DUAL ENROLLMENT: A CORRELATIONAL ANALYSIS OF HIGH-SCHOOL STUDENTS' PARTICIPATION AND COLLEGE PERSISTENCE IN FLORIDA

by

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ABSTRACT

The purpose of this quantitative correlational study was to determine the relationship between dual enrollment (DE) participation and college persistence among 399 high-school students enrolled in the five campuses of a state college in southeastern Florida from Fall 2010 to Fall 2012 using archived student records. Multiple regression was used to examine the correlation between college persistence and DE credits earned, GPA earned in DE courses, and algebra grades and to determine which variable was the greatest predictor of college persistence. The results of the study indicated that there was a significant but small correlation between DE participation and college persistence. Using analysis of variance, the result showed that there was a significant difference between the college persistence of DE and non-DE students. DE students had a mean college persistence score higher than non-DE students. The results of the study using Pearson correlation also showed that there was no significant correlation between GPA earned in DE courses and college persistence. No significant correlation between algebra grades and college persistence was found. The most important result of this study indicated that there was a highly significant correlation between a student's DE credits earned and his or her college persistence and the best predictor of college persistence was the DE credits earned. Based on these findings, more research is required to investigate how DE and non-DE students compare in terms of the relationship between the variables GPA, DE credits earned, algebra grades, and college persistence.

DEDICATION

This dissertation is dedicated to my family. My grandfather inspired me to seek knowledge and to share it with those who had lesser opportunities. My father believed in my dreams. My mother always encouraged me. My five sisters and two brothers inspired me to be a better "ate" (eldest sister). My husband, Terry, shared my joys, discoveries, and challenges, pushed me up when I was down, and carried me through. My friends cheered for me as I advanced from one chapter to another. I am truly blessed to be surrounded by so much love.

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Chapter 1: Introduction

The United States faces an ongoing challenge of improving secondary education graduation rates, postsecondary enrollment, and completion rates (Cassidy, Keating, & Young, 2011). Despite high aspirations to complete a college degree in the United States (Adelman, 1999; Dalton & Ingels, 2008), only 30% of adults 25 years of age and older in 2012 have acquired a bachelor's degree (U.S. Census Bureau, 2012). During the recent recession from 2008 to 2010, it was reported that adults with a bachelor's degree had unemployment rates lower than adults with lesser educations. Between October 2012 and October 2013, high-school dropouts had a jobless rate of 27.9%, compared to the jobless rate for men who have acquired a bachelor's degree of 7.9% and women who have acquired a bachelor's degree of 6.5% (U.S. Bureau of Labor Statistics, 2014).

College persistence and completion remain the biggest higher education challenges in the United States (Kanter, 2010). College persistence refers to the ability among students to enroll in college and remain two or more terms at a 2-year institution and four or more terms at a 4-year institution (McCormick, 2010). College persistence is also defined as first-to-second-year persistence (D'Amico, Morgan, Robertson, & Rivers, 2013). The graduation rates for 25-to-35-year-old adults have dropped from the first to the 12th ranking in the United States. This problem starts in high school or earlier, where 25% of students between ninth and 12th grades drop out (Kanter, 2010). "That means 25% of high school students fail to graduate; that's 1.2 million students on the streets instead of in school. The U.S. loses a high school student every 22 seconds" (Kanter, 2010, para. 7). An 18-year-old who drops out of high school can earn $260,000 less over his or her lifetime than one who completes high school. An additional year in school for

an 18-year-old dropout will cut by half income and tax losses, which were estimated at $192 billion in 2005 (Rouse, 2005).

Struhl and Vargas (2012) claimed that one strategy through which states and school districts can raise college readiness and success among students is to provide them a chance to enroll in college while still in high school. This is called dual enrollment (DE). According to the National Center for Education Statistics (NCES, 2005), DE which is "also known as 'dual credit,' 'concurrent enrollment,' and 'joint enrollment,' refers to the participation in college-level courses and the earning of college credits by high school students" (p. 1). The DE program is a government acceleration program that aims to shorten a student's college completion time. The acceleration in the time to degree saves the state money by reducing the cost of college subsidies and solving the problem of overcrowding in the classroom (Florida Office of Program Policy Analysis and Government Accountability, 2008). The College Board (2011) estimated that as of 2009, 83.6% of schools in the United States offered DE; however, the latest statistics from NCES (2011) estimated that from 2009 to 2010, only 10% of students below 18, presumably DE students (Speroni, 2011b), had part-time enrollment at degree-granting institutions.

Several studies found that DE participation has a strong positive association with educational outcomes (Bailey, Calgano, Hughes, Jeong, & Karp, 2007; Speroni, 2011b; Struhl & Vargas, 2012). In one of these studies comparing DE and non-DE students in Florida in 2000-2002, Bailey, Calgano, Hughes, Jeong, and Karp (2007) showed that students participating in the DE program had a 17.7% likelihood of enrolling in college and a 7.7% likelihood of enrolling in a 4-year institution. Struhl and Vargas (2012)

tracked about 30,000 secondary graduates in Texas in 2004 and found that DE participants were twice as likely to enroll in college, return for another year, and complete a degree. In another study in Florida, Speroni (2011b) found that when students took a challenging course like algebra, the likelihood of their college enrollment increased by 16% and their college degree completion by 23%.

DE is a strategy that can account for an increase in high-school graduation, postsecondary enrollment, and completion rates. Although research on DE has shown positive effects on educational outcomes, there is room for more in-depth investigation. Some studies have explored DE on the state level to show the effects of DE on college persistence, like those completed in Florida (Bailey et al., 2007; Speroni, 2011b) and Texas (Struhl & Vargas, 2012). However, there is limited literature on campus-based efforts to understand college persistence (Allen, 2010). This study analyzed archived student records and examined DE as a strategy to improve college persistence. The study also examined how selected variables affected college persistence.

Background of the Problem

DE is an educational program that provides high-school students with the opportunities to earn credits in college and start earlier (N. Hoffman, Santos, & Vargas, 2009). In Florida, for example, DE is mandated and DE students were found to be 4% more likely to pursue a degree in college one year after their secondary education and 5% more likely to remain in college two years longer than non-DE students (Hughes & Karp, 2008). DE is available not only to gifted students, but also to middle achievers, those on a technical career track (N. Hoffman et al., 2009), minorities, and disabled students (Carroll & Hunt, 2006). In Florida, 67 school districts signed agreements with colleges

that allow high-school students to enroll and earn college credits simultaneously without paying registration, tuition, and laboratory fees. DE students have the option of attending classes during or after their regular class hours in their school or on the college campus. Regardless of location, the qualified faculty members must be accredited by the colleges (Fla. Stat. § 1007.271, 2012).

DE is an important concern for policymakers and educators because of the possibility that DE can promote positive outcomes for participating students (Adelman, 1999; E. Hoffman, 2012; E. Hoffman & Voloch, 2012). The Education Commission of the States (2011) stated that 46 states have at least one statewide DE program. Currently, 12 states require all secondary schools, colleges, and universities to provide DE opportunities. In Georgia, Indiana, Louisiana, and Missouri, there are multiple DE programs with different groups paying for tuition. Florida's Statewide Course Numbering System (SCNS) includes more than 100,000 courses and makes it easier to transfer credits. According to the Florida Department of Education (FLDOE, 2011), DE headcount in Florida has increased from 32,480 in 2001-02 to 46,083 in 2010-2011. The FLDOE also tracks former DE students and how well they performed in the college and university systems. In New York, the City University of New York (CUNY) claimed that for Fall 2010, 29% of students entering college the first time had "College Now" DE participation. As a result of positive benefits from the DE program, CUNY has formed partnerships with 4-year colleges and aligned its general education core to facilitate transfer of credits among its 17 campuses (E. Hoffman & Voloch, 2012).

The positive outcomes for participating DE students include reduction in high-school dropout rates, an improvement in high-school curriculum rigor, assistance to low-

achieving and underrepresented students, and a decrease in college cost (Bailey et al., 2007). DE saves the state money by accelerating the student's time to complete high school or a college degree (Carroll & Hunt, 2006). DE is cheaper for the state compared to other acceleration programs (FLDOE, 2009). DE also provides additional training and industry certification programs for students not ready to enter the workforce after high school (Barnett, Bragg, & Gardner, 2004). Above all, DE is a strategy to improve student readiness for college and success for students most likely not to attend college (Edmunds, 2012; Karp, 2012; Struhl & Vargas, 2012).

The literature on DE has focused on several areas because of its strategic and policy implications for improving students' college readiness and success (Edmunds, 2012; Karp, 2012; Struhl & Vargas, 2012). Research by Adelman (1999, 2004, 2008) provided a framework for how DE participation complements the high school curriculum. Several studies have focused on challenges faced by aligning secondary and postsecondary curricula (Abbott & Fisher, 2010; Bailey, Hughes, & Karp, 2003; Cassidy et al., 2011; N. Hoffman et al., 2009; Hughes & Karp, 2008; Kirst & Venezia, 2004) to build "a more seamless K-16 education system for all students" (N. Hoffman et al., 2009, p. 56). Other studies on DE have covered various topics, such as student data linkages across K-12 and postsecondary institutions (N. Hoffman et al., 2009), the benefits of DE on low-socio-economic-status students (An, 2013), the positive outcomes of DE on career and technical education (CTE) students (Bailey et al., 2003), the benefits of DE for underrepresented students (Carroll & Hunt, 2006), and a comparison between DE and other acceleration programs (Borman, Cotner, D'Souza, Estacion, & Smith, 2011). According to the studies by Bailey et al. (2007) and Speroni (2011a, 2011b), DE

participation is correlated with several positive college outcomes. In a recent study in Florida, Speroni (2011b) found that enrolling in an algebra course improved college enrollment by 16% and both 2-year and 4-year degree attainment by 23%.

There are numerous studies pertaining to DE participation and college persistence on the national level (Adelman, 2004, 2006; Bailey et al., 2007; Kleiner & Lewis, 2005; Swanson, 2008), as well as the state level (Bailey et al., 2007; McCormick, 2010; Speroni, 2011b; Struhl & Vargas, 2012; Wintermeyer, 2012). These studies focused on Florida (Karp, 2012; Speroni, 2011b), Tennessee (McCormick, 2010), Texas (Struhl & Vargas, 2012), and California (Speroni, 2011a; Wintermeyer, 2012). Despite this, there is limited literature on campus-based efforts to understand DE as a strategy to improve college persistence.

Problem Statement

The high dropout rate among high-school students is the general problem addressed in this study. The specific problem is the need to understand how DE participation can improve college persistence. Although there is some evidence from research that strongly suggests that DE has improved college education outcomes (Struhl & Vargas, 2012; Swanson, 2008), there is limited literature to support the effectiveness of DE as a strategy to improve college persistence and degree attainment (Swanson, 2008). DE can be used as a basis to improve college persistence, access, quality, and completion of secondary education (Belfield, Hughes, & Rodriguez, 2012; Cowan & Goldhaber, 2013; Kanter, 2010). DE is already in place in most states and school districts and can be mobilized as a strategy to respond to the call from the government to increase the

graduation rate in the United States to 90% by 2020 (Balfanz, Bridgeland, Bruce, & Fox, 2013).

Purpose Statement

This quantitative study with a correlational design examined the influence that DE participation had on college persistence and determined which variable was the greatest predictor of college persistence. For this study, college persistence was determined by the number of semesters that DE students remained in college from Fall 2010 to Fall 2012. The study provided a profile of the students participating in the DE courses and explored the relationships between college persistence and DE participation, DE credits earned, grade point average (GPA) earned in DE courses, and algebra grades in a DE program, among 399 archived student data records from high-school DE students on the campuses of a Florida college who

1. participated in DE courses while in grades 10 to 12;
2. remained in college from Fall 2010 to Fall 2012;
3. resided in the four-county geographic region of southeastern Florida;
4. enrolled in a DE course on one of the campuses of College A.

