# EARLY DECLARATION OF A COLLEGE MAJOR

# AND ITS RELATIONSHIP TO COLLEGE

# STUDENT PERSISTENCE

by

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ABSTRACT

Completion of a college degree, as reflected by graduation rates, is a priority for campus administrators, politicians, families, and students. When students do not graduate, it has an effect on students, families, institutions, and surrounding communities. Colleges and universities, whether public or private, may find financial support declining when graduation rates do not improve. Debt acquired during college can be costly for students who drop-out before earning a degree. Some students, parents, administrators, faculty, and staff perceive that students making an early decision about a major is necessary for success in college. Many believe that enrolling as undeclared contributes to student attrition from college. Significant numbers of first-time in college students enroll each year without having chosen a major. Previous research examining undeclared students, however, is limited, conflicting, and dated. Still, increasingly, administrators and other stakeholders agree on two things: students should persist to graduation and students should declare a major as early as possible. This was an ideal time, therefore, to examine whether these two things were in fact correlated to one another.

The study was conducted through the conceptual frame provided by Astin's (1993) I-E-O model in order to determine if matriculating in an undeclared versus declared academic program was predictive of college student persistence and degree completion, taking into consideration student demographics, pre-college academic performance, institutional sub-environments, high-impact educational practice participation, and within-college academic performance. For this study, the term undeclared was defined as those students who matriculate to the institution without having a degree-granting major.

The logistic regression models conducted for this study resulted in the finding that there are no differences in persistence or on-time graduation for declared and undeclared students. The study concludes that research into factors impacting persistence and completion should focus on factors other than major declaration at matriculation. Because declared and undeclared students are quite alike, especially when one considers college student persistence, colleges and universities should encourage and permit students to explore their options for majors as opposed to making premature, uninformed decisions. Institutional policy and practice should be adjusted to consider all students as in need of major exploration.

# DEDICATION

This dissertation is dedicated to that which matters most: family.

To my parents, Jerry and Hiroko –you sacrificed so much for all of your children to have opportunities that you didn't have. I learned so much about committing to a task, working hard, giving your best, and persisting from you. Thank you for all you did for me. Thank you to my brothers Jeff and Kevin, and my sister Crystal.

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# CHAPTER I:

# INTRODUCTION

Completion of a college degree has been identified by campus administrators, politicians, families, and students in recent years as a priority for colleges and universities throughout the country (Advisory Committee on Student Financial Assistance, 2012; National Commission on Higher Education Attainment, 2013; U.S. Department of Education, 2006). According to DeAngelo, Franke, Hurtado, Pryor, & Tran (2011), "greater educational attainment is associated with both higher salaries and lower unemployment rates. Increasing student degree attainment is, therefore, vital to the economic health of the United States" (p. 3). As a result, governmental leaders have raised expectations and increased accountability on institutions of higher education to improve degree completion rates (Horn & Lee, 2016).

Further, college completion, often reflected by graduation rates, is frequently used by government and accreditation entities as a measure of whether institutions of higher education are successful (Brubacher & Rudy, 1997; Horn & Lee, 2016; Labi, 2015). Graduation rates are one of the most important statistics used when evaluating colleges (Duncan, 2013) as part of the College Scorecard for the purpose of helping students and families compare institutions while in the process of choosing which institution to attend. Given the cost of a college degree, enabling families to know upfront whether an institution is likely to graduate students in a timely manner has emerged as a priority.

When students fail to complete a degree, it can lead to negative consequences for a number of stakeholders, including: students, families, colleges and universities, and surrounding

communities (Barbatis, 2010). For example, institutions of higher education, whether public or private, may find financial support declining if graduation rates do not improve. A number of state governments have implemented performance-based funding formulas that are tied to institutional performance in areas such as graduation and retention rates (Center for American Progress, 2012). The better the performance, the better the funding support. Conversely, those institutions with low performance receive less funding. Currently, fewer than 60% of students earn a degree within six years of enrolling at a four-year institution, and even fewer, 37.1%, complete a degree in four years (Knapp, Kelly-Reid, & Ginder, 2012), which suggests that many institutions are not achieving the success required to address the college completion priority. The loss of needed funding not only includes funding from state governments. Student attrition from college, prior to completion of a degree, costs institutions of higher education thousands of dollars in lost student tuition and fees, and potential alumni donations (DeBerard, Spielmans, & Julka, 2004).

For students, and their families, the consequences of leaving college without completing a degree can be serious (DeBerard, Spielmans, & Julka, 2004). Debt acquired during college can be costly, with students dropping-out of college leaving with an average debt of $7,000 (Hanford, 2011). These students are also substantially more likely, at a rate that is four times higher that degree completers, to default on their student loans (Casselman, 2012). At the same time, career opportunities are frequently limited, as completing some college is rarely considered a viable credential qualifying one for white collar or professional work. Communities, too, suffer consequences. When a student from a small town, for instance, leaves to attend college, frequently many members of the community, not just family members, are invested in the students' success. When the student fails, others in the community can be discouraged from

believing they should try as well. Thus, the success or failure of individuals resonates well beyond the particular life trajectory for the student.

Understanding why students drop out or choose to leave college, as a result, is important to colleges and universities. Increasing the number of students who graduate as opposed to drop out is integral for institutions, as mentioned above, as it affects funding, legitimacy, and rankings. Additionally, improving college completion rates is necessary if institutions are to continue to fulfill their long-held responsibilities of serving as a public good, providing economic mobility between generations, and supporting local and surrounding communities.

In the pursuit of understanding persistence and attrition, researchers have considered a variety of potential factors that may affect the likelihood that college students persist, including but not limited to: the level of student engagement with the institution (Kuh, Cruce, Shoup, Kinzie, & Gonyea, 2008); integration into the academic environment of the institution (Tinto, 1993); participation in dual enrollment while in high school (D'Amico, Morgan, Robertson, & Rivers, 2013); demographic characteristics of students such as race, gender, and ethnicity (Leppel, 2001; Munoz & Maldonado, 2012); and participation in learning communities (Barnes & Piland, 2011). The findings from the research have led to the development and implementation of programs designed to increase the likelihood of persistence. Some of these programs include: new student orientations, faculty-mentored undergraduate research opportunities, first-year seminars, ethnic support programs, peer mentoring, and academic advising (Kuh, 2008; Ryan, 2013; Talbert, 2012).

Some students, parents, administrators, faculty, and staff perceive another factor, in particular, students making an early decision about a major, as necessary for success in college. Texas State Higher Education Commissioner, Dr. Raymund Paredes, stated in 2011, that "there's

a lot of research at the national level indicating that the sooner students make up their minds, the more likely they are to graduate" (Mangan, 2011). His sentiments are echoed by many, producing a widely-held belief that starting college without a major is a possible barrier to degree completion and a contributing factor as to why students fail to achieve academic success (Onink, 2010; Simon, 2012).

Each year, significant numbers of first-time in college students, between 22% and 50%, enroll in higher education without a choice of major selected (Gordon, 2007; Kramer, Higley, & Olsen, 1994). Many view starting undecided about their major as one factor why students may be at-risk of dropping out of college (Allen & Robbins, 2008). There exists an assumption that these are the same students—or that the overlap between undeclared students and "at risk of non-completion" students is a significant one. In other words, the prevalent belief is that the sooner students declare a major, the better the chances that they will persist in college through graduation and graduate within four years (Kim & Rzonca, 2003; Leppel, 2001).

If one considers Paredes' statement, however, in full context, it reveals an opportunity for further research. Although he mentions that "there's a lot of research at the national level," (Mangan, 2011) there is, in fact, no consensus in the limited research about whether starting college as decided or undecided plays a significant role in the completion of a college degree (Gordon, 2007). There is also little agreement more generally in the research findings as to whether or not having a major affects college student persistence (Graunke, Woosley, & Helms, 2006).

Much of the disagreement that exists in the research examining the undecided student may be a result of the inconsistent definitions of "undecided." Ashby, Wall, and Osipow (1966) described undecided students as those "who had difficulty in identifying an entry program in the

university and chose instead to begin their university studies in the Division of Counseling" (p. 1038). In contrast, Anderson, Creamer, and Cross (1989) defined the term undecided as "an administrative term that identifies students who have not chosen a major field of study" (p. 46). Foote (1980) classified undecided students as those students still undetermined about their academic major after having completed two years of college.

