7	50.9%	-14.5%

[a] Unknown or Not Reported

Table 59

Success in ENC1101 by Ethnicity and Developmental Course History (DE)

Student Identified Hispanic	Observed N	Expected N	Percent Success	Percent Change
Yes				
DE	36	34.9	67.9%	
No DE	234	216.6	74.8%	9.2%
No				
DE	53	54.1	64.6%	
No DE	503	520.4	66.9%	3.4%

Table 60

Success in MAT1033 by Ethnicity and Developmental Course History (DE)

Student Identified Hispanic	Observed N	Expected N	Percent Success	Percent Change
Yes				
DE	20	17.1	50.0%	
No DE	66	63	47.1%	-6.2%
No				
DE	44	46.9	40.0%	
No DE	142	145	44.1%	9.3%

Table 61

Success in ENC1101 by Gender and Developmental Course History (DE)

Gender	Observed N	Expected N	Percent Success	Percent Change
Male				
DE	30	33.6	58.8%	
No DE	290	307.3	65.3%	10.0%
Female				
DE	57	52.1	72.2%	
No DE	442	420.7	72.7%	0.7%
Unknown/NR				
DE	2	3.3	40.0%	
No DE	5	9	38.5%	n/a

Table 62

Success in MAT1033 by Gender and Developmental Course History (DE)

Gender	Observed N	Expected N	Percent Success	Percent Change
Male				
DE	24	27.3	37.5%	
No DE	80	89.1	40.4%	7.2%
Female				
DE	39	36.3	45.9%	
No DE	125	114.8	49.0%	6.3%
Unknown/NR				
DE	1	0.4	100.0%	
No DE	3	4.1	33.3%	n/a

Table 63

Success in ENC1101 by Pell Grant Eligibility and Developmental Course History (DE)

Pell Grant Eligible	Observed N	Expected N	Percent Success	Percent Change
Yes				
DE	71	73.2	64.0%	
No DE	501	514.2	67.4%	5.0%
No				
DE	18	15.8	75.0%	
No DE	236	222.8	73.3%	-2.3%

Table 64

Success in MAT1033 by Pell Grant Eligibility and Developmental Course History (DE)

Pell Grant Eligible	Observed N	Expected N	Percent Success	Percent Change
Yes				
DE	43	41.4	44.3%	
No DE	123	132.8	41.7%	-6.2%
No				
DE	21	22.6	39.6%	
No DE	85	75.2	50.9%	22.2%

Table 65

Success in ENC1101 by First-Generation and Developmental Course History (DE)

Student Identified as First-Generation	Observed N	Expected N	Percent Success	Percent Change
Yes				
DE	32	33.6	62.7%	
No DE	212	197.2	74.4%	15.7%
No				
DE	57	55.4	67.9%	
No DE	525	539.8	67.3%	-0.9%

Table 66

Success in MAT1033 by First-Generation and Developmental Course History (DE)

Student Identified as First-Generation	Observed N	Expected N	Percent Success	Percent Change
Yes				
DE	28	20.5	58.3%	
No DE	75	64.8	52.1%	-11.9%
No				
DE	36	43.5	35.3%	
No DE	133	143.2	41.8%	15.6%

Table 67

Success in ENC1101 by High School Grade Point Average and Developmental Course History (DE)

High School GPA	Observed N	Expected N	Percent Success	Percent Change
High (3.0-4.0)				
DE	9	10.9	60.0%	
No DE	117	92.7	93.6%	35.9%
Mid (2.0-2.9)				
DE	44	42.3	75.9%	
No DE	201	225.3	66.1%	-14.8%
Low (1.0-1.9)				
DE	1	0.7	100.0%	
No DE	0	0	n/a	n/a

Table 68

Success in MAT1033 by High School Grade Point Average and Developmental Course History (DE)

High School GPA	Observed N	Expected N	Percent Success	Percent Change
High (3.0-4.0)				
DE	13	8.4	68.4%	
No DE	53	38.2	70.7%	3.3%
Mid (2.0-2.9)				
DE	29	33.6	38.2%	
No DE	86	100.3	43.7%	12.6%
Low (1.0-1.9)				
DE	0	0	n/a	
No DE	0	0.5	n/a	n/a

Table 69

Success in ENC1101 by High School Class Rank and Developmental Course History (DE)

High School Class Rank	Observed N	Expected N	Percent Success	Percent Change
Top 20%				
DE	2	1.5	100.0%	
No DE	18	13.3	100.0%	n/a
High (61st-80th percentile)				
DE	3	2.9	75.0%	
No DE	47	41.2	83.9%	10.6%
Mid (41st-60th percentile)				
DE	17	16	77.3%	
No DE	89	78.8	83.2%	7.1%
Low (21st-40th percentile)				
DE	15	15.3	71.4%	
No DE	95	100.9	69.3%	-3.0%
Lowest 20%				
DE	14	15.3	66.7%	
No DE	50	64.8	56.8%	-17.4%

Table 70

Success in MAT1033 by High School Class Rank and Developmental Course History (DE)

High School Class Rank	Observed N	Expected N	Percent Success	Percent Change
Top 20%				
DE	2	0.9	100.0%	
No DE	6	4	75.0%	n/a
High (61st-80th percentile)				
DE	8	4.1	88.9%	
No DE	33	25.4	64.7%	-37.4%
Mid (41st-60th percentile)				
DE	11	10.4	47.8%	
No DE	45	40.3	55.6%	14.0%
Low (21st-40th percentile)				
DE	11	14.9	33.3%	
No DE	28	36.4	38.4%	13.3%
Lowest 20%				
DE	9	10.8	37.5%	
No DE	17	22.9	37.0%	-1.4%

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