Significance of the Study

The study provided information on the relationship between DE participation and college persistence. Empirical evidence showing that DE participation influenced college persistence may be used by policymakers to provide an increase in accessibility of the DE program to high-school students, especially for the states just starting to create partnerships between secondary and postsecondary schools (Allen, 2010).

The study presented information on the profile of high-school students participating in the DE program and determined the relationship between variables, such as DE participation, DE credits earned, GPA earned in DE courses, and algebra grades in a DE program, to college persistence. The study also determined which among these variables best predict college persistence. The information presented may be used by educators and administrators to identify students who have the profile of succeeding in the DE program. This information may also be used to identify DE program practices that may assist students to transition into college. For example, College A may use data on GPA earned from DE courses and DE credits completed to determine at what point of the DE program students may need more academic support to persist toward college completion.

Nature of the Study

A quantitative, correlational design with multiple regression analysis was used to examine the relationship between DE participation and college persistence. A research problem is identified according to the latest development in the area or the demand to explain an occurrence in quantitative research (Creswell, 2012). The quantitative approach was appropriate because this method provided a description of the trends and relationships among variables and developed generalizations that apply to existing theories (Creswell, 2012; Leedy & Ormrod, 2010).

Correlational research with multiple regression analysis was used to determine any relationship between variables (Creswell, 2012). This design was appropriate because it tested the relationship between the variables to determine if they influenced or predicted each other. This study also described the profile of the students participating in

the DE program and explored the relationship between DE participation, DE credits earned, GPA in DE courses, algebra grades in a DE program, and college persistence.

Research Questions and Hypotheses

Research questions. The research questions that were answered in this research are the following:

RQ1: What relationship exists between DE participation and college persistence?

RQ2: What relationship exists between the number of DE credits earned and college persistence?

RQ3: What relationship exists between the GPA earned in DE courses and college persistence?

RQ4: What relationship exists between algebra grades in a DE program and college persistence?

RQ5: Given the variables of DE credits earned, GPA earned in DE courses, and algebra grades in a DE program, which is the greatest predictor of college persistence?

Hypotheses. The following hypotheses were tested to identify the relationship among DE participation, DE credits earned, GPA earned in DE courses, algebra grades in a DE program, and college persistence:

$H_0$1: There is no significant correlation between DE participation and college persistence.

H_a1: There is a significant correlation between DE participation and college persistence.

$H_0$2: There is no significant correlation between DE credits earned and college persistence.

H_a2: There is a significant correlation between DE credits earned and college persistence.

$H_0$3: There is no significant correlation between GPA earned in DE courses and college persistence.

H_a3: There is a significant correlation between GPA earned in DE courses and college persistence.

$H_0$4: There is no significant correlation between algebra grades in a DE program and college persistence.

H_a4: There is a significant correlation between algebra grades in a DE program and college persistence.

H_o5: Given the variables DE credits earned, GPA earned in DE courses, and algebra grades in a DE program, no variable can predict college persistence.

H_a5: Given the variables DE credits earned, GPA earned in DE courses, and algebra grades in a DE program, a variable or variables can predict college persistence.

Theoretical Framework

The theories that were used to guide this study were the collaborative leadership theory by Bennis and Heenan (1999), the theory of institutional departure from higher education by Tinto (1988), and the theory of persistence by Pascarella and Terenzini (1991, 2005).

DE is a collaborative leadership effort between the state, high schools, and colleges. Leadership is a "driver for change and performance improvement in schools" (Hallinger & Heck, 2010, p. 226). Collaborative school leadership emphasizes processes that involve shared commitment and accountabilities in achieving school goals and student learning outcomes (Hallinger & Heck, 2010). For example, in Florida, the DE program is mandated and paid for by the state and managed by local colleges in coordination with the high school districts. The collaboration between these stakeholders is vital to the success of the program.

Tinto's (1988) theory of institutional departure from higher education stated that the integration of a student into a college's academic or social environment is related to his or her institutional commitment. The theory also stated that greater commitment and social involvement correlate with subsequent persistence in the school and course completion (Tinto, 1988). Tinto identified major sources of student departure from higher education as academic difficulties, the inability to integrate in school activities, and the inability to achieve educational goals. This theory indicated that in order to persist in an academic setting, students must be integrated into the institution.

The theory of persistence by Pascarella and Terenzini (1979) also stated that the regular and constant interaction between faculty and students affects the decision of the student to continue or withdraw from the institution. The theory also stated that student background characteristics may not be related to attrition, but may affect how students interacted with their college experience.

Definition of Terms

College GPA – The GPA earned in college courses is calculated by taking the final grade in a course and taking the assigned grade value equivalent as A = 4, B = 3, C = 2, D = 1, and F = 0, then multiplying this by the corresponding credits of the course. The product is added to results from all other courses and the sum is divided by the total credit hours completed (College A, 2012).

College persistence – A student who persists "is a student who enrolls full-time, continuously pursues a degree with the expectation of graduation in about four (or two) years" (Bloom, Habley, & Robbins, 2012, p. 4). For this study, college persistence was defined as continued enrollment in a DE program for two or more semesters at an institution; it is also first-to-second-year persistence (D'Amico et al., 2013; Dembo, Mossler, & Nakajima, 2012; McCormick, 2010).

College Now – The CUNY's DE program (E. Hoffman & Voloch, 2012).

Dual enrollment (DE) – Also "dual credit," "concurrent enrollment," and "joint enrollment," it refers to high-school students enrolled in college courses (NCES, 2005, p. 1).

Dual enrollment (DE) courses – College-level courses that award college credits to participating high-school students (NCES, 2005).

Student demographic characteristics or profile – Includes the demographic variables age, gender, race, and ethnicity of DE students (College A, 2012).

Assumptions, Scope, Limitations, and Delimitations

Assumption. An assumption is a condition taken for granted and without it the research study will be pointless (Leedy & Ormrod, 2010). The main assumption was that

the data provided by the records department of the college were accurate and reliable. College A is accredited by the Southern Association of Colleges and Schools and complies with the core requirements, comprehensive standards, and federal regulations that ensure that the information provided by the institution complies with the Compliance Certification report and the Family Educational Rights and Privacy Act (FERPA).

Scope of the study. The scope of this quantitative, correlational study limited the research to the variables DE credits earned, GPA earned in DE courses, algebra grades in a DE program, and college persistence in College A for DE students enrolled from Fall 2010 until Fall 2012.

Limitations. One of the limitations of this study was that the semesters covered were only from Fall 2010 until Fall 2012, excluding the summer sessions within this timeframe. Another limitation was that the results of this research may be generalizable only to colleges in Florida or other states that may have similar demographics and characteristics to College A. Florida is known as "a state with a well-developed, highly regulated, and fully funded dual enrollment program" (Speroni, 2011b, p. 55).

Delimitations. One delimitation of the study was that the archived student record data only covered the period from Fall 2010 until Fall 2012 in College A. Another delimitation was that there is a possibility that a confounding variable such as socio-economic status might affect the study outcome. This extraneous variable may be statistically related to the independent variable and may affect the results of the study. Another delimitation of the study was that interpretations and analysis were completed according to the theoretical framework used. Other alternative theoretical frameworks might have given the results of the study a different interpretation.

Summary

The road to college "remains broken for far too many students, especially those from lower income, minority, or less educated backgrounds" (Abbott & Fisher, 2010, p. 1). For some students, DE is the most affordable and effective strategy to achieve higher learning and elevate academic opportunities and aspirations (Abbott & Fisher, 2010). For the state, DE is a mechanism that saves state money (Carroll & Hunt, 2006). DE can be used as a strategy to improve college persistence and achieve the country's target of reaching a graduation rate of 90% by 2020 (Balfanz et al., 2013).

Chapter 1 included information on the importance of DE as a strategy to improve college persistence. The main topics were (a) the problem that policymakers are facing to improve college retention, persistence, and completion and (b) the potential that DE can be a strategy to improve college persistence if colleges can be mobilized to provide high-school students the learning opportunities and a head start in college via the DE program.

The influence of DE participation on college persistence was investigated in this quantitative, correlational research. College persistence was measured in the number of semesters that selected students remained in college from Fall 2010 to Fall 2012. A profile of the DE students participating in DE courses was included and the relationship between college persistence and DE participation, DE credits earned, GPA earned in DE courses, and algebra grades in a DE program was determined. The population was 399 archived DE high school student data records from the five campuses of a state college in Florida of students who remained in college from Fall 2010 to 2012.

The theoretical framework that guided the study was the collaborative leadership theory by Bennis and Heenan (1999), the theory of institutional departure from higher education by Tinto (1988), and the theory of persistence by Pascarella and Terenzini (1991, 2005). The results from this study may contribute to the existing knowledge on DE participation, DE credits earned, GPA earned in DE courses, algebra grades in a DE program, and college persistence. Chapter 2 covers a survey of the literature on DE participation and college persistence.

Chapter 2: Review of the Literature

Chapter 2 contains a review of theories, germinal work, historical perspectives, contemporary research, and research design on student participation in DE and college persistence. Discussions include theories regarding student participation, student persistence, and factors affecting student participation. Various perspectives are compared to provide an understanding of existing research and to establish the conceptual framework for the study.

The purpose of this quantitative, correlational study was to determine what influence DE participation had on college persistence. Chapter 2 starts with a discussion of the theories on student persistence and moves on to a historical overview of DE in Florida. This review also includes literature on the demographic profile of students who participate in the DE program. The DE program is reviewed, including specific areas, such as the relationship between DE participation and college persistence, and variables such as DE credits earned, GPA earned in DE courses, and algebra grades in a DE program. Finally, this review presents current unsolved problems, unresolved issues, gaps in DE participation, and college persistence.

The collaborative leadership theory of Bennis and Heenan (1999), the theory of institutional departure from higher education by Tinto (1988), and the persistence theory developed by Pascarella and Terenzini (1991, 2005) are reviewed to establish the theoretical framework of this study.

Collaborative Leadership Theory

Bennis and Heenan (1999) stated that co-leadership or collaborative leadership is a close-knit partnership. DE is a collaborative partnership between the state, high

schools, and colleges (Allen, 2010). The partnership has various benefits such as cost sharing, grant funding initiatives, state funding and support, sharing of facilities, and instructional capacities (Amey, Eddy, & Ozaki, 2007), sharing of information and other resources, and community building (Otte, 2002). According to Hallinger and Heck (2010), collaborative school leadership shares a commitment to meet common school goals and accountabilities to achieve student learning outcomes. For example, DE is funded and supported by the state and administered by the local colleges in coordination with the high-school districts in Florida where DE is mandated. DE fosters good relationships among secondary teachers, secondary staff and college faculty to assist and motivate students (Hughes, 2010, p. 13).

Theory of Institutional Departure

The theory of institutional departure from higher education by Tinto (1988) stated that a student's institutional commitment or departure decision is related to his or her integration into a college's academic or social environment. The theory also stated that precollege educational experience, individual attributes, and family background affect the student's commitment. Tinto identified academic difficulties, setbacks in solving educational goals, and inability to integrate into the institution as the major sources of student departure. Students should be integrated into the systems in the various activities and social groups to persist in the institution. Tinto suggested that student integration into a college's academic or social environment relates to institutional commitment and increasing the student's college persistence.

Persistence Theory and Research

The theoretical framework for comprehending why students depart from college can be attributed to Tinto (1975). Several other authors such as Pascarella and Terenzini (1991, 1998, 2005), Braxton, Milem, and Sullivan (2000), Reason and Terenzini (2005), and Braxton, Jones, Hirschy, and Hartley (2008) developed revisions and empirical works. Tinto suggested that precollege educational experiences, individual attributes, and family background affect the commitment of the student to the institution. Factors like academic and social systems should be investigated to understand college persistence.