Lewallen (1992) indicated that the term undecided should be "used to identify students unwilling, unable, or not prepared to make educational and/or vocational choices" (p. 1). Lewallen (1992), however, clarified his definition stating:

> The term undecided has been operationalized in a variety of ways. In some instances, it has been measured by choosing "undecided" from a list of potential majors or careers on an admissions form or survey. At other times, it has been determined by a measure of the student's certainty about the choice. Still, at other times, it has been measured by a scale or instrument. (p. 2)

Another definition, which states that the undecided are students who are "unwilling, unable, or unready to make educational and/or vocational decisions" (Gordon, 2007, p. x) has emerged and become more commonly used in recent years, particularly among academic advising researchers (Ellis, 2014). Yet, even with this more consistently applied definition, there continues to be limited research in the field. Of particular value to this study was the continued lack of consensus about whether being undecided affects the likelihood of persistence and/or degree completion. To complicate the matter further, throughout the literature, the name "undecided" is still being used interchangeably with other labels such as: deciding, exploratory, general studies major, open major, open-option, pre-major, undeclared, and undetermined.

There are a variety of possible reasons, over the course of several decades, to explain why there exists such vastly different definitions of "undecided" or "undeclared." One reason has been the research questions out of which these findings emerged: frequently the category of undecided or undeclared was often not the primary subject of investigation in the projects undertaken (Gordon, 1995). Another factor is the lack of connectivity between the researchers engaged in the question (Lewallen, 1992). Finally, it may also be the case that not until recently has there been a social climate in which understanding these students has been of sufficient importance (Breneman, 1993; Cuseo, 2005).

What is clear from the past 50 years is that students and families increasingly want decisions about majors to lead to jobs. This desire for a direct connection between a field of study in college and post-college employment motivates them to want particular majors with greater perceived vocational value over others. Because of this, students and their families prefer entering higher educational institutions with a guarantee of admittance to those majors. During the 1960s, students began to view the college experience as a chance for financial stability, rather than for intellectual stimulation and growth. According to Breneman (1993), "between the 1960s and the mid-1980s, a precipitous decline occurred in the percentage of freshmen who reported that developing a "meaningful philosophy of life" was an important reason for attending college, while the percentage concerned with being "well off financially" increased dramatically" (p. 96). At the same time, students increasingly pursued majors that they believed led to higher paying occupations. This shift in reasoning for attending college led to, and has been reinforced by, the vocational theories, models, assessments, and inventories that developed during the same time period (Appel & Witzke, 1972; Hacker, Carr, Abrams, & Brown, 2013; Holland, 1973, 1985). These concepts and models put increased emphasis on the undergraduate degree as a means to a

specific career. Colleges and universities have responded in turn placing heavy emphases on declaring a major, and doing so early. This has been intensified by increasing attention on retention and graduation rates (Simon, 2012). Within this context, being "undeclared" became a negative. Terms frequently used instead of undeclared, such as "exploratory" or "open option," only reinforced the negative perception as they suggested students taking circuitous, and time-consuming, routes to graduation and career.

The emphasis on major declaration is part of a turn towards vocational and employment concerns that has been occurring in higher education over several decades. As Breneman (1993) describes, colleges and universities faced with financial concerns for themselves and their students, gradually led to the shift toward professional programs and away from liberal arts programs between the 1960s to the 1980s. In response, Thelin (2011) explains, "most American colleges and universities have succumbed to … the misplaced belief that there is an indelible connection between academics and employment" (p. 368). This change is reflected in the growth of educational offerings, such as majors, minors, and/or certificates. These offerings, in recent years, were often driven by potential employment opportunities (Simon, 2012).

It appears, therefore, that higher education administrators and students' families increasingly agree on two things: students should persist to degree completion and students should declare a major as early as possible. This is an ideal time, therefore, to examine whether these two things are in fact correlated to one another.

## Statement of the Problem

Significant numbers of first-time in college students enroll each year at institutions of higher education without having declared a major (Gordon, 2007; Kramer, Higley, & Olsen, 1994). In addition, substantial numbers of students who enroll in college with a declared major

change their major, suggesting that the initial choice was not fully crystalized (Lewallen, 1992; The University of Texas at Austin, 2012; Titley & Titley, 1980). Starting college undecided or undeclared has been perceived by some as a possible barrier to graduation and a factor in why students fail to persist or achieve academic success (Mangan, 2011; Onink, 2010). Because of the potential impact on student attrition versus persistence, understanding the effects of enrolling with or without a major is important for institutions seeking to improve persistence and graduation rates.

This problem is further complicated by contradictions within the literature. Inconsistencies exist with the definitions used to identify undeclared students, and to describe persistence. Some of this is due to the diversity within the undeclared population, one that Gordon has referred to as a "complex, heterogeneous group" (Gordon, 2007, p. 4). Further adding to the complexity is that among these varied students, there are a number of factors that contribute to their indecision. Researchers, consequently, have not found agreement on whether being undeclared is a factor that has an effect on the likelihood that students persist in college. Some of the literature on either side of the disagreement includes publications not based upon empirical research or evidence. Further empirical examination of the persistence of undeclared and declared students is necessary to help resolve the disagreement.

The definition of college student persistence is also inconsistent (Hagedorn, 2012; Mortenson, 2012). Problematic is the frequent interchangeable use of the terms retention and persistence (Renn & Reason, 2013) and the ever-changing and non-linear enrollment patterns of students (Hagedorn, 2012). There are some scholars that would also argue that student persistence or attrition is not the responsibility of the student but rather that student departure

from college is an interactive process between the institution and the student (Braxton, Hirschy, & McClendon, 2004).

Earlier research findings are problematic as they were determined by scholars who analyzed opinions and perceptions of undeclared students rather than empirical studies focused on studying students directly (Lewallen, 1992). These studies were not designed to examine the relationship between persistence and whether a student matriculated to college with or without a major declared. The design of this study included the examination of the persistence of undeclared and declared students in order to understand which of the two groups has a greater tendency to persist. It also considers the effects of a variety of input and environmental variables on student persistence and degree completion. This study could have focused on student departure or institutional retention efforts. However, as both the choice to enroll as undeclared or declared and the choice to persist at an institution are both student choices, it was important to frame this study through the lens of student persistence.

## Purpose of the Study

The purpose of this study was to examine the relationship between matriculating with or without a declared major and college student persistence. A significant number of new first-time in college students enroll as undeclared or undecided each year on campuses across the country (Gordon, 2007; Kramer, Higley, & Olsen, 1994). With increasing college completion and persistence rates a priority for many institutions of higher education, some institutions have considered policies designed to force or require a choice of major upon matriculation. Other institutions have moved to allow students to opt out of declaring until further exploration of academic programs and majors can be conducted (The University of Texas at Austin, 2012). For

this study, the term undeclared was defined as those students who matriculate to the institution without having a degree-granting major.

There are two important differences in this study that distinguish it from earlier studies. While previous studies have used differing definitions, this study involved examining the persistence of students using a definition of undeclared that has been institutionally operationalized: students who are undeclared are those who matriculate without a degree-granting major selected. The reason for opting for this definition is that it can delimit a group of students consistently across institutions and can be utilized in studies on undecided students at any institution that has an "undeclared" designation that students may be admitted into or select upon application for admission. This definition, as a result, can be applied at institutions of varying size and/or type (research, liberal arts, two-year versus four-year, etc.) as long as an undeclared option for academic program is available for students.

Although the purpose of this study was to compare undeclared and declared students, as have previous studies, there was one additional important difference. This study examined persistence from matriculation through to degree completion. This is important because accepted thinking about the relationship between declaring a major and timely graduation assumes that one leads to the other. Therefore, exploring the actual relationship between these things, if there is one, has the potential to be of value to scholars, to college and university leaders, and to students and families alike.

By researching the possible differences in persistence rates for undeclared and declared students, the aim of this study was to add to the discussion about undeclared college students and whether they are a potential at-risk population. In addition, an objective of this study was to seek some resolution to the disagreement in the literature about the performance of undeclared college

students, often reflected in rates of persistence to degree completion and as academic achievement as measured by college grade point average.