Pascarella and Terenzini (1991, 2005) conducted a survey of research for the last 30 years on how college affected students and concluded that there are several forces that influence the learning capability and persistence of students. The review also presented findings that indicated that most studies on factors affecting students have focused on only a few factors at a time, resulting in only a partial picture of the factors affecting the student.

Reason and Terenzini (2005) presented a framework that incorporates four sets of influences on student outcomes, including experiences and characteristics before college, including the context of the organization, individual experiences, and student environment. Reason and Terenzini suggested a framework that offers a comprehensive map of the forces that may promote or impede student learning, development, or persistence. Reason and Terenzini also presented specific aspects of elements included in the student environment that need inquiry, namely experiences in the classroom and extracurricular activities.

Braxton et al. (2000) stated that engaging students in class discussions affects college student departure decisions. Braxton et al. found a direct relationship between active learning and commitment to the institution. The findings from the study are not generalizable to other colleges as the research is limited by a very selective university. The study was replicated and extended by Braxton et al. (2008), with a focus on the effect of faculty practices that emphasize active learning. The study used a sample from eight colleges with different profiles to measure student persistence. Braxton et al. (2008) found that a student's social integration in the institution was directly related to his or her commitment and persistence.

Historical Overview of Dual Enrollment in Florida

The Education Code of Florida, Title XLVIII K-20, stated that the rationale for the DE program is mandating acceleration mechanisms to be available to secondary and postsecondary students. An articulated agreement between the school district and the colleges that administer the program governs this program (Fla. Stat. § 1007.271, 2012). According to the Florida Postsecondary Education Planning Commission (FLPEPC), DE started in Florida in the 1970s from articulation agreements between secondary schools, 2-year colleges, and universities (FLPEPC, 1997). The Florida General Assembly enacted a legislative order in 1972 that directed the FLPEPC to review the effectiveness of the acceleration programs, including AP, DE, and international baccalaureate instruction (FLPEPC, 1997). In 1974, legislation was enacted allowing 2-year colleges but not school districts to accept full-time enrollment for DE students. This legislation resulted in resistance to DE courses by school districts that resulted in a drop in enrollment for 42 of the 67 districts. The restrictions were lifted in 1984 and a new law,

Chapter 84-336, was passed granting full funding to districts. This change in legislation resulted in a jump in the enrollment as noted by the FLPEPC (1988). DE participation increased when the school districts were granted full funding (FLPEPC, 1988). From 2001 to 2010, DE headcount in Florida increased by 42% from 32,480 students to 46,083 students. From 2009 to 2010, the increase in DE enrollment in Florida was 8.88% (FLDOE, 2011).

Florida has a mandated statewide DE program for secondary students (Allen, 2010). Students from public schools should receive free tuition, fees, and textbooks. Students from private schools or those being home schooled receive free tuition. The SCNS used in Florida facilitates the transfer of DE credits to colleges and universities.

Secondary students must qualify to participate in the DE program. The students should be enrolled in a high school or home schooled. The students are required to have a GPA of 3.0 to enroll in a college credit courses or a 2.0 unweighted GPA to qualify for a certificate course. The students should also pass the College Preparation Test (CPT) and meet any additional admissions criteria set by the particular college (FLDOE, 2009). In 2010, there were 46,083 students enrolled in the DE program (FLDOE, 2011).

Student Demographic Characteristics

Borman, Cotner, D'Souza, Estacion, and Smith (2011) presented the results of a study on the acceleration programs for high-school students in Florida. Borman et al. described the DE students in Florida as women (62%), White (72%), in grades 11 and 12 (7.3%), and less likely to be Hispanic (9%). The sample of the study comprised grade 11 and 12 students who participated in the DE program and other acceleration programs in 2006-2007. The study focused on DE policies in the qualitative portion and dealt with

the demographic and transcript data in the quantitative portion. The study included all students enrolled in the 67 main districts that provided demographic data. The final sample had 353,950 students, of whom 25,992 (7.3%) were dual enrollees.

In a study of data from two cohorts of 229,828 secondary students in Florida in 2000-01 and 2001-02, Speroni (2011a) determined the ability of DE and AP to predict college access and success. The findings of the study indicated that DE students had a greater likelihood of going to college than their AP counterparts. Speroni also found that although there was a similarity in the gender composition of AP and DE students, DE serves fewer Black and Hispanic students (19%) than AP. Both DE and AP programs attract students from relatively similar, more affluent socioeconomic backgrounds. In terms of academic ability as measured by the Florida College Admission Test, students taking AP only are academically better prepared than DE students (Speroni, 2011a).

A study by Bailey et al. (2007) examined the outcomes of DE participation, with a focus on CTE student records in Florida and New York City. The study used 2,303 records from New York and 299,685 from Florida. The authors completed separate analyses of each dataset to determine the effect of DE on high school outcomes. The authors compared the demographic characteristics, grades, and test scores of DE students and non-DE students. The statistical estimators of means and standard errors were used in all these comparisons. The authors found that in Florida, DE students

1. had greater likelihood to be female and white;
2. had lesser likelihood to be labeled as eligible for free lunch;
3. had GPAs in high school higher than non-DE students;
4. were more advantaged in demographic and academic characteristics;

5. were more advantaged than their non-DE peers among CTE students.

DE Credits Earned

Participation in College Now, CUNY's comprehensive DE program, showed that on average, those in associate degree programs earned 0.77 more credits in their first year than their non-participating DE peers (Michalowski, 2007). A possible reason for this is that the program helped the students to be more prepared for a 2-year degree, enroll in college, or earn more credits (Michalowski, 2007). The effects on students enrolled in the 4-year degree programs were slightly weaker. The study showed that on the average, the students earned half a credit more than their non-participating peers (Michalowski, 2007).

In a study on the impact of high school DE participation on degree completion, Swanson (2008) found that students who participated in DE and had 20 or more college credits in the first year had a 28% greater likelihood to persist to a second year than their non-DE-participation counterparts. One of the reasons for this is that DE participation and credit accumulation may create a nest egg effect among students, which enables them to remain in college (Swanson, 2008).

Cowan and Goldhaber (2013) investigated the effects of *Running Start*, a DE program in Washington State, on secondary graduation and college enrollment. They tracked students from early high school until college and found no evidence that participation in DE increases full-time college attendance (Cowan & Goldhaber, 2013). There was some evidence that DE participation "increases enrollment in two-year colleges at the expense of enrollment in four-year colleges" (Cowan & Goldhaber, 2013, p. 2). In investigating the number of college credits students attempt while in the

Running Start program, Cowan and Goldhaber found that many students enroll for only one quarter or for the entire two years of eligibility in the program. The study also found that there is a 15% greater likelihood for students who have earned 76 or more credits to earn a two-year degree or enroll in college after high school. Furthermore, the closer the student is to earning an associate's degree, the more likely it is that the student will continue attending a 2-year college than a 4-year college (Cowan & Goldhaber, 2013).

Belfield, Hughes, and Rodriguez (2012) examined the effect of participation in the Concurrent Courses Initiative (CCI), a partnership between secondary and postsecondary schools in California that offered DE programs, and found that CCI DE students accumulated more college credits that increase over time than their comparison group. They also found that CCI DE students earned 20% more college credits than peers from the same district after two years in college (Belfield, Hughes, et al., 2012).

Grade Point Average

The DE program in Florida is "well-developed, highly regulated, and fully funded" (Speroni, 2011b, p. 55). Students qualify to be accepted in the DE program. Students should have a GPA of 3.0 to enroll in DE courses or a GPA of 2.0 for certificate courses and should complete placement testing (Fla. Stat. § 1007.271, 2012, p. 1). Speroni (2011b) tracked graduating students from 2000-01 and 2001-02 through summer 2007 in chosen counties in Florida to investigate the effect of DE participation on student outcomes. Speroni used two regression discontinuity (RD) analyses to review the mandate in Florida that requires minimum academic standing for students to enroll in DE. Speroni evaluated the effect of DE using GPA as the criterion for eligibility and used the effect of college algebra as a DE participation criterion. The findings from the study

indicated that there was no evidence that taking DE courses significantly increased secondary graduation, enrollment in college, or persistence for students with the minimum GPA requirement.

Belfield, Edwards, Hughes, and Rodriguez (2012) stated that the CCI was a 3-year study starting in 2008 and ending in 2011. The study examined the possibility of using DE to enhance college for low-income or underrepresented youth in higher education. The study tracked outcomes for students in 21 secondary schools and 10 postsecondary institutions in California. The study reported that career-focused DE programs can be beneficial to underachieving and underrepresented students. Data for the academic years 2008-09 and 2009-10 were used to determine the effect of DE participation on GPA. Using student characteristics and standardized test scores as controls, the study reported that GPAs of 2008-2009 dual enrollees were slightly higher than their district peers; however, this result did not hold for the 2009-2010 dual enrollees. The findings concluded that DE courses have no likely effect on participating students' GPAs.

Bailey et al. (2007) used data from two DE programs in New York and Florida to examine the outcomes of DE participation, with a focus on CTE. The dataset from New York was 2,303 records and included only students from one of the 19 vocational high schools. There were 299,685 public high school records from Florida. The study reported that one year after graduation, DE students from Florida had higher GPAs and earned greater credits than non-DE students. DE students also had higher cumulative GPAs three years after graduation.

College Algebra

Speroni (2011b) tracked Florida students from 2000-01 and 2001-02 through summer 2007 to investigate their postsecondary outcomes. The state records provided demographic characteristics and standardized and placement test scores. The enrollment data from out-of-state colleges were provided by the National Student Clearinghouse. Speroni found that when students take college algebra, there is an increase of 16% in the likelihood of entering college and a 23% greater likelihood of completing a college degree. Speroni stated that a possible reason for this is that the more rigorous curriculum that DE students experience while in high school gives them a better preparation for college. Speroni stated that students who enrolled in college-level algebra started college with greater self-confidence.

A 2007-2008 study by the FLDOE compared the grades of DE students and non-DE students and found that in examining grades in college algebra and freshman composition courses, DE participants had a greater likelihood of earning a grade of C or better than non-DE students. On a statewide basis, 91.4% of students participating in the DE program earned a C or better in algebra, while 74.5% of non-DE students earned a C or better (FLDOE, 2009).

Adelman (2006) tracked a sample of eighth-graders from 1988 to 1992 by using transcripts from the NCES. This study was a replication of a previous study by Adelman (1999) that tracked high-school students from 1982 until 1993. Both studies tried to follow the national sample to determine the aspects of their schooling that affected their completion of a 4-year degree. A comparison of data from the 1982 and 1992 studies showed that a high-school student's completion of a higher level of math above Algebra

2 provides momentum toward a 4-year degree. The study also found that high-school students who took other math classes beyond Algebra 2 had a higher attainment rate of a 4-year degree. The study showed that attainment rates decreased at every level below Algebra 2 completion for 4-year degrees. Adelman (2006) used an odds-ratio analysis to validate these findings. An odds ratio indicated the chances of an event happening or not. Adelman (2006) found that for both groups, the odds ratio showed that a higher level of math improves the chances of completing a 4-year degree by 2.5%.

College Persistence

Bailey et al. (2007) analyzed the effect of participation in DE courses on CTE and non-CTE students in Florida and New York. The report analyzed datasets from the two states, controlling for student characteristics using ordinary least squares and logistic regression. The authors tracked 36,217 DE students and 4,654 high school CTE graduates of 2000-01 and 2001-02 who entered public colleges in Florida. The authors also followed 2,303 vocational secondary graduates who enrolled in 2001-02 and were part of CUNY's College Now DE program. The study analyzed the impact of DE participation on students' subsequent enrollment and persistence in Florida's postsecondary institution and New York's CUNY. The study showed that for Florida, both CTE, and non-CTE students had a greater likelihood of persisting to another semester in college. The study also showed that DE participation had positive short-term and long-term outcomes in New York and that DE students had a greater likelihood of pursuing a 4-year degree than their non-DE peers.

The College Board (2011) presented findings from a five-state survey of 4-year colleges and universities. The report offered insights into the efforts of these schools to

improve success and persistence rates. The findings revealed that most institutions were engaged in retention efforts but allocated insufficient resources to enhance student success and increase persistence. The report also stated that although the schools regularly analyzed students' persistence rates and created retention committees, there were minimal organizational structures to manage retention efforts.

Struhl and Vargas (2012) completed a study of 32,908 high school graduates from Texas in 2004 who continued to college through June 2011. Half of the students were DE students and half were not. The study used a rigorous quasi-experimental design to compare students with similar academic and social characteristics except for DE participation. The study showed that DE participants were twice as likely to enroll and return for another year in college and almost twice as likely to complete a college degree. The findings on college persistence also showed that DE students "who completed at least one DE course while in high school were 1.79 to 2.07 times more likely to persist to the second year" (Struhl & Vargas, 2012, p. 12) than their non-DE peers.

D'Amico, Morgan, Robertson, and Rivers (2013) used a sample of 2,607 DE students enrolled from 2005-2008 who continued enrollment at a South Carolina technical college to determine which demographic and DE variables among former DE students who continued in a technical college were significant in predicting persistence from year one to year two in college. The study used multivariate and bivariate analysis to come up with three findings. The first result of the study was that there was no difference in persistence between students from economically distressed and non-distressed counties. The second result was that DE students who completed the career programs were more persistent than students who completed transfer courses. The third

result was that completion of DE courses on a college campus led to improved persistence upon entering college.

Review of Research Design

An (2013) examined the effect of DE on degree attainment by low socio-economic status students using statistics from the National Education Longitudinal Study of 1988 (NELS:88) and comparing data with the Beginning Postsecondary Students longitudinal study of 2004/09 (BPS:04:09). An found that DE participation had a positive influence on the attainment of a college degree, even after accounting for covariates that include other factors like student, family, and school achievements. An conducted a propensity score-matching model to analyze the effect of DE participation on degree attainment and assess the sensitivity of these results. An cautioned that the results of the sensitivity analysis would change based on the specifications of the matching model.

Cho and Karp (2013) determined if taking a student success course would influence the student's ability to accumulate credits on his or her first year in college and persist to another year. Cho and Karp used a sample of 23,822 archived student data records for a 2004 cohort in the Virginia community college system. Using this sample, Cho and Karp developed a logit regression model using standardized marginal effect coefficients and three short-term outcomes. The study found that there are positive relationships between participation in a student success course if taken in the first semester, credit completion, and persistence to another year. Another finding of the study is that the timing of the enrollment in a student success course made a difference.

Students enrolling in their first 15 credits had a 10% greater likelihood of persisting compared to 6% for those who enrolled in their first semester.

Speroni (2011b) examined selected graduating cohorts in Florida from 2000-01 and 2001-02. Speroni provided empirical evidence of the impact of DE on graduating from high school, enrollment in college, and completion of college using RD design. Florida has a mandate that requires DE participants to qualify with a minimum high-school GPA and a CPT minimum score (Fla. Stat. § 1007.271, 2012). Speroni used these requirements to examine the impact of enrolling in a DE course with the GPA requirement. Speroni also examined the CPT requirement for algebra. Speroni used a "sequential RD approach to determine whether any observed effect on outcomes experienced after college can be attributed solely to the DE experience" (Speroni, 2011b, p. 3). The findings suggest that DE programs may increase college enrollment and that the completion of a difficult subject like algebra may influence the value of the DE program. Speroni cautioned that the RD estimates pertain only to students on the margin of eligibility.

Gaps in the Literature

According to Bailey et al. (2007), studies on DE participation generally lack comprehensive data on K-16 systems. Most studies include narrow samples, primarily because of limited data. "Many studies do not address preexisting characteristics and self-selection and do not control for factors that may lead to student success in colleges, such as career goals, academic motivation, and differences in methods of instruction" (Allen, 2010, p. 15). This means that there is a possibility that positive findings may be caused by factors other than DE participation. Allen also stated that very few studies

have looked into the short-term effects of DE on the patterns in which courses are taken, graduation rates in high school, or GPA. The reason for this is the difficulty in controlling for crucial variables that affect the decision to participate in DE.

There is also a gap pertaining to the methods of analyzing data and the availability of national data. Adelman (2004, 2006) was the first to use the data from the NCES that tracked eighth-graders in 1988 who were expected to complete high school in 1992 and followed them until December 2000 (the NELS:88 dataset). The limitation of this work is that it did not use any advanced statistical method to control for student characteristics and behavior (Allen, 2010). Swanson (2008) used logistic regression on the same data to determine the impact of DE participation on student demographic attributes. One limitation of the NELS:88 data is that it is difficult to make conclusions about the effectiveness of the DE program today on the basis of data from students who graduated in 1992. An (2013) examined the effect of DE on college degree attainment of low socio-economic-status students using the same NELS:88 data and compared them with the data from the BPS:04:09. An cautioned that the sensitivity analysis results would change according to the specifications of the matching model.

Summary

Chapter 2 gave a survey of literature that included an examination of the theories, germinal work, historical perspectives, contemporary research, and research design on student participation in DE and its effect on college persistence. The literature review indicated a growing interest in understanding the effect of participation in DE on college persistence on the national level, as indicated by various studies. A discussion of the theories that affect DE participation and persistence was done, including the collaborative

leadership theory, the theory of institutional departure, and persistence theory and research. The chapter presented a historical overview of DE in Florida followed by a review of literature covering the variables that were studied, including student demographics, DE credits earned, GPA earned in DE courses, and algebra grades in a DE program. A review of studies on college persistence was also completed. A review of the research designs conducted on current studies was included to understand recent statistical methods used. Finally, a review of the gaps in existing literature was completed. Chapter 3 presents the research method and design used in the study.

Chapter 3: Research Methods

The purpose of this quantitative, correlational study was to determine what influence DE participation had on college persistence. The rationale for the interest in this topic was twofold. First, as the researcher is an educator involved with DE students, DE participation may affect "student achievement, institutional practice, and the role of higher education in improving K-12" (Hoffman, 2012, p. 5). Second, college persistence was chosen because of the increasing challenge in improving graduation rates (Cassidy et al., 2011) and the urgent desire of the government to improve postsecondary completion rates (Kanter, 2010).

This chapter presents the research method and design used in the study. The research questions and hypotheses are reiterated to show alignment with the selected method and design. The chapter includes a discussion of the population, quantitative sampling, geographic location, informed consent, confidentiality, validity, reliability, and data collection and analysis.

Research Method and Design Appropriateness

The quantitative, correlational method was used to determine the relationship between DE participation and college persistence. The quantitative method was used because the study examined numeric student data. The variables used in the study, such as DE credits, GPA, and algebra grades in a DE program, are specific and measurable. The quantitative, correlational method was appropriate because the research problem determined the relationships among the independent variables, DE participation, DE credits, GPA earned, and algebra, and the dependent variable, college persistence.

Research method. The quantitative research method identifies a problem for research according to the need to explain a reason for an occurrence, a trend, or a relationship among variables. The quantitative method presents questions and hypotheses for research that are numerical, precise, and quantifiable. Quantitative research also collects and analyzes numeric data from a large number of populations. The results from quantitative research can be generalized to the population (Christensen & Johnson, 2012). Quantitative research analyzes data using statistics and presents findings using tables and graphs to explain relationships among the variables.

Research design. A quantitative, correlational research design was used to identify how the variables are related. The study also used multiple regression analysis to determine if combined independent variables can predict outcomes of the dependent variables. Findings from the analysis of the data were used to create generalizations to the population.

The correlational research design for the study determined if there was a pattern between the dependent and independent variables. The research design included the collection of data, data analysis, and the presentation of findings. The research design also provided a measure of the degree of association, relation, or predictability between the variables using a statistical procedure. A good correlational study considers several factors including sufficient size of the sample, excellent presentations in illustrations and graphs, and an interpretation and assessment of the direction and magnitude of the relationships among variables. Other important factors considered were the choice of appropriate statistics and statistical procedures, identification of predictor and criterion variables, and an indication of expected direction of the relationships among variables.

Multiple regression analysis, which is also called multiple correlations, allowed various independent variables or predictor variables to make a forecast about a dependent variable or outcome variable. This study determined if the multiple independent variables DE participation, DE credits earned, GPA earned in DE courses, and algebra grades in a DE program can predict the dependent variable, college persistence. Although multiple regression may not determine cause-and-effect relationships, it may predict an outcome that allows the study to develop generalizations that may be applicable to other population.

The selection of the research design had a significant effect upon the study. The quantitative, correlational design with multiple regression analysis determined the relationship among the variables and predicted outcomes. The financial resources, time, and other resources required to procure data are all important determinants that can affect the type of method and design in a study.

Research Questions

The purpose of the quantitative, correlational study was to determine the influence DE participation had on college persistence. The research questions that were answered in this research follow:

RQ1: What relationship exists between DE participation and college persistence?

RQ2: What relationship exists between the number of DE credits earned and college persistence?

RQ3: What relationship exists between the GPA earned in DE courses and college persistence?

RQ4: What relationship exists between algebra grades in a DE program and college persistence?

RQ5: Given the variables of DE credits earned, the GPA earned in DE courses, and algebra grades in a DE program, which is the greatest predictor of college persistence?

These research questions guided the investigation of the relationship between DE participation and college persistence among DE students in a college in southeastern Florida. The research questions also identified trends and variables that showed how DE participation was related to college persistence.

Hypotheses

The following hypotheses included a null and an alternative hypothesis that were tested to identify the relationships among DE participation, DE credits earned, GPA earned in DE courses, algebra grades in a DE program, and college persistence:

$H_0$1: There is no significant correlation between DE participation and college persistence.

H_a1: There is a significant correlation between DE participation and college persistence.

$H_0$2: There is no significant correlation between DE credits earned and college persistence.

H_a2: There is a significant correlation between DE credits earned and college persistence.

$H_0$3: There is no significant correlation between GPA earned in DE courses and college persistence.

H_a3: There is a significant correlation between GPA earned in DE courses and college persistence.

H_04: There is no significant correlation between algebra grades in a DE program and college persistence.

H_a4: There is a significant correlation between algebra grades in a DE program and college persistence.

H_o5: Given the variables DE credits earned, GPA earned in DE courses, and algebra grades in a DE program, no variable can predict college persistence.

H_a5: Given the variables DE credits earned, GPA earned in DE courses, and algebra grades in a DE program, a variable or variables can predict college persistence.

Population

The population of the study was composed of 399 archived records of students in high school who participated in the DE program of a Florida state college from Fall 2010 until Fall 2012. The archived records included data from all its campuses. The archived student data records were available at the main campus.

Quantitative Sampling

A sample of 399 archived student data records was selected from a starting group of 2,663 DE and non-DE students enrolled in college from Fall 2010 until Fall 2012. The information used included demographic profile, DE participation, DE credits earned, GPA from DE courses, and algebra grades in a DE program. The records department of College A provided data with student identifiers. Comfrey and Lee (1992) suggested that

"the adequacy of sample size might be evaluated very roughly on the following scale: 50 – very poor; 100 – poor; 200 – fair; 300 – good; 500 – very good; 1000 or more – excellent" (p. 217).

Informed Consent

Informed consent may be described as the researcher informing the participants of all aspects of the project that may influence the participant's willingness to volunteer (Christensen, Johnson, & Turner, 2011). One measure to protect the rights of the participants was to obtain approval from the review boards that implemented the guidelines developed by the Food and Drug Administration. The study received an approval to conduct research under a "minimal risk" category from the Institutional Review Board (IRB) of College A on July 17, 2013. The study did not have any identifiable information that could be linked to any student because the data were coded by the records department. The study did not require informed consent from the participating DE students because it was classified as "exempt from further IRB review due to research entailing no more than 'minimal risk' and falls under the following category: research conducted in established or commonly accepted educational settings, involving normal educational practices" (U.S. Department of Health and Human Services, 2009, § 46.101(b)). The records department provided the archived student records with no identifiable link to the student to protect privacy and anonymity.