This study explored and analyzed data from one cohort of incoming full-time enrolled, first-time in college students during the period from the fall 2010 quarter through summer 2016 quarter. More specifically, the study examined student data from a research intensive, public, four-year institution that is part of a larger state system of research universities in the western United States.

## Significance of the Study

The results of this study have potential implications for how policy about major selection is determined by institutions of higher education, as well as how colleges and universities provide support services in the form of academic advising and career counseling to both undeclared and declared students. Higher education institutions have increased pressures from a variety of stakeholders to ensure that students graduate, and that they graduate in a timely manner. As a result, many colleges and universities have reinforced the message that students should declare early rather than take the time to explore their options, assuming that an early decision leads to timely graduation. In order for institutions to be certain that these are wise actions, the literature requires a more consistently applicable definition of undeclared, as well as research findings based on empirical data.

College and university leadership would find the study important as the findings could influence policy related to matriculation, declaration and/or change of major, and services provided to support students including admissions counseling, academic advising, career counseling, and new student orientation. If the study findings result in the understanding that a relationship does exist wherein starting undeclared adversely impacts persistence, then there may

be support for policies that require students declare a major upon entry. Conversely, if there does not appear to be such a relationship, then campus policy-makers may want to consider implementing policies and services that support and encourage major exploration.

Students and their families would find the results important as understanding the effect of starting with or without a major changes the priority placed on the decision about initial major. If there is no correlation, students may face less pressure to decide early. If there is a correlation, then students would understand that as a step toward successful degree completion, an early decision may be necessary.

The number of published empirical studies that were focused on the potential relationship between being undecided and persistence has, up to this point, included just one published study, by Leppel (2001), in the last 30 years. The results, then, of this current study will add significantly to the scholarly knowledge base about undecided students and college student persistence, more generally. Another benefit that this study provides is a more easily operationalized and consistent definition of the term "undecided" moving forward. The findings also encourage further study and examination of the relationships between academic major and persistence, and academic major and completion of a college degree.

## Research Questions

This study examined whether matriculating with a declared academic major or as undeclared is a significant factor in the persistence as well as timely degree completion of full-time enrolled, first-time in college students. The research questions guiding this study were as follows:

1. What are the demographic characteristics of first-time in college freshmen that matriculated to the institution in the fall 2010 quarter as undeclared and declared?

2. What are the pre-college academic performance, developmental/workload course enrollment, and high-impact educational practice participation characteristics of first-time in college freshmen that matriculated to the institution in the fall 2010 quarter as undeclared and declared?
3. Are there statistically significant differences in college academic performance (earned college GPA) of first-time in college freshmen that matriculated to the institution as undeclared and declared?
4. To what extent, if any, do first-time in college freshmen that matriculated to the institution as undeclared and declared change their major?
5. To what extent do the variables included in this study predict college student persistence of first-time in college freshmen?
6. To what extent do the variables included in this study predict graduation of first-time in college freshmen?

## Conceptual Framework

Astin's (1993) input-environment-output (I-E-O) model was used as the conceptual model for this study. The I-E-O model, as depicted in Figure 1 below, provides researchers with a lens through which to understand the potential ways that the college experience affects students. It does not simply attribute the outcomes, whether positive or not, to the experiences that students have while in college. The I-E-O model is a more complete framework to examine not only the relationship between college experiences and outcomes, but also recognizes that who the student is or was before they entered the college environment may affect the likelihood or predictability of the outcomes being measured. This conceptual model allows researchers to be able "to control for the effects of initial student input difference by means of multivariate

analyses" (Astin & antonio, 2012, p. 30). As a result, it is not only a helpful framework for studying the effects of college on students, but also a framework that lends itself to quantitative research such as this study.

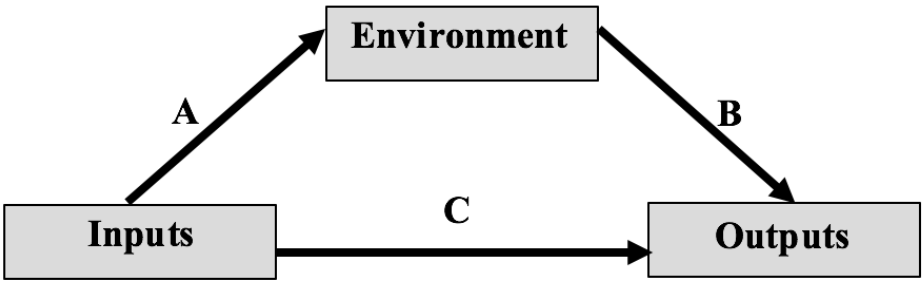


*Figure 1.* Astin's (1993) I-E-O model.

In the I-E-O model, students matriculate to institutions of higher education from a variety of pre-college environments and with a variety of characteristics. As Astin and antonio (2012) explain, "*inputs* refers to those personal qualities the student brings initially to the educational program" (p. 19). Those pre-college environments, for example, might include family. Familial environments would differ by characteristics such as parental income or parental education. The student characteristics, for example, might include race/ethnicity, gender, academic performance, and college entrance exam scores. These inputs, have effects on the environment as well as the outputs being measured. The environment can include programs, services, faculty, staff, or other students with which students interact. Additionally, environments include the courses students take, the activities in which students participate, and the places in which students reside. The

environments, much like the inputs, also have an effect on the outputs. For this study, those outputs were persistence and graduation.

## Definition of Terms

For the purpose of this study, there were a number of terms that required definition. Most of the definitions are directly from the National Center for Education Statistics Integrated Postsecondary Education Data System Glossary (2017). The terms being used in the study are defined as follows:

*Degree* – An award conferred by a college, university, or other postsecondary education institution as official recognition for the successful completion of a program of studies (National Center for Education Statistics, 2017).

*Dual enrollment* - A program through which high school students may enroll in college courses while still enrolled in high school. Students are not required to apply for admission to the college in order to participate (National Center for Education Statistics, 2017). Dual enrollment will also be described interchangeably in the study as dual credit.

*Full-time student* - A student enrolled for 12 or more semester credits, or 12 or more quarter credits, or 24 or more contact hours a week each term (National Center for Education Statistics, 2017).

*Graduation rates* – for this study, an output measure of student persistence through to completion of a degree. The number of students entering the institution as full-time, first-time, degree/certificate-seeking undergraduate students completing their program (National Center for Education Statistics, 2017). Graduation rates are often reported as number of students completing their program within 100 and 150 percent of normal time to completion.

*Program* – A combination of courses and related activities organized for the attainment of broad educational objectives as described by the institution (National Center for Education Statistics, 2017). For this study, may also be referred to as degree-granting program; describes those academic majors/programs within which a student may earn a degree at the undergraduate level.

*Programs with no formal award* – Any formally organized program with stated educational objectives and well-defined completion requirements that does not lead to a formal award (National Center for Education Statistics, 2017). For this study, also referred to as non-degree granting program; describes those academic programs within which a student may not earn an undergraduate degree, such as those program designations listed as undeclared or undecided.

*Normal time to completion* – The amount of time necessary for a student to complete all requirements for a degree or certificate according to the institution's catalog. This is typically four years (eight semesters or trimesters, or 12 quarters, excluding summer terms) for a bachelor's degree in a standard term-based institution. (National Center for Education Statistics, 2017). In this study, also referred to as on-time or timely degree completion; an output measure of the number of years it takes for a student to graduate with a degree.

*Part-time students* - A student enrolled for either less than 12 semester or quarter credits, or less than 24 contact hours a week each term (National Center for Education Statistics, 2017).

*Persistence* – "an individual phenomenon—students persist to a goal" (Reason, 2009, p. 660). Persistence was operationally defined for this study as an output measure of a student's continued enrollment at the institution from the first year to second year, second year to the third year, third year to the fourth year, and from the fourth year to graduation.

*Retention Rate* - A measure of the rate at which students persist in their educational program at an institution, expressed as a percentage. For four-year institutions, this is the percentage of first-

time bachelors (or equivalent) degree-seeking undergraduates from the previous fall who are again enrolled in the current fall (National Center for Education Statistics, 2017).