Confidentiality

Ethical research requires that the privacy of the participants is respected (Christensen & Johnson, 2012). Confidentiality is the "ethical protection for those who are studied by holding research data in confidence or keeping them secret from the

public" (Neuman, 2010, p. 139). The privacy of participants was protected by maintaining confidentiality and anonymity of information. Confidentiality means that the researcher did not release information in a way that links specific individuals or participants to responses. Confidentiality also means that information was presented publicly in aggregate form, like percentages or means, without any link to specific individuals. Anonymity means that the researchers did not disclose the identity of the participants. The research did not have any identifiable information linked to the students as the information was coded by the records department using student identifiers.

Confidentiality also refers to the proper handling of information from participants to ensure respect of their privacy. The study collected data without identifiable information. Data were stored in a computer protected by a password and were accessible only by the researcher. Hard copies of data were kept under lock and key at the researcher's place of residence. Data will be maintained for three years on the computer and hard copies. At the end of three years, data stored in the computer will be deleted and hard copies will be shredded.

Geographic Location

The study used the archived records of students in a state college on the Treasure Coast of Florida, also referred to as College A. It is in St. Lucie County, which is a suburban and rural school district serving families in southern Florida. College A is a comprehensive educational provider with an enrollment of about 32,000 students per year.

Data Collection

The study received approval to conduct research under a "minimal risk" category from College A's IRB on July 17, 2013. The study had no identifiable information that could be linked to any student in this study because the data were coded by the records department. The records department provided archival data of students in high school who were enrolled in the DE program from Fall 2010 to Fall 2012. The archival student data included information on demographic profile, DE credits earned, GPA earned in DE courses, algebra grades in a DE program, and college persistence. The researcher received University of Phoenix IRB approval before data collection commenced.

The study examined the archival student data to determine any relationship between the predictor and outcome variables. The study also examined the degree to which the independent variable predicted the dependent variable. The data collected in this study are cross-sectional, which means that the data on multiple variables were collected once. The data on the demographics were used to create a demographic profile of the students. The coding scheme for the variables was developed to fit multiple regression analysis through the Statistical Package for Social Science (SPSS).

College persistence was the dependent or outcome variable. College persistence was defined operationally as the total number of semesters that DE students remained enrolled from Fall 2010 to Fall 2012. The number of semesters was measured on an interval scale for multiple regression analysis. The college persistence variable could range from 1 (Fall 2010) to 5 (Fall 2010, Spring and Fall 2011, Spring and Fall 2012) total semesters. Since many students did not take courses during the summer sessions,

these were not included in the analysis. Data from students who did not enroll between Fall 2010 and Fall 2012 were excluded from the study.

The independent variables, DE credits earned, GPA earned in DE courses, and algebra grades in a DE program, were measured on interval scales. The number of DE credits earned from Fall 2010 to Fall 2012 was totaled. For instance, a student who enrolled in only one 3-credit-hour DE course in the study's timeframe would have a total of three DE credits earned. Likewise, a student who took two 3-credit-hour DE courses from Fall 2010 to Fall 2012 would have a total of six DE credits earned. GPA earned in DE courses, which was computed by College A, was based on the standard 4-point grading scale used by most colleges: A = 4 points, B = 3 points, C = 2 points, D = 1 point, and F or W = 0 points. The coding scheme for algebra grades was similar (A = 4 points, B = 3 points, C = 2 points, and D = 1 point). Students who withdrew or failed the algebra courses were not included in the study. Once the dataset was established, cross tabulation was performed to generate descriptive statistics to determine patterns and trends. Multiple regression analysis was applied to examine relationships among the variables and to measure the influence of the dependent variable on the independent variables.

Validity and Reliability

An instrument that measures the variables in a study should be valid and reliable. Christensen et al. (2011) stated that "validity is the accuracy of inferences, interpretation, or actions" (p. 507). The different categories of validity are "statistical conclusion validity, construct validity, internal validity, and external validity" (Christensen et al., 2011, p. 169). Statistical conclusion validity is the appropriate use of statistics while the

validity of inferences about variables is called construct validity. Internal validity "refers to the validity of inferences drawn" while "external validity refers to validity of cause-and-effect relationship being generalizable to other persons, settings, variables, and measures" (Creswell, 2012, p. 303).

Internal validity has several categories of threats. The first category is a threat that relates to characteristics of the participants of the study. The second category is a threat that pertains to treatments that are used in the study. The third category is a threat that happens while an experiment is conducted and pertains to the procedures of the study that include instrumentation and testing. Internal validity did not apply to the study, because the data used were archived student records.

The external validity threats "are problems that threaten ability to draw correct inferences from the sample data to other persons, settings, variables, and measures" (Creswell, 2012, p. 306). There are three threats that may affect the ability to generalize inferences. The first threat refers to the interaction of treatment and selection. This means that findings may not be generalizable beyond the group in the study to different demographics, including age, gender, race, location, or personality groups. The solution to this threat was to increase generalizability by having a diverse population. The second threat to external validity is the interaction of treatment and setting. This threat happens when there is an inability to generalize from the setting in which the study was conducted to another setting. The solution to this threat was for the researcher to prepare an analysis of the impact of a treatment for different types of settings. The third threat is interaction of treatment and history. This threat arises when the findings are generalized to past or future situations. A solution to this is to create a similar study later. External validity

threats applied to the study, as the sample selected had limitations on the nature of the school, being a state college. Findings from this study apply to schools and states with similar demographic and characteristics to College A.

Reliability means that "scores from an instrument are stable and consistent" (Creswell, 2012, p. 159). A researcher is "limited by the reliability of the measurement instruments and by the reliability with which he or she uses them" (Drost, 2011, p. 107). The forms of reliability are test-retest reliability, alternate forms reliability, inter-rater reliability, and internal consistency reliability. This study did not use surveys, questionnaires, interviews, or tests. The records department provided the data from archived records of DE students who participated in the DE program from Fall 2010 to Fall 2012.

Data Analysis

The purpose of this quantitative, correlational study was to determine relationships and predictability among variables using multiple regression analysis. The SPSS software was used to conduct an analysis of the student archival data. The research questions and hypotheses were designed to determine the relationship between the independent variables, namely DE participation, DE credits earned, GPA earned in DE courses, and algebra grades in a DE program, and the dependent variable, college persistence.

Preliminary analysis included a frequency distribution of demographic characteristics like gender and age to provide a profile of the DE student. Cross tabulation was also used to examine the relationship between the variables. Cross tabulation is a command available in SPSS and it provided an overview of data.

The study used descriptive statistics to evaluate the general trends and patterns in the data. Multiple regression analysis determined the relationship among variables and measured the influence between the independent variables, DE credits earned, GPA earned in DE courses, and algebra grades in a DE program, and the dependent variable, college persistence. The multiple regression equation is similar to the regression equation but includes additional predictors. The Pearson r correlation coefficient was used to determine the strength of the variables (Steinberg, 2011). The standardized beta scores were used to determine the degree of prediction for a variable after taking out the effects of all other predictors (Steinberg, 2011).

Summary

A discussion of the quantitative research method and the correlational research design and its appropriateness to the study was the starting point in this chapter. Multiple regression analysis was used as a method of analyzing the data. The chapter included the research questions and hypotheses as well as a discussion of the population, quantitative sampling, geographic location, informed consent and confidentiality, data collection, validity, and reliability.

The purpose of the quantitative, correlational study was to examine the relationships among the independent variables DE participation, DE credits earned, GPA earned in DE courses, and algebra grades in a DE program and the dependent variable, college persistence. A profile of the demographic characteristics of DE students was presented. Finally, the study provided insight into which variable had the most predictability of college persistence. Chapter 4 covers a discussion of the findings, including a review of the research questions and hypotheses.

Chapter 4: Results

The purpose of this quantitative study with a correlational design was to determine the influence that DE participation had on college persistence and to determine which variable was the greatest predictor of college persistence. College persistence was defined operationally as the total number of semesters that DE students remained enrolled from Fall 2010 to Fall 2012. The number of semesters was measured on an interval scale for multiple regression analysis. This chapter covers the findings of the study, starting with a description of the sample, demographic analysis, descriptive statistics, correlational analysis of the five research questions, and a summary of the results.

Sample

A sample of 399 archived student data records was selected from a total population of 2,664 DE and non-DE students enrolled in college from Fall 2010 to Fall 2012. The archived records included data from the campuses of a Florida state college, College A. The information was provided by the records department of the college, using coded student identifiers.

Size. There were 399 archived student data records of DE students and 2,265 archived student data records of non-DE students. Table 1 shows the frequency distributions of participants and non-participants in the DE program.

Table 1

Frequency Distribution of DE Participants and Non-DE Participants

Dual enrollment	Frequency	Percentage
Yes	399	15%
No	2,265	85%
Total	2,664	100%

In December 2013, College A provided archived student data records for DE and non-DE students enrolled in the campuses of the college from Fall 2010 to Fall 2012. The data included information on the demographic profile of students, DE participation, number of DE credits earned, GPA from DE courses, and algebra grades of DE and non-DE students. Table 1 shows that the total of the archived records was 2,664, of which 399 or 15% were DE-enrolled students while 2,265 or 85% were non-DE-enrolled students. The sample used for this study was the 399 DE archived records (N = 399).

Demographics

The demographics included DE students' data on gender and age. Student classification according to need-based financial aid and scholarship were also provided.

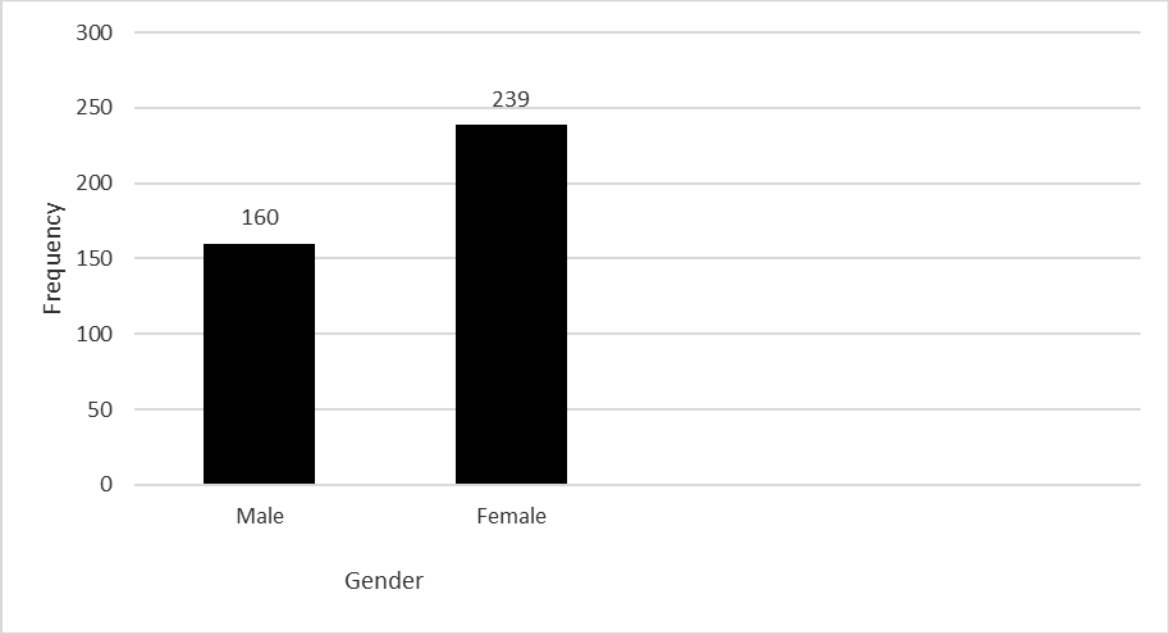

Figure 1: Frequency of participants' gender.