*Undeclared* – "an administrative term that identifies students who have not chosen a major field of study" (Anderson, Creamer, & Cross, 1989). For this study, the definition was operationalized as a classification for students who matriculate to the institution in one of the many non-degree granting program designations; used interchangeably with undecided.

## Organization of the Study

This study is organized into five chapters. This chapter introduced the topic and the significance and purpose for the study. Chapter two provides an overview of relevant literature related to college student persistence, persistence with choice of academic major and major changing behavior, as well as the student populations of undecided and decided students. Chapter three describes the methodology of the study, including detail about the student populations, the institutional site, and the processes for statistical analyses. The results from this study, presented in detail in chapter four, provide administrators, faculty, and professional advisors with helpful information to use when considering policies, programs, and advising and career counseling services aimed at both undecided students and decided students. The results extend the current body of knowledge about undecided, decided, and major changing students with regard to major and/or career choices as it relates to major change, persistence, and academic achievement. Finally, chapter five provides explanation about the findings, the implications of the study, as well as recommendations of areas for future research exploration. In addition, it provides insights for the institution examined regarding patterns of behavior as well as the factors that affect the success of its students.

# CHAPTER II:

# REVIEW OF LITERATURE

This study involved examining whether entering college as undeclared versus declared is a significant factor in the persistence through to degree completion of first-time in college students. Up through roughly 30 years ago there was little agreement in the literature about the possible relationship between persistence in college and enrolling as an undeclared student. Within the last 30 years, only one study has explored this question and that one found that undecided students were more likely to drop out (Leppel, 2001).

This chapter includes a review of four areas within the literature on persistence that are broadly understood within current studies to be influential. Defining persistence, however, can be challenging with the variety of enrollment patterns that students may follow (Hagedorn, 2012) Ultimately, the aim of this study was to take an initial step within the field that can add declared/undeclared status as a factor that influences student persistence. Doing so, however, requires first establishing a clear understanding of other influential factors broadly supported in the literature so as to know where declared/undeclared might fit, and what might be its value as well as the limits of its influence.

In reviewing the current literature broadly, beginning with key search terms including college student persistence, undeclared students, and major/career choice, this chapter is organized with the research findings in four major themes: student persistence/attrition in college, academic achievement and persistence, persistence with choice of academic major, and major choice behaviors.

The first theme includes literature that examines persistence and attrition in college and some of the variables that affect why students may or may not persist through to degree completion. Some of those variables include, but are not limited to, gender, ethnicity, educational goals and aspirations, parents' education, income, major changing behavior, and college earned grade point average (GPA). With regard to these variables, there is not necessarily agreement about whether each has a positive or negative correlation to student persistence. Most of the articles are based on theories about college student persistence, including Tinto's (1975, 1993) theory of student departure, or Bean's (1980, 1983) causal model of student attrition/industrial model of student attrition, or in theories about student development such as Chickering and Reisser's (1993) theory of identity development.

Academic achievement and its relationship to college student persistence serves as the second major theme. The studies examined in this theme considered both pre-college academic achievement as well as college academic achievement. In addition, some of the studies considered whether students who start college as undecided about a major choice are more or less likely to achieve academic success as compared to their decided peers.

The third theme, persistence with initial choice of major, includes research on whether or not students are likely to keep the major choice they initially chose upon enrollment or application for admission. Most of these articles examined whether students in science, technology, engineering, or mathematics (STEM) fields had a greater likelihood to persist in STEM majors. Additional articles considered non-STEM majors and other factors such as ethnicity and persistence with major choice. Many of the researchers approached the question of persistence with major choice through the lens of major-interest congruence or major-interest fit.

These studies, however, included no examination into whether students not only persisted with a choice of major but also graduated.

Major choice, the fourth theme in this chapter, includes research regarding behaviors of students related to decisions about academic field of study. In this theme, some scholars considered the likelihood of one choice of major over another. Some researchers also sought to determine if gender or ethnicity play a role in major choice. Additionally, this theme includes research about students who chose to enroll at institutions of higher education as undeclared, as often described in contrast with their declared peers. The literature included in this theme includes insights as to why students start college with or without a major, and how the basis of those decisions might influence persistence in college.

The primary research questions for this study were most closely related to the persistence in college, persistence with major choice, and major choice behavior themes. As this study examined the possible relationship between student persistence and initial status as undeclared or declared, the previous studies and theories related to persistence more generally helped to inform where there may be gaps in the research and reasons why students enroll without a major. Of secondary value is the theme on academic achievement and persistence because it adds to the existing debate about whether undeclared students are less academically able.

## Student Persistence in College

In the literature about college student persistence, researchers focused primarily on understanding the correlates of, as well as the effects of various programs or interventions, on persistence and attrition. In many of the studies, researchers examined the topics through the theoretical frameworks of either Tinto's (1993) theory of student departure, Bean's (1980) causal model of student attrition, or the developing purpose vector, one of the seven vectors as part of

Chickering and Reisser's (1993) theory of identity development. Also, included in this section is an overview of Braxton, Hirschy, and McClendon's (2004) revision of Tinto's (1975) theory. These theories provide the frameworks for much, but not all, of the research exploring college student persistence that follows in this review. As a result, it is important to examine these theoretical frameworks before reviewing the relevant research.

**Tinto's (1975, 1993) Theory of Student Departure**

Tinto's theory is derived primarily from Emile Durkheim's theory of suicide developed in 1897 and Van Gennep's (1960) rites of passage theory. The framework for this theory is that students enter college with pre-existing beliefs, values, characteristics, and experiences which frame how they view their experiences while in college. Once in college, that framework then plays an important role in determining whether discrete experiences students have within the institution will lead them to stay within or depart from the institution (Figure 2) prior to degree completion. Tinto argued that one mechanism that enhances students' ability to persist is integration into the institution: if they are able to see themselves as part of the social and academic fabric of the college or university, they are more likely to persist regardless of discrete experiences. In contrast, those who were not able to integrate into one or the other environment would be less likely to graduate.

Tinto's theory on student departure is often used by researchers and practitioners as a theory to understand student retention. This approach is problematic because departure explores a student's decision whereas retention explores an institution's actions. The problem appears to be caused by a misunderstanding in the literature of the terms retention and persistence. These terms are often used interchangeably; however, they are in fact the results of behaviors by two different actors: the student and the institution. Tinto's theory is not primarily about student

retention but rather student persistence as he discusses the students' choices about whether to stay or to drop out of college. Retention has often been mistaken as a measure of student progress to graduation, when instead it is an institutional measure. Persistence, in contrast, is a measure of student actions that are reflected in continued progress to degree completion. Institutions of higher education attempt to retain students, while students attempt to persist to the goal of degree completion (Falcone, 2011; Reason, 2009).

Tinto's (1993) theory has been criticized by scholars because it was derived exclusively from studies of students who enroll at four-year institutions (Braxton, Sullivan, & Johnson, 1997). Tinto's theory failed to consider the significant and growing student population that enrolled at two-year institutions or community colleges (Pascarella, Smart, & Ethington, 1986). Pascarella et al. (1986) acknowledged, however, that this criticism perhaps should not be leveled exclusively at Tinto. In fact, most of the research on persistence had ignored the two-year college student.

Another critique of Tinto's theory of student departure is that it did not appropriately apply to students from underrepresented populations in higher education. According to Tierney (1992), "Tinto has misinterpreted the anthropological notions of ritual, and in doing so has created a theoretical construct with practical implications that hold potentially harmful consequences for racial and ethnic minorities" (p. 603). Tierney argued that Tinto had failed to adequately account for differences across cultures. Whereas some cultures, such as the dominant White cultures Tinto explored, may see integration into new social environments as an important rite of passage in college, and therefore as a means of enhancing belonging and ultimately persistence to graduation, this was not universally true for students from other cultures.

Other cultural groups may not place the same value on social integration or may not perceive separation from these new settings as a negative event (Tierney, 1992). As a result, concluding that integration into campus culture would necessarily improve persistence could be untrue for minority students. Were this to be true, well-intentioned attempts to get minority students to experience such integration could actually work counter to the goal of improving their degree completion. It might be necessary for institutions to consider how to adjust campus culture rather than expect students to integrate into the institutional culture. Tierney also argued that Tinto's (1993) theory was too narrow as it was framed using an individualistic rather than pluralistic perspective. This, then, limited its utility within campuses that are frequently multicultural environments.

In spite of such criticisms, Tinto's theory continues to be considered an integral one in the literature on college student persistence. As a result, Tinto's ideas form the foundation of many of the guiding theories and principles of many articles reviewed later in this chapter. Tinto's work is indelibly linked to the current scholarship on how background characteristics and pre-college experiences can affect the level to which a student initially commits to an institution. This is evident in literature reviewed in this first theme on college student persistence.

### Braxton, Hirschy, and McClendon's (2004) Revision of Tinto's Theory for Residential Colleges and Universities

Although Braxton, Hirschy, and McClendon (2004) criticized Tinto's (1975) theory, rather than abandon it entirely, they advocated for the theory's revision. This revision was developed using the process of inductive theory construction, and it tested factors of social integration at both residential and commuter institutions. Braxton, et al. (2004) argued that four

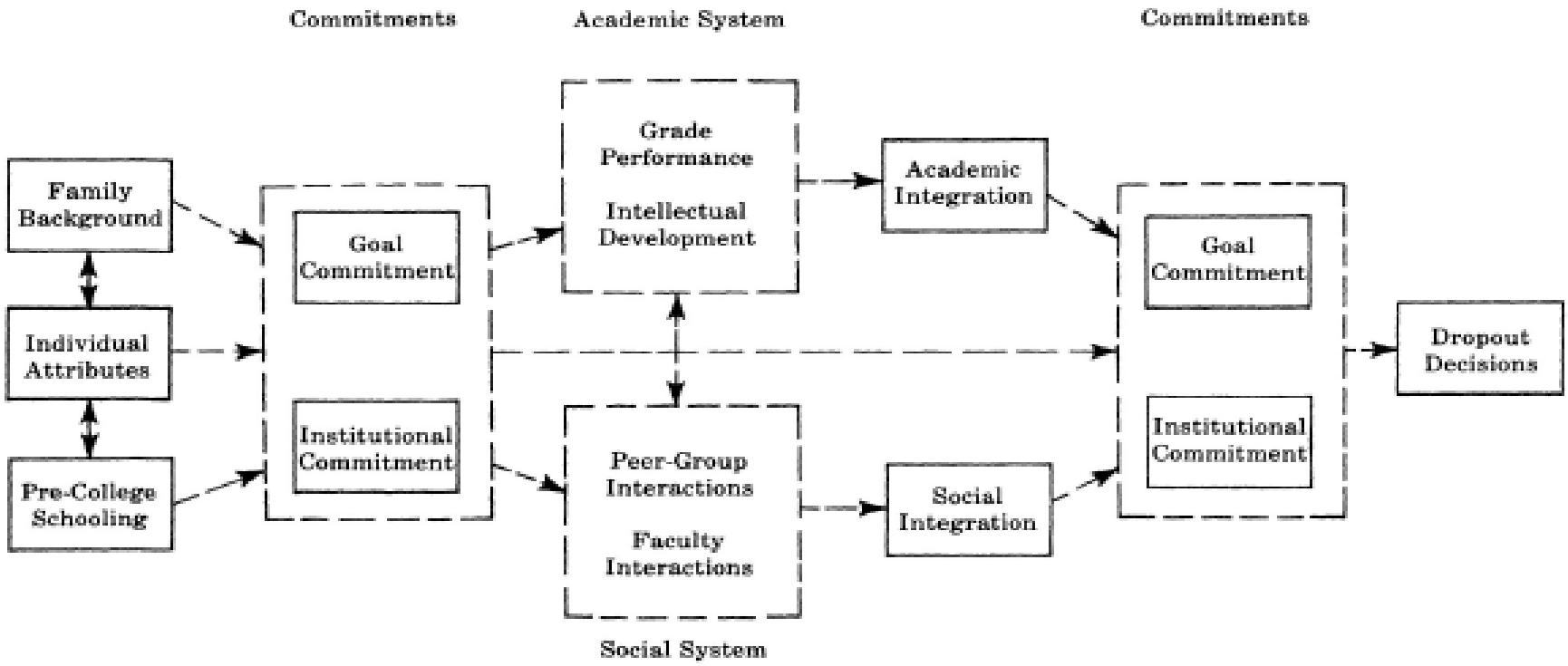


*Figure 2.* Tinto's Theory on Student Departure from Tinto, V. (1975). The figure shows the process that might lead to a college student's decision to drop out.

of the proposed concepts in Tinto's (1975) original work had strong empirical support for remaining a part of a revised theory. Those four ideas were: that students bring to colleges and universities a set of characteristics that can influence their commitment levels to the institution; the level of a student's initial commitment to the institution influences their continued and subsequent institutional commitment; social integration to the campus also influences a student's level of commitment; and the greater a student's institutional commitment level, the less likely a student would depart from the institution. In their revised theory, Braxton, et al. (2004) added six additional factors that influenced the level of student social integration to the campus environment. These six additional factors were: commitment of the institution to student welfare, institutional integrity, communal potential, proactive social adjustment, psychosocial engagement, and ability to pay.

**Commitment of the institution to student welfare.** For this factor of the revised theory Braxton, et al. (2004) suggest that the level to which a college or university is committed in its interactions with the student, to the welfare of the student, influences the level of social integration a student experiences within the institutional environment. Some of the examples that display institutional commitment to student welfare include: valuing, respecting, and treating students equitably (Berger & Braxton, 1998); institutional concern for successful transition into the environment as displayed through positive orientation and first-year experiences (Pascarella, Terenzini, & Wolfle, 1986); and importance placed on student learning as represented by faculty teaching practices, organization, and preparation (Braxton, Milem, & Sullivan, 2000; Braxton, Bray, & Berger, 2000). Essentially, the stronger the level of commitment to student welfare that an institution has, the higher the likelihood of social integration to the institution.

**Communal potential.** This factor is best described as the level to which a student feels that they have a group or groups within which the student fits. This group or groups are best described as sharing similar values or beliefs and similar goals or ideas (Braxton, et al., 2004). Opportunities for increased communal potential may be found within student clubs or organizations, in on-campus living environments (Berger, 1997), in the classroom (Tinto, 2000), or through engagement that extends beyond the classroom in the form of study groups. The more a student believes they fit, the more communal potential exists, and the more likely a student will feel socially integrated into the institution.

**Institutional integrity.** If faculty, administrators, and staff at the university act in accordance with the mission and goals of the institution, the greater the likelihood that a student will socially integrate into the institutional environment (Braxton, et al., 2004). Similar to an institution's commitment to student welfare, institutional integrity is often demonstrated through fair and equitable treatment of students through the application of its policies (Berger & Braxton, 1998). Institutional integrity can also be shown in the congruence between the student's expectations of their experience based upon institutional information and communication and the student's actual experience.

**Proactive social adjustment.** Essentially, the more a student applies proactive strategies for social adjustment in their new environment, the greater the likelihood that the student achieves social integration (Braxton, et al., 2004). The increased likelihood that a student applies proactive strategies is influenced by the student's level of psychological maturity (Health, 1980) and the student's level of need for social connection (Pascarella & Chapman, 1983). Similarly, the ability of a student to handle and respond to stress can influence their level of social adjustment and integration (Bray, Braxton, & Sullivan, 1999; Carver, Scheier, & Weintraub,

1989). Students who are unable to utilize proactive social adjustment strategies and appropriate stress-coping strategies are less likely to be socially integrated.

**Psychosocial engagement.** This factor, Braxton, et al. (2004) suggested, involves the level of psychosocial energy that a student expends when engaging in social interactions within the institutional environment. The more energy a student allocates to their social interactions, the higher the level of social integration (Milem & Berger, 1997). This can be reflected, for example, in the level of involvement by a student in student organizations, the type of interactions with peers both within and outside the classroom, and the frequency with which a student elects to stay on campus during the weekend versus going home.

**Ability to pay.** Finances can play an important role in whether a student engages socially with other members of the campus community (Braxton, et al., 2004). If a student feels the costs associated with attending are less than satisfactory, they are less likely to socially integrate, and as a result, less likely to persist (Cabrera, Stampen, & Hansen, 1990). For some students, this is reflected in an increased need to work to earn more to cover the costs of attendance, or even needing to take time away from enrollment based on an inability to pay.