Gender. Figure 1 shows the frequency distribution of the participants' gender. There were 239 female students or 60% and 160 male students or 40%.

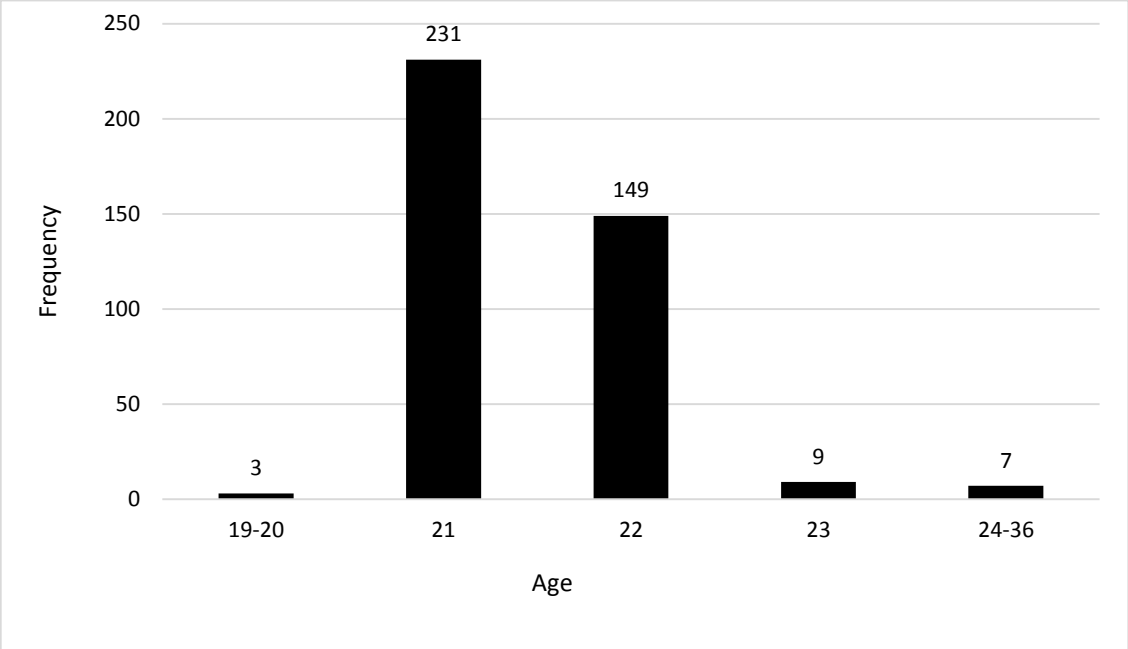

Figure 2: Frequency of participants' age.

Age. Figure 2 shows the frequency of the age distribution of the participants. Among the 399 participants, three students (less than 1%) were between the ages of 19 and 20 while 231 students (58%) were 21 years old and 149 students (37%) were 22 years old, nine students (3%) were 23 years old, and seven students (2%) were between the ages of 24 and 36.

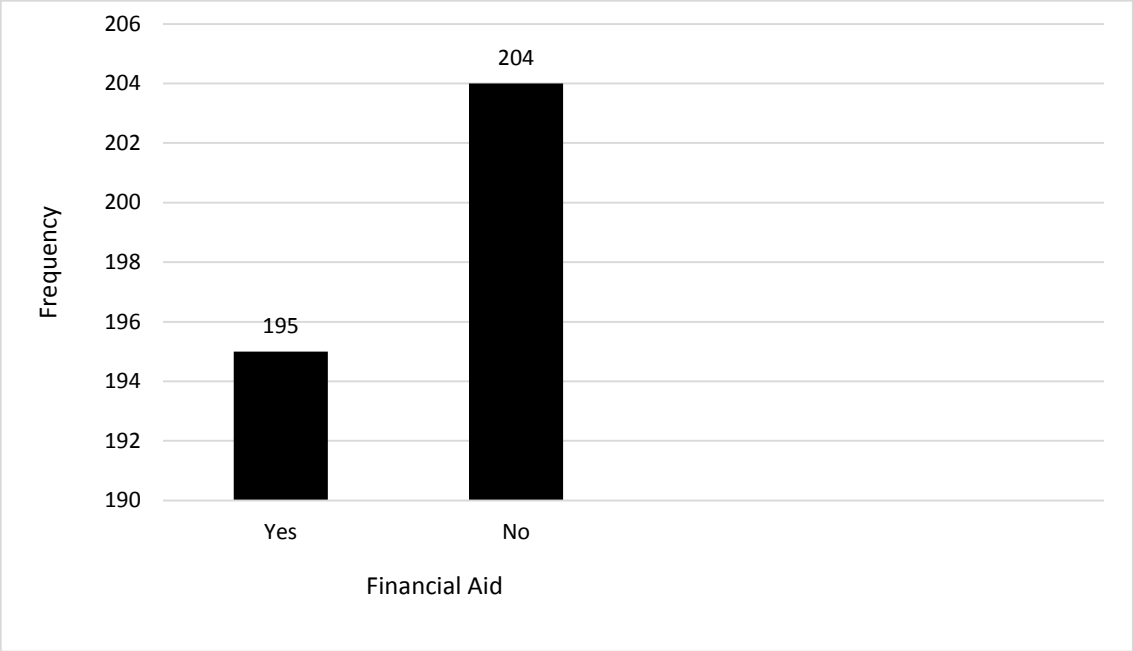

Figure 3: Frequency of financial aid recipients.

Financial aid. Figure 3 shows the frequency of financial aid received by DE students. The participants were classified to indicate whether they received any type of need-based financial aid during the period from Fall 2010 through Fall 2012. The frequency distribution of participants who received need-based financial aid showed that 195 students, or 49%, received some form of scholarship while 204 students, or 51%, did not receive any form of scholarship.

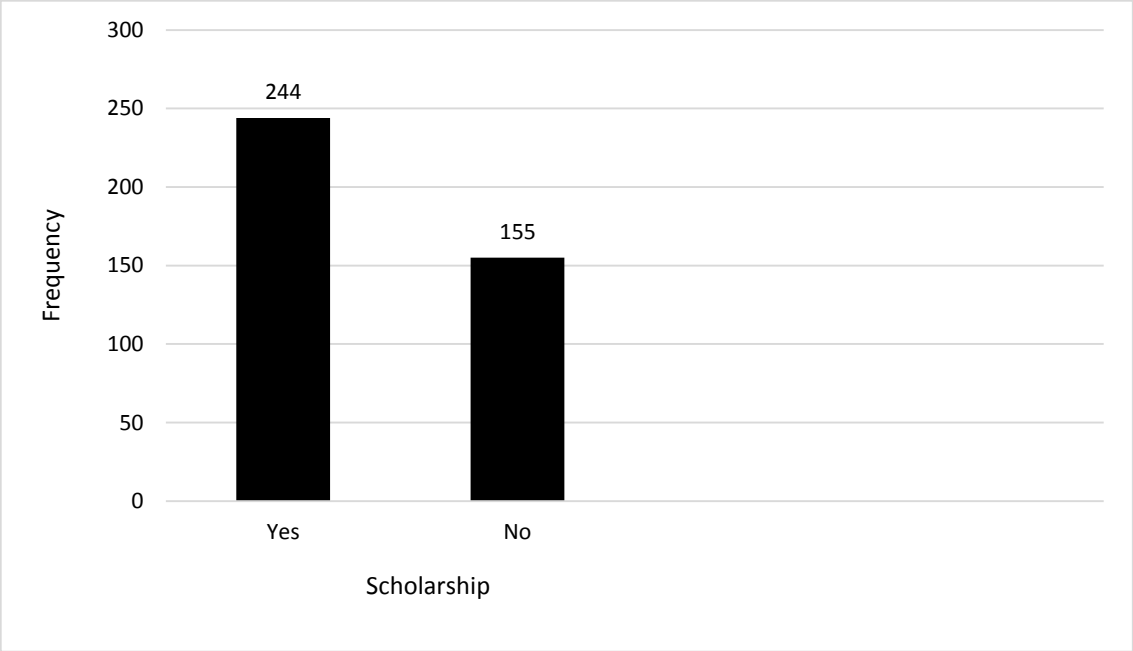

Figure 4: Frequency of scholarship recipients.

Scholarship. Students were classified to indicate whether they received scholarship during the period Fall 2010 through Fall 2012. Figure 4 shows the frequency distribution of participants who received a scholarship. Among the participants, 244 students, or 61%, received some form of scholarship while 155, or 39%, did not receive any form of scholarship.

Descriptive Statistics

The archival student data was examined to determine the relationship between the dependent and independent variables. College persistence was the dependent variable. College persistence was defined as the total number of semesters that DE students remained enrolled from Fall 2010 to Fall 2012. DE credits earned, GPA earned in DE courses, and algebra grades in a DE program were the independent variables and were

measured on interval scales. Table 2 shows the descriptive statistics for the main variables for DE students.

Table 2

Descriptive Statistics for Main Variables for DE students

Main Variable	*N*	*M*	*SD*	*Skew*	*Minimum*	*Maximum*
Dual enrollment credits	393	39.90	16.35	-0.06	3	75
Grade point average	388	2.73	0.78	-0.55	0.21	4
Algebra grade	140	3.21	1.18	-0.41	1	5
Total semesters enrolled	399	3.66	1.31	-0.54	1	5

The descriptive statistics showed the general trends and patterns in the data. As shown in Table 2, the DE students had an average of 39.90 DE credits earned (*SD* = 16.35) from Fall 2010 to Fall 2012. The DE students had a GPA average of 2.73 (*SD* = 0.78). The average algebra grade was 3.21 (*SD* = 1.18). The average total semesters enrolled for the DE students was 3.66 (*SD* = 1.31). The data on the DE credits earned, GPA, algebra grade, and total semesters enrolled had a skew of less than one and were all normally distributed. The data were suitable for inferential statistics.

Correlational Analysis

RQ 1 – DE participation and college persistence. The first research question in this study follows:

What relationship exists between DE participation and college persistence?

The first set of hypotheses in this study was as follows:

$H_0$1: There is no significant correlation between DE participation and college persistence.

H_a1: There is a significant correlation between DE participation and college persistence.

There was a significant correlation between DE participation and college persistence ($r(2662) = .13$, $p = .00$). The positive Pearson correlation of $r(2662) = .13$ means that there is a direct relationship between DE participation and college persistence. This also means that when participation in the dual enrollment program was high, college persistence also tended to be high. When participation in the DE program was low, college persistence also tended to be low. The probability of .00 means that the relationship between DE participation and college persistence is significant. The effect size of the Pearson correlation, $r(2662) = 0.13$ means that the correlation between DE participation and college persistence was significant but small. Based on this, the null hypothesis was rejected and the alternative hypothesis was supported.

An analysis of variance (ANOVA) determined the average persistence of the DE students and the non-DE students. The ANOVA similarly found a significant difference ($F = 43.97$, $p = .00$) between DE and non-DE students' college persistence. The mean college persistence score of non-DE students ($N = 2{,}265$) was 3.12 semesters ($SD = 1.52$). In contrast, DE students ($N = 399$) had an average persistence score of 3.66 ($SD = 1.31$).

RQ 2 – DE credits earned and college persistence. The second research question in this study follows:

What relationship exists between the number of credits earned and college persistence?

The second set of hypotheses in this study was as follows:

$H_0$2: There is no significant correlation between DE credits earned and college persistence.

H_a2: There is a significant correlation between DE credits earned and college persistence.

Table 3 shows that there was a highly significant correlation between a student's DE credits and his or her college persistence ($r(391) = .81$, $p = .00$). Students with a high number of DE credits tended to stay in college longer, while students with fewer DE credits did not persist as long. The effect size of the correlation was large. The positive Pearson correlation of $r(391) = .81$ means that there is a direct relationship between DE credits earned and college persistence. This also means that when DE credits earned were high, college persistence also tended to be high. When DE credits earned were low, college persistence also tended to be low. The probability of .00 means that the direct relationship between DE credits earned and college persistence is significant. The effect size of the Pearson correlation, $r(391) = 0.81$ means that the correlation between DE credits earned and college persistence was large. Based on this, the null hypothesis was rejected and the alternative hypothesis was supported.

Table 3

Correlation Between DE Credits Earned, GPA, and Algebra Grades and College Persistence

Predictor variables	*N*	*r*	*p*
Dual enrollment credits earned	393	.81	.00
Grade point average	388	.01	.89
Algebra grades in dual enrollment	140	.09	.30

RQ 3 – GPA and college persistence. The third research question in this study follows:

What relationship exists between the GPA earned in DE courses and college persistence?

The third set of hypotheses in this study was as follows:

$H_0$3: There is no significant correlation between GPA earned in DE courses and college persistence.

H_a3: There is a significant correlation between GPA earned in DE courses and college persistence.

Table 3 shows that there was no significant correlation between GPA earned in DE courses and college persistence ($r(386) = .01$, $p = .89$). Students with high GPAs were not more persistent than students with low GPAs. The positive Pearson correlation of $r(386) = .01$ means that there is a direct relationship between GPA earned in DE courses and college persistence. The probability of .89 means that the direct relationship between GPA earned and college persistence is not significant. The effect size of the Pearson correlation, $r(386) = .01$ means that the correlation between GPA earned in DE

courses and college persistence was small. Based on this, the null hypothesis was accepted and the alternative hypothesis was rejected.

RQ 4 – Algebra grades and college persistence. The fourth research question in this study follows:

What relationship exists between algebra grades in a DE program and college persistence?

The fourth set of hypotheses in this study was as follows:

$H_0$4: There is no significant correlation between algebra grades in a DE program and college persistence.

H_a4: There is a significant correlation between algebra grades in a DE program and college persistence.

Table 3 shows that there was no significant correlation between algebra grades and college persistence ($r(138) = .09$, $p = .30$). Students with high algebra grades were not more persistent than students with low algebra grades. The positive Pearson correlation of $r(138) = .09$ means that there is a direct relationship between algebra grades in a DE program and college persistence. The probability of .30 means that the direct relationship between GPA earned and college persistence is not significant. The effect size of the Pearson correlation, $r(138) = .09$ means that the correlation between algebra grades and college persistence was small. Based on this, the null hypothesis was accepted and the alternative hypothesis was rejected.

RQ 5 – Predictor variables and college persistence. The fifth research question in this study follows:

Given the variables of DE credits earned, GPA earned in DE courses, and algebra grades in a DE program, what is the greatest predictor of college persistence?

The fifth set of hypotheses in this study was as follows:

H_o5: Given the variables of DE credits earned, GPA earned in DE courses, and algebra grades in a DE program, no variable can predict college persistence.

H_a5: Given the variables of DE credits earned, GPA earned in DE courses, and algebra grades in a DE program, a variable, or variables can predict college persistence.

Table 4

Regression Analysis of Predictors of College Persistence

Predictor variables	Unstandardized coefficients		Standardized coefficients	*t*	*p*
	β	SE	β		
Constant	1.62	0.26		6.14	.00
Dual enrollment credits	0.06	0.00	0.84	16.27	.00
GPA	-0.07	0.09	-0.05	-0.79	.43
Algebra grade	-0.09	0.06	-0.09	-1.49	.14

The best and only predictor of college persistence is DE credits earned. Multiple regression indicated that the study's three predictor variables were able to predict significant changes in college persistence (Adjusted $R^2 = .66$, $p = .00$). However, as shown in Table 4, dual enrollment credits earned was the only statistically significant

predictor of college persistence (β = 0.84, t = 16.27, p = .00). GPA (β = -0.05, t = -0.79, p = .43) and algebra grades (β = -0.09, t = -1.49, p = .14) were not significant predictors of college persistence. The alternative hypotheses were supported.

Summary

Chapter 4 included the findings from the study, a review of the data, analysis, and results. The demographic profile of the students, including the gender, age, need-based financial aid, and scholarship, were also provided. The five research questions and hypotheses were examined to determine the relation between DE participation, DE credits earned, GPA earned in DE courses, algebra grades in a DE program, and college persistence. The data from RQ 1 indicated a highly significant correlation between DE participation and college persistence; the effect size of the correlation, however, was small. The data from RQ 2 indicated a highly significant correlation between a student's DE credits earned and college persistence, with a large effect size of correlation. The data from RQ 3 indicated that there was no significant correlation between GPA earned and college persistence. The data from RQ 4 indicated that there was no significant correlation between algebra grades and college persistence. Finally, the data from RQ 5 indicated that the best and only predictor of college persistence was DE credits earned. Chapter 5 provides implications and conclusions of the results, a discussion of the assumptions and limitations of the study, and recommendations for leadership and future research.

Chapter 5: Conclusions and Recommendations

The purpose of this quantitative study with a correlational design was to determine the influence that DE participation had on college persistence and to determine which variable was the greatest predictor of college persistence. The correlation of these variables was determined with the use of archived DE student records and multiple regression analysis. College persistence was defined as the total number of semesters that DE students remained enrolled from Fall 2010 to Fall 2012 in a state college in southeastern Florida. The number of semesters was measured on an interval scale for multiple regression analysis. DE participation has positive effects on college enrollment, attainment, and completion (An, 2013; Speroni, 2011a). DE participation is positively related to college persistence, higher GPA, and more credits earned (Hughes, 2012). DE may be used as a strategy to improve college readiness and success (Hughes, 2012; Struhl & Vargas, 2012).

Chapter 5 presents implications and conclusions based on the five research questions that guided this study, followed by a discussion of the limitations of the study and recommendations for leadership and future research.

Results and Conclusions by Research Questions

Research questions were developed to examine (a) if there was a relationship between DE participation and college persistence, (b) if there was a relationship between the number of DE credits earned and college persistence, (c) if there was a relationship between the GPA earned in DE courses and college persistence, (d) if there was a relationship between algebra grades and college persistence, and (e) which variable,

among DE credits earned, GPA earned in DE courses, and algebra grades, is the greatest predictor of college persistence.

Research Question 1. The first research question, "What relationship exists between DE participation and college persistence?" was answered by using Pearson's correlation coefficient to test for a relationship between the independent variable, DE participation, and the dependent variable, college persistence. The conclusion was that there was a significant but small correlation between DE participation and college persistence. This conclusion aligns with prior studies where researchers determined that DE participation was related to college persistence (Bailey et al., 2007; College Board, 2011; Hughes, 2012; Speroni, 2011a; Struhl & Vargas, 2012). Bailey et al. (2007) found that there is greater likelihood for CTE and non-CTE students to persist to a second semester in college and to continue with a four-year degree. The College Board (2011) found that insufficient resources were allocated to improve persistence. On the other hand, Speroni (2011b) found, using student data from 2000-2002 in Florida, that there was no evidence that participation in DE increases the likelihood that students will graduate.

An ANOVA was performed and showed that there was a significant difference between the college persistence of DE and non-DE students. DE students had a mean college persistence score higher than non-DE students. This result aligns with Struhl and Vargas (2012), Speroni (2011a), Belfield, Hughes, et al. (2012), and Cowan and Goldhaber (2013), who found that DE students had a greater likelihood of enrolling in college and persisting than their non-DE peers.

Research Question 2. The second research question, "What relationship exists between the number of DE credits earned and college persistence?" was answered by using Pearson's correlation coefficient to test for a relationship between the independent variable, DE credits earned, and the dependent variable, college persistence. The conclusion was that there was a highly significant correlation between a student's DE credits earned and his or her college persistence. This conclusion aligns with prior studies where researchers determined that DE credits earned was positively related to DE participation (Belfield, Hughes, et al., 2012; Cowan & Goldhaber, 2013; Michalowski, 2007; Swanson, 2008).

Michalowski (2007) found that students in associate degree programs earned more college credits in their first year, on average, than non-DE students. DE students who were enrolled in 4-year degree programs also earned more credits than their non-DE peers (Michalowski, 2007). One reason for this may be that the DE program helped students to prepare better for college or to earn more credits. Swanson (2008) found that there is 28% greater likelihood that DE students who have earned 20 or more credits in their first year in college will persist another year than their non-DE participation counterparts. One of the reasons for this is that DE participation and credit accumulation may create a nest egg effect among students, which enables them to remain in college (Swanson, 2008).

Cowan and Goldhaber (2013) tracked students in Washington State and found that there was a 15% greater likelihood to earn a 2-year degree or enter college for students with 76 or more credits. They also found that students who are closer to earning an associate's degree will continue in a college that offers a 2-year degree rather than a 4-

year college (Cowan & Goldhaber, 2013). Belfield, Hughes, et al. (2012) found that DE students in the CCI accumulated more college credits that increased over time than their comparison group. They also found that CCI DE students had greater likelihood of earning 20% more credits after 2 years in college than their peers from the same district (Belfield, Hughes, et al., 2012).

Research Question 3. The third research question, "What relationship exists between the GPA earned in DE courses and college persistence?" was answered by using Pearson's correlation coefficient to test for a relationship between the independent variable, GPA earned in DE courses, and the dependent variable, college persistence. The conclusion was that there was no significant correlation between GPA earned in DE courses and college persistence. Prior studies were comparative and had mixed findings on GPA (Allen & Dadgar, 2011; Bailey et al., 2007; Belfield, Hughes, et al., 2012).

Belfield, Hughes, et al. (2012) stated that GPAs of 2008-2009 DE students were slightly higher than their district peers, but this result did not hold for 2009-2010 dual enrollees. The findings showed that DE courses have no significant effect on participating students' GPAs. Bailey et al. (2007) found that Florida DE students had higher GPAs than their non-DE peers and had higher cumulative GPAs, three years from graduation. Allen and Dadgar (2011) found that DE participation is related to improved college GPA. There have been no studies relating GPA earned in DE courses and college persistence.

Research Question 4. The fourth research question, "What relationship exists between algebra grades in DE courses and college persistence?" was answered by using Pearson's correlation coefficient to test for a relationship between the independent

variable, algebra grades in DE courses, and the dependent variable, college persistence. The conclusion was that there was no significant correlation between algebra grades and college persistence. This conclusion is not aligned with prior studies, where researchers determined that algebra grades were positively related to college completion (Adelman, 2006; Speroni, 2011a).

Speroni (2011a) found that when college students take algebra, there is an increase in the likelihood of enrolling and completing a college degree. A possible reason for this is that the more rigorous curriculum provides better preparation for college. FLDOE (2010) compared grades of DE and non-DE students and stated that the former had a greater likelihood of earning a grade of C or better than the latter in algebra and composition courses. Adelman (2006) found that a student's completion of a higher level of math above Algebra 2 provides momentum toward a 4-year degree and greater attainment rates. Attainment rates of bachelor's degrees decreased at every level below Algebra 2 completion.

Research Question 5. The fifth research question, "Given the variables of DE credits earned, GPA earned in DE courses, and algebra grades in a DE program, which is the greatest predictor of college persistence?" was answered by using multiple regression analysis to evaluate which among the three predictor variables were able to predict changes in college persistence significantly. The conclusion was that the best and only statistically significant predictor of college persistence is DE credits earned. This conclusion aligned with prior studies, where researchers determined that DE participation is positively related to improved likelihood of degree completion (An, 2013; Struhl & Vargas, 2012). Bailey et al. (2007) also found that for Florida, both CTE and non-CTE

students had a greater likelihood of continuing to another semester while DE participants in New York had a greater likelihood of pursuing a 4-year degree than non-DE students. There are no studies determining whether DE credits can predict college persistence.