### Bean's (1980, 1983) Causal Model/Industrial Model of Student Attrition

Rather than revise Tinto's (1975) theory, Bean sought to develop a different model to explain student departure. Much like Tinto's theory, Bean derived a causal model of student attrition from work in another discipline. Bean considered the work of Price (1977), who examined turnover of employees from organizations. As Bean (1980) explained, "student attrition in IHEs [institutions of higher education] is analogous to turnover in work organizations – i.e., students leave IHEs for reasons similar to those that cause employees to leave work organizations" (p. 157). In his model of student attrition, Bean hypothesized that, much like

worker satisfaction with employers, student satisfaction with an institution affected whether a student persisted or dropped out. For Bean, that level of satisfaction was not impacted most importantly, as it was for Tinto, by whether an individual was integrated into the campus culture in dialogue with their pre-college experiences. Instead, the important indicator of whether a student would persist or leave was what he termed "institutional commitment" (p. 177). This, he found, was affected by student satisfaction, in other words how one assessed their personal experience with individuals, services, and systems and whether these led to opportunity and were therefore understood as of value. Bean (1983) revised his model, renaming it the industrial model of student attrition, given its basis in Price's (1977) model.

For Bean (1980), apart from the institutional factors, the individual indicator that was most important was gender. Men and women drop out of colleges for different reasons, according to his interpretation of the data. One recommendation, for example, was specific to women, finding that institutions should encourage, recommend, or even require women to participate in campus student organizations because this would increase their integration in the campus environment. Men, on the other hand, needed flexible schedules during the first semester because excessive repetition could encourage them to leave.

One critique of Bean's model is that, within such a system, men would be encouraged to enjoy freedom of self-determination while women would be encouraged to undergo integration into larger groups or systems. Another criticism of Bean's model is that it did not appropriately address any differences between institutions in terms of the average chance of student persistence (Titus, 2004). Differences in institutional type, size, location, mission, and selectivity are likely to have varied effect on a student's satisfaction and/or commitment to the institution.

Although Price's (1977) model did not include consideration of background characteristics of employees, Bean (1980) believed that such demographic characteristics of students were important to account for in order to best understand the students' interaction with the campus environment. However, as with Tinto's (1993) model, Bean's (1980) initial research and model was not inclusive of students from non-White racial/ethnic populations. He limited his initial study of his causal model of attrition to single, White, first semester, first-time in college students, all under the age of 22, and attending one institution.

**Chickering and Reisser's (1993) Theory of Identity Development**

Originally, Chickering (1969) postulated that individuals go through seven stages, or vectors, of identity development. One of the criticisms of this theory, such as those discussed previously, was that it was based on White males and did not consider how identity development might be different for other populations (i.e., women, racial/ethnic minorities). In 1993, with the help of Reisser, Chickering revised the seven vectors in an attempt to address that criticism.

In the first vector, students need to develop competence. Originally, Chickering described competence as something that could be developed in three areas: intellectual, manual, or interpersonal. Through developing competence in these areas, he felt, students might be more likely to integrate into the intellectual (academic), manual (tasks), and interpersonal (social) aspects of the institutional environment. During a revision of their theories decades later, Chickering and Reisser (1993) changed the manual competence area to include activities associated with health and wellness, artistic endeavors, and recreation. As a result, this competence area was renamed "physical and manual."

The second vector involved an individual becoming more aware of and learning how to manage his or her emotions. In the revisions, Chickering and Reisser (1993) expanded this vector

to include emotions and feelings beyond that of what they had included originally: desire or aggression. For students, the authors argue, it is important during this vector that they begin to recognize how they feel, acknowledge those emotions, and respond in an appropriate manner.

During the third vector, according to Chickering and Reisser (1993), students move through autonomy toward interdependence. Here, the important development is that students' behaviors reflect a sense of ownership and self-responsibility. This happens, they argue, because students begin to understand and place importance on being connected and interdependent with others. According to Evans, Forney, Guido, Patton, and Renn (2010), students desire, at this point, to be considered responsible adults who are able to make decisions on their own. At the same time, they still want positive relationships with their parents and families.

The fourth vector explores how students achieve the goal of developing mature interpersonal relationships (Chickering & Reisser, 1993). This vector originally was listed after developing identity, but was moved to earlier in the model, in part to respond to the criticism that the theory was not inclusive of individuals outside of White males. The focus of this vector includes increasing intercultural understanding and appreciation, developing close friendships and intimate relationships. Then, during the fifth vector, Chickering and Reisser describe how students begin to establish their personal identity. In the revisions from the original theory, this vector was expanded in an attempt to be more inclusive of differences in identity development including, but not limited to, gender, sexual orientation, and race/ethnicity.

It is during the sixth vector, once students have taken steps to develop their more mature personal identity, that they can begin developing their purpose. This vector is more relevant to some of the articles that will be examined later in this literature review. Purpose, Chickering and Reisser (1993) define, means specifically developing one's occupational and life goals. Students

in the process of experiencing this vector are often making decisions about their academic major, career opportunities, and life plans. This vector is the one that is engaged when students are making decisions about their educational and career paths. It is worth noting that within this theory, first-year, first-time in college students do not typically progress through this sixth vector during the first year.

Once students have developed their purpose, they can move into the seventh and last vector where they begin to develop personal integrity. According to Chickering and Reisser (1993), this requires students to create a personal system of values that can balance self-interest with one's responsibilities to the larger society. Students begin to weigh possible actions against their personal values and consistently commit to those values.

Though Chickering and Reisser (1993) modified the original theory, the newly revised version still faces some of the same criticism as the original theory. As Evans, et al. (2010) argued, "Chickering's theory is empirically grounded and comprehensive; however; it lacks specificity and precision. Even in the newer version, definitions of vectors are often quite general" (p. 80). This lack of specificity is still seen as not fully integrating the concerns about the theory's applicability to students from underrepresented minority populations (Torres, Howard-Hamilton, & Cooper, 2003).

Within the next section, literature is reviewed in which researchers examined the relationship between student demographic characteristics and persistence, particularly gender, race and ethnicity, and first-generation status. It also addresses the work of scholars who have explored the relationship between college student persistence and the academic aspirations of students.

## Demographic Characteristics and Persistence

Student background characteristics, their interactions and experiences, and their perspectives and attitudes influence whether they are more or less likely to persist in college (Oseguera and Rhee, 2009). The studies included in this section involved researchers examining student demographic characteristics and any possible relationship with persistence. More specifically whether or not gender, race and ethnicity, first-generation status, or a number of other background variables attributed to the student affect persistence. In much of the following literature, scholars aimed to understand how each of these variables influences the likelihood of a college student to persist to degree completion.

**Gender.** Gender may or may not be a factor that affects college student persistence. Laskey and Hetzel (2011) found that gender did not affect retention rates of students considered at-risk of dropping out of college. Rigali-Oiler and Kurpius (2013) determined that there exists no significant difference in the persistence through degree completion between men and women. Other research studies concluded that there exists a difference in college student persistence rates for men versus women.

For those researchers that suggest a difference in persistence by gender, disagreement exists about whether men or women persist at a higher rate. In the literature, men reported a higher level of intention to persist in college then women (Cech, Rubineau, Silbey, & Seron, 2011). Although there was found to be a higher reported level of intention to persist, the findings did not include data to distinguish if actual persistence rates differed as well. Wright, Jenkins-Guarnieri, and Murdock (2013) found men more likely to end up on scholastic probation than women during the first year of college. This study, however, did not include an examination of persistence beyond the first year.

In terms of reported persistence behavior, in one longitudinal correlation study, the findings resulted in women as more likely to drop out of college than men (DesJardins, Kim, & Rzonca, 2003). In another study, in contrast, women tended to persist at a considerably higher level than men (Blecher, 2006). More recently, Ewert (2012) concluded that women were more likely to graduate than men at a rate 21% to 22% higher. One reason for the difference, according to Ewert, is that men engage in more disrupted attendance patterns of behavior than women, which reduces the likelihood of persistence. According to Leppel (2002), though lacking a statistically significant difference in the results, women had a higher observed persistence rate than men. Leppel did find, however, when controlling for other factors, the gap in persistence rates of women and men increased in favor of the women. Leppel's findings suggest that differences in the other characteristics of students may affect persistence of each gender differently.

The relationship between gender and college student persistence may be mediated by other factors such as personality measures. Haemmerlie and Montgomery (2012) found that individual differences in personality, regardless of gender, affected whether students remained at the institution or not. For men but not women, however, Haemmerlie and Montgomery concluded that a significant relationship between personality measures and retention exists, whereas a relative lack of professional role confidence among women pursuing engineering as a major appears to predict a greater likelihood of attrition (Cech, Rubineau, Silbey, & Seron, 2011).

**Race and ethnicity.** The race or ethnicity of a student may or may not also factor into student persistence in college. Wolfle (2012) found no statistically significant correlation between ethnicity and college student persistence from the first year to the second year of

college. Wolfle also concluded that, when enrolled in developmental or remedial coursework, ethnicity again did not reflect a significant relationship with persistence. Rigali-Oiler and Kurpius (2013) did not conclude any differences between European American students and racial and ethnic minority students in terms of persistence. Rigali-Oiler and Kurpius also did not find a significant difference in persistence rates when comparing various racial and ethnic groups to one another. Laskey and Hetzel (2011) examined students in a provisional admittance program and also found that ethnicity did not affect persistence and retention of students. Students who enroll full-time, in general, are more likely to persist regardless of their race or ethnicity (St. John, Hu, Simmons, Carter, & Weber, 2004). The race or ethnicity of a student alone does not appear to affect persistence to degree completion when a student enrolls full-time.

In a number of studies, researchers suggest that the relationship between the ethnic background of students and persistence is mediated by other factors such as financial aid and perception of the campus environment. Mendoza, Mendez, and Malcolm (2009), in a study examining the effects of financial aid on persistence at community colleges, found that White and Native American students from income backgrounds of $40,000/year or above persisted at the highest rates. Castillo, Conoley, Choi-Pearson, Archuleta, Phoummarath, and Van Landingham (2006) determined that a negative perception of the university environment translates to a higher likelihood that students will drop out of college, especially for Latino students. When removing perception of the university environment from the data analysis, Castillo et al. concluded that no significant relationship exists between ethnic identity and persistence attitudes. This result supports the idea that ethnicity alone does not affect college student persistence.

**First-generation status.** The first-generation status of a student may also relate to the likelihood of persistence in college. Ishitani (2003) found first-generation students were 71% more likely to drop out of college during the first year of enrollment than students who came from families with two college-educated parents. First-generation students, according to Ishitani (2006), faced a higher risk of attrition than their non-first-generation peers. In another study, Astin (2005-2006) determined that degree completion is positively correlated with the level of education accomplished by the student's father. He further suggested that "students who come from well-educated families have an advantage when it comes to completing college" (p. 9). Soria and Stebleton (2012) discovered lower retention rates for first-generation students than non-first-generation students even when controlling for other variables. Somers, Woodhouse, and Cofer (2004) concluded that first-generation students, regardless of family-income, were less likely to persist than continuing-generation students. Wright, Jenkins-Guarnieri, and Murdock (2013), in contrast to these other studies, found that first-generation status did not correlate with persistence at a statistically significant level.

**Socioeconomic status.** The socioeconomic status of a student may also influence the probability of persistence in college. Oseguera and Rhee (2009) found socioeconomic status positively associated with a student's persistence. The higher the socioeconomic status, the higher the chance of successfully progressing through college.

**Academic aspirations.** Another possible factor affecting college student persistence is that of the student's academic goals. Blecher (2006) determined that one of the strongest predictors of student persistence to degree completion within six years is educational aspirations. The higher the level of desired education sought by a student, the greater the likelihood of persisting in college.

Graunke, Woosley, and Helms (2006) found that students who had the goal of completing a degree in a specific academic major were less likely to persist to degree completion than students who had a more general goal of earning a college degree. The students with a more narrow and specific goal, when faced with the possibility that the major they had selected was not the best fit in terms of interest or academic performance, were suddenly lacking an academic goal to which to aspire. In contrast, those students who had the more general goal of earning a college degree, persisted through possible changes of major as the original goal of graduating continued to be possible.

**Other.** The background of a student, more specifically the family environment and educational history, appears to affect the student persistence through to degree completion. For African American students, Ellington and Frederick (2010) determined that family experiences played a major role in the likelihood of academic success and persistence in college. As with family experiences, the education afforded to students during elementary and secondary school – often determined based upon where a family resides – also plays a significant role in student success and persistence for African American students (Ellington & Frederick, 2010).

In terms of the educational history of students, it appears that the socioeconomic area in which students attend high school may be a factor. Niu and Tienda (2013), more specifically, found that students who attended more affluent high schools were more likely to persist as well as graduate in four years than students who attended high schools located in areas classified as economically average.

## High-Impact Educational Practices and Persistence

There are ten practices, commonly referred to as high-impact educational practices (HIPs), that have been shown to have an effect on student success (Green & Farazmand, 2012;

Kilgo, Ezell Sheets, & Pascarella, 2014; Kuh, 2008). These practices include, but are not limited to experiences such as first-year seminars, learning communities, internships, and undergraduate research opportunities. Each of these practices is designed to increase student engagement with the institution through purposeful and intentional interactions about highly important matters over an extended length of time. The practices also challenge students to experience perspectives and cultures different from their own, to apply the knowledge they gain in the classroom, and to reflect on the experience (O'Neill, 2010).

In an examination of first-year students at a variety of institutions, Tukibayeva and Gonyea (2014) determined that students who engaged in HIPs such as service learning, learning communities, and/or undergraduate research opportunities experienced statistically significant positive effects in terms of their persistence. In another research study on learning community programs, racial/ethnic minority students and/or first-generation students who participated in the Key Academic Community (Key) program at Colorado State University persisted at significantly higher rates than the students who did not participate in Key (Nosaka & Novak, 2014).

Kilgo, Ezell Sheets, and Pascarella (2014) also found that students who participated in any of the ten HIPs saw positive effects on their learning in college. Although researchers appear to agree that HIPs are correlated with increased persistence and success for students, many caution that the effects may be different for students across demographic and pre-college academic performance characteristics (O'Neill, 2010; Seifert, Gillig, Hanson, Pascarella, & Blaich, 2013; Tukibayeva & Gonyea, 2014). Researchers and practitioners, therefore, must be intentional about understanding how a student's background might result in disparate levels of effectiveness of a particular HIP.

In the review of the literature, it is difficult to ascertain which factors above are correlated with college student persistence. With many of the variables examined in the research, there appears to be lack of consensus as to whether any one variable is consistently correlated with persistence. In terms of demographic related variables, this lack of agreement in the findings is likely as a result of the heterogeneous nature of the categories of gender, race and ethnicity, and first-generation status. There appears to be some consistency with regard to academic aspirations, but the literature is limited with respect to this variable and persistence. High-impact educational practices appear to be positively correlated with persistence. The next section of this chapter reviews the possible relationship between academic performance, both prior to and during college, and persistence through college.

## Academic Achievement and College Student Persistence

This section includes literature related to the relationship between academic achievement and college student persistence. In some of the studies, researchers considered the effect of earned college grade point average (GPA) or number of college credit hours in which a student enrolls as measures of academic achievement. In other studies, researchers chose to reflect academic achievement in the form of pre-college achievement as reflected by college entrance exams and high school GPA. Additionally, some scholars have considered whether a student's choice to enroll in college as undecided or undeclared affects their academic achievement.

### Earned College GPA

Earned college grade point average (GPA) may play a role in student persistence. Johnson (2006) investigated stop out behavior of college students and determined that a student's earned college GPA was the most important factor of student departure, especially during the initial enrolled terms. Students who earn higher college GPAs in their first semester or first year

are less likely to drop out than students who earn lower college GPAs (Stewart, Lim, & Kim, 2015). In a study that examined the factors that affect degree completion, DesJardins, Kim, and Rzonca (2003) also found that students who earned higher first year GPAs had decreased odds of dropping out of the institution. In a later study, Kreysa (2007) identified cumulative college GPA earned as one of the greatest predictors of persistence in college for students who were not in need of remediation.

For students in remedial coursework during their first year, again, the findings showed cumulative college GPA as being predictive of persistence. In seems obvious that the better the grades earned by students the more likely they will persist. In one study, however, African American students who received mostly grades of A in their coursework were actually less likely to persist (St. John, Hu, Simmons, Carter, & Weber, 2004). It is possible, then, that the relationship between GPA earned and persistence is influenced by other variables, or that other variables may have a greater effect and may not always reflect a positive correlation with GPA.

**Enrollment**

In addition to GPA as a measure of academic achievement, the number of credit hours in which a student enrolls during his or her first year appears also to have an effect on persistence. DesJardins, Kim, and Rzonca (2003) found that students enrolled in a higher number of college credits during their first year or who had earned prior college credit while in high school were less likely to drop out of college. When students enroll on a full-time basis in college, and also earn higher grades in course work, they are more likely to persist in college (Nakajima, Dembo, & Mossler, 2012).

Johnson (2006), when examining reasons why students drop out of college, concluded that students who enrolled part-time at a four-year college or university have a greater likelihood

of leaving the institution than students who enrolled full-time. In a study focused on community college students, Crosta (2014) concluded that the key factors to academic success included full-time enrollment and continuous enrollment term after term. Crosta also found that full-time community college students had a higher likelihood of upward transfer to a four-year institution, and, therefore, persistence to completion of a bachelor's degree. The researchers conducting each of these studies on enrollment did not, however, also examine if there was a difference in how many credit hours a student completed out of the credits in which they enrolled. As a result, enrollment alone may not have the effect on college student persistence that the findings from these studies suggest. There may exist other factors that contribute to student attrition with greater significance than enrollment.

**Pre-College Achievement**

As mentioned above, pre-college achievement, as reflected by college entrance examination scores and high school GPA, may also factor into college student persistence. Sparkman, Maulding, and Roberts (2012) determined that together, high school GPA and ACT exam scores predict with statistical significance a student's cumulative earned college GPA. The higher the high school GPA and ACT scores, the higher the predicted cumulative earned college GPA. Astin (2005-2006), while examining degree completion factors, determined that SAT exam scores and high school GPA were the strongest predictors of eventual degree completion. More specifically, high school GPA was a much stronger predictor than SAT scores. Astin noted that, although SAT scores were a strong predictor of degree completion, the test scores do not help to predict student attrition. DeBerard, Spielmans, and Julka (2004) found that higher SAT exam scores and high school GPAs translated into greater college academic achievement. In their study, low high school GPA appeared as the only variable that was a statistically significant

predictor of student retention. DeBerard et al., however, explain that only a modest correlation existed between high school GPA and low first year academic achievement. This suggests that students with low high school GPAs may still achieve academic success in their first year of college.

## Student Persistence with Major Choice

In the literature, there appears to be some general agreement among researchers that major-interest congruence is a likely predictor of whether students continue to pursue their initial major choice (Allen & Robbins, 2008; Leuwerke, Robbins, Sawyer, & Hovland, 2004). The assumption in these studies is that those students who persist with a major choice are more likely to graduate than those students who change majors.

Holland's (1973, 1985) theory of careers suggests that individuals seek out environments that match their personality type. While dated, it is worth considering here because it informs most subsequent studies in career development literature and studies regarding major-interest fit. Holland also expressed that work environments, by nature of having employees with particular personality types, also could be attributed a personality type. He theorized that individuals with particular personality types seek out work environments with personality types that match. For example, highly social personality types look for work environments with social personality types.

In the research on major-interest fit, the major is a representation of the academic environment in which the student participates. The better the fit a student's interests are to that academic environment, theoretically, the more likely the student will persist in that academic environment. Tracey, Allen, and Robbins (2012) determined that congruence, as it relates to the individual student's interests and the environment of the major, are significant predictors of

persistence with a major choice. This supports Tinto's (1993) theory of student departure as increased satisfaction with the institutional environment contributes to improved student persistence to graduation.

Major-interest fit is a factor that has been shown to positively affect academic performance. Tracey and Robbins (2006) found that students with majors that were similar to their interests earned higher overall college grade point averages (GPA) than students with majors not similar to their interests. First-year GPA and major-interest fit, however, appear to have little relationship to one another (Allen & Robbins, 2008). In a follow-up study, Robbins and Allen (2010) again determined that interest-major congruence did not have a positive effect on the GPA earned during the first-year of college. First-year GPA, although not related to major-interest fit, was also correlated with persistence with a major choice. The students who earned higher GPAs during their first year of college had a greater likelihood of persisting with their initial choice of academic major (Allen & Robbins, 2008). If a student is not successful in the coursework related to the major, they are not likely to either want or be able to pursue the major further.

Though congruence between major choice and student interest may predict persistence within the major, it does not necessarily guarantee persistence through to degree completion (Graunke, Woosley, & Helms, 2006; Robbins & Allen, 2010; Tracey & Robbins, 2006). There is, as a result, some disagreement about the effect of major-fit on college student persistence in general. As fit with major can be affected by a variety of variables (including, but not limited to: interests, values, skills, abilities, personality type), it is possible that major-interest congruence may be mediated by those variables.

Some other factors related to major-interest fit include commitment to the institution, academic self-efficacy, career interests, and motivation. Wessel, Ryan, and Oswald (2008) concluded that major fit was positively correlated with a student's affective commitment to the institution and a student's academic self-efficacy. The better the fit with the major, the greater the commitment to the institution as reflected by the student. Robbins and Allen (2010) also found a positive correlation between major-interest and student motivation. Student motivation is more likely to be positive when the student has found a strong major-interest fit. Although motivation, self-efficacy, and commitment to the institution appear positively correlated with major-interest fit, career interests and major choice do not necessary relate to academic performance. When considering congruence between career interests and major choice, Pozzebon, Aston, and Visser (2014) determined that any such congruence did not relate to student academic performance.

**Demographic Characteristics and Persistence with Major Choice**

Some studies have considered whether particular student demographic characteristics might have a relationship with a student's ability to persist with their major choice. With regard to gender, female students were more likely to choose a major that was congruent with their interests than were male students (Robbins & Allen, 2010). Women and minority students, according to Griffith (2010) appeared to persist in science, technology, engineering, and mathematics (STEM) majors at a lower rate than men and non-minority students. When considering institutional and student background characteristics, however, the study found that women and minorities persisted in STEM fields at or above the level of men and non-minorities.

Robbins and Allen (2010) determined that first-generation students, those who were the first in their family to attend college, persisted with a major choice at a higher rate. What was

important here was that these students, in addition to being first-generation, also had a strong fit between major and their interests. Shaw and Barbuti (2010), in contrast, found little difference in major persistence rates for first-generation students as opposed to non-first-generation students. This may be as the result of the differences in other demographic characteristics across the population of first-generation students. One difference, family income, according to Robbins and Allen (2010), was not correlated with major-interest fit, indicating that many students may be likely to choose majors that are not a good match with their interests, regardless of family income level. Shaw and Barbuti (2010), as with other researchers, found little difference in major persistence rates when parental income was considered as a possible factor. As a result, their findings were inconclusive as to whether students who are first-generation and from low-income families would be more likely to persist with a major choice.

**Pre-College Academic Characteristics and Persistence with Major Choice**

The literature also included research regarding whether pre-college characteristics are related to persistence with a major choice. Allen and Robbins (2008) determined that a student's earned high school GPA and composite score on the ACT college entrance exam positively correlated with major persistence. They do caution, however, that the relationship between these two measures may be mediated in part by first-year earned college GPA. Still, in a follow-up study, interest congruence was the strongest predictor of higher college GPAs, of persisting, and of remaining in those majors with the most restrictive requirements (Tracey, Allen, & Robbins, 2012). Shaw and Barbuti (2010) also found that high school GPA was a predictor of a student's persistence with their initial choice of major. There is the possibility, however, that high school GPA is more strongly correlated with academic performance in any major as opposed to persistence with major choice, but further examination would be necessary.

In terms of coursework completed in high school, taking advanced placement (AP) classes prior to enrollment in college, Griffith (2010) determined, had a positive relationship with persistence in STEM fields for women and minority students. The students who enrolled