Limitations and Delimitations

The scope of the study was restricted by the participants who were DE students in a southeastern Florida college from Fall 2010 until Fall 2012. One of the limitations of this study was that the semesters covered were only from Fall 2010 until Fall 2012, excluding the summer sessions within this time frame. Another limitation was that the results of this research may be generalizable only to colleges in Florida or other states that may have similar demographics and characteristics to College A.

One delimitation of the study was that the archived student record data only covered the period from Fall 2010 until Fall 2012 in College A. Another delimitation of the study was that there is a possibility that a confounding variable such as socio-economic status may affect the study outcome. This extraneous variable may be statistically related to the independent variable and may affect the results of the study. Another delimitation of the study was that interpretations and analysis were completed according to the theoretical framework used. Other alternative theoretical frameworks might have given the results of the study a different interpretation.

The effect of demographic data on college persistence was not considered in the study. Data on gender, age, race, scholarship, and financial aid were briefly reviewed, but the demographics were not examined in terms of their relationship with DE participation or college persistence. Speroni (2011b) indicated a similarity in the gender composition of AP and DE students, where DE serves fewer Black and Hispanic students

(19%) than AP. Both DE and AP programs attract students from relatively similar, more affluent socioeconomic backgrounds. Bailey et al. (2007) stated that Florida DE students had a greater likelihood of being female and white, were less likely to be eligible for free lunch, and were more advantaged in terms of academic and demographic attributes.

Implications

The growing interest in DE as a strategy to propel students towards college persistence and degree completion has been included in the literature (An, 2013; Cowan & Goldhaber, 2013; Speroni, 2011b; Struhl & Vargas, 2012; Swanson, 2008). Research showed relationships between DE participation and increased high-school graduation (Belfield, Hughes, et al., 2012; Cowan & Goldhaber, 2013; Karp et al., 2007). Some other results showed that DE participation had a relationship to the likelihood of enrolling in college (Belfield, Edwards, 2012; Cowan & Goldhaber, 2013; Speroni, 2011a). The results from this study showed a similarity to previous literature that reported that although there was a highly significant correlation between DE participation and college persistence, the effect size of the correlation was small (Speroni, 2011b).

This study examined the relationship between college persistence of DE students and DE participation, GPA, DE credits, and algebra grades. Previous studies have related DE participation with these variables, but the relationship between college persistence and GPA, DE credits, and algebra grades was not investigated. Previous literature has indicated that DE participation was related to improved GPA (Adelman, 2006; Belfield, Hughes, et al., 2012; FLDOE, 2010; Speroni, 2011b). Although the literature indicated that DE students had greater likelihood of persisting to another semester (Allen & Dadgar, 2011; Bailey et al., 2007), there were no findings relating GPA with college

persistence. This study found that there was no significant correlation between college GPA and college persistence. Two possible reasons for this can be given. In Florida, high school GPA is a requirement to participate in the DE program. Once a student is accepted in the program, the passing grade in a class and not the GPA becomes the requirement for graduation. Thus, as long as a student passes his or her college courses, GPA is not a crucial factor and a reason for college persistence. This may be different for students who intend to enroll in universities in the state or out of state, where GPA is a factor for eligibility or acceptance. The second reason is lack of incentive to persevere to obtain a higher GPA. Since there is an open enrollment policy in Florida universities, the free college courses from DE are more important than the GPA obtained from the courses, especially for DE students who do not plan to pursue a 4-year degree.

Past literature has shown a positive relationship between algebra grades and college completion (Adelman, 2006; FLDOE, 2010; Speroni, 2011a) and that completion of a higher level of math above Algebra 2 provided momentum toward a bachelor's degree and higher college attainment rate. There is no prior research claiming that the grade in a college algebra course will predict persistence; rather, research indicated that passing the course may be a predictor that DE students will get higher grades than non-DE students. Previous literature also relied on a different set of samples that considered high school GPA. Contrary to the literature, this study did not use a GPA eligibility cutoff criterion and covered all students enrolled between the period Fall 2010 and Fall 2012. This study found that there was no significant correlation between algebra grades and college persistence. Although algebra grade provided a step closer to completion of a degree and was considered a rigorous course, the findings from the study showed that

students with high algebra grades were not more persistent than students with low algebra grades and although algebra grades may predict bachelor's degree completion, it does not predict student persistence into the next semester.

This study found that there was a highly significant correlation between a student's DE credits earned and college persistence. The review of literature indicated a positive relationship between credit accrual and DE participation (Bailey et al., 2012; Cowan & Goldhaber, 2013; Speroni, 2011a), but there is limited literature investigating the relationship between DE credits earned and college persistence. The literature indicated that DE students with 76 or more credits had a 15% greater likelihood of earning an associate's degree, enrolling in college after high school, and accumulating more credits (Belfield, Hughes, et al., 2012; Cowan & Goldhaber, 2013). One possible reason for this is that credit accumulation brings the student closer to completion of a college degree. This result is aligned with Tinto's (1988) theory of institutional departure from higher education, which stated that a student's integration into a college's academic or social environment relates to his or her institutional commitment and increases the student's college persistence.

This study also found that among the selected variables of GPA, DE credits earned, and algebra grades earned, the best and only variable that can significantly predict changes in college persistence is DE credits earned. There is limited literature indicating that possible predictors of college access and success are AP or DE participation (Speroni, 2011a). There are no studies determining whether DE credits can predict college persistence. The results of the study by D'Amico et al. (2013) indicated that there are no differences between persistence among students from economically

distressed or non-distressed counties. The study also indicated that students who completed career programs through DE had a greater likelihood of persisting than students who completed transfer courses. D'Amico et al. also suggested that the completion of DE courses on a college campus improves persistence once entering college.

The results of this study indicated that the best and only variable that can predict changes in college persistence is DE credits earned. This finding is important because it emphasizes the importance of DE as a strategy to improve college persistence, retention, and completion. Credit accumulation through DE encourages students to persist to complete a 2-year degree or continue to a bachelor's degree. DE participation provides the college experience and better prepares the students for obtaining a degree. This finding is also important because it reiterates the need for policymakers and school administrators to engage in retention efforts by increasing the resources allocated to enhancing student success and increased persistence. This can be done by changes in organizational structures that can manage and improve retention efforts. Since DE is available to low-income students who may never have a chance to earn college credits or pursue higher education, then DE may be their only chance.

Recommendations for Leaders

Policymakers are constantly faced with the challenge of improving college retention, persistence, and completion. DE is an important concern for policymakers and educators because of the possibility that DE can promote positive outcomes for participating students (Adelman, 1999; E. Hoffman, 2012; E. Hoffman & Voloch, 2012). DE can also reduce dropout rates, improve the rigor of the curriculum in the secondary

education sector, and accelerate college completion time. DE can provide additional training for students entering the workforce after high school. Considering the potential benefits from DE and recognizing how credit accumulation may affect the student's decision to persist to college completion, the following are recommendations for leaders:

1. Strengthen coordination efforts between the state, local school districts, and colleges to expand DE opportunities especially for low-income students.
2. Regularly evaluate and assess how the courses required by the DE program are aligned with the needs of the community and local businesses that will provide employment to DE graduates. Expand existing DE courses to include additional courses that are needed by the community and the local businesses.
3. More opportunities should be provided to high-school teachers who are willing to complete the eligibility requirements to teach college-level courses. The availability of more certified instructors may improve the coverage of DE courses.
4. Financial resources should be allocated to practices that will increase enrollment in DE courses. For example, financial incentives to motivate enrollment in the program can be provided to high-school teachers for encouraging high-school students to participate in the program. While other programs like Advanced Placement provide some financial incentives to high school teachers in Florida, there are no financial incentives provided for high school teachers who teach the DE program.
5. Colleges should provide more information sessions for parents and high-school students to explain the benefits of DE participation.

6. Tutorial services and various instructional supportive services should be made available to assist DE students, especially those who are close to completion of a degree or certificate. Advisory support should also be accessible.

Recommendations for Future Research

Future study is recommended to investigate further how DE and non-DE students compare in terms of the relationship between the variables GPA, DE credits earned, algebra grades, and college persistence. The inclusion of a longer period of time than Fall 2010 to Fall 2012 will improve the scope of the study and provide insight on the degree completion of the students. A study can be replicated with a different cohort in Florida using the same framework and variables. This may provide a broader perspective and may help policymakers in understanding the effect of DE participation on college persistence. The study may also be replicated in other states to determine if the results would be similar.

The significant findings of the study that pertain to the relationship between DE participation and college persistence should be widely disseminated and presented in upcoming conferences on DE like the National Alliance of Concurrent Enrollment Partnership in October 2014 and National Association of Developmental Education in February 2015.

The effect of demographic data on college persistence was not considered in the study. Investigation of the relationship between college persistence and gender, age, race, scholarship, and financial aid and other variables can strengthen previous findings in the literature and may help policymakers in targeting groups that have greater need of DE. The relationship between college credits earned, rather than DE college credits, and

college persistence can also be explored to understand how measures to improve college persistence and retention can bring about college completion.

This study revealed that there was a highly significant correlation between a student's DE credits earned and his or her college persistence. Students with a higher number of DE credits tended to stay in college longer, while students with lesser DE credits did not persist as long. One possible reason for this is that earning enough credits motivates students to complete their associate's degrees or move on to bachelor's degrees. Future studies can determine the threshold number of credits that affect the decision of the student to persist or not in college.

The findings from the study can be generalized to similar colleges. College A had 2,386 DE students from 2010 to 2011 (FLDOE, 2011), out of a total number of students of 13,270 (Florida College Guide, 2014). The increase in DE participation in College A from 2008-2009 to 2010-2011 was 18% (FLDOE, 2011). College A was established in 1959 and offers 150 programs and certificate courses. The demographic profile of the students in the college is as follows: African American – 14%, Asian American – 1%, Hispanic American – 10%, European American – 71%, and others – 4% (Florida College Guide, 2014). The results and findings of this study can be generalizable to colleges that exhibit similar demographics and characteristics.

Summary

The findings and conclusion of the study were discussed considering the research questions, limitations, and recommendations for future research. One result of this study is that there was a significant but small correlation between DE participation and college

persistence. The result of the study showed that there was a significant difference between the college persistence of DE and non-DE students.

The most important result of this study was that there was a highly significant correlation between a student's DE credits earned and his or her college persistence. The implication of this finding to leaders is that credit accumulation may affect the student's decision to persist to college completion and it is important to improve existing organizational structures to emphasize persistence, retention, and completion efforts. The results of the study also showed that there was no significant correlation between GPA earned in DE courses and college persistence and that there was no significant correlation between algebra grades and college persistence.

Based on the findings and limitations of the study, the following recommendations were made to leaders: better coordination between state, local school districts, and colleges to expand DE opportunities especially for low-income students; regular evaluation and assessment of DE course offerings to determine if they are aligned with the needs of the community and local businesses; expansion of existing DE courses according to the needs of the community; greater opportunities for high-school teachers to be qualified to teach college courses to improve the coverage of DE courses; allocation of financial resource to high-school teachers who teach DE courses; colleges should provide more information sessions to educate parents and high-school students about the benefits of the DE program; and finally, more tutorial services and various instructional support services should be made available to assist DE students, especially those who are close to completion of a degree or certificate.

Future research can investigate how DE and non-DE students compare in terms of the relationship between the variables GPA, DE credits earned, algebra grades, and college persistence. Further research can also include a longer time frame to improve the scope of the study and provide insight into the reasons for degree completion by the students. Further investigation into the relationship between college persistence and gender, age, race, scholarship, financial aid, and other variables can also be done to identify student groups who are in greater need of the DE program. A study in Florida and different states with different cohorts using the same framework and variables can be replicated to determine how the results will compare with the study. Finally, further research on the threshold number of credits that will enable students to persist toward completion should be identified to be able to reach these students and assist them to persist.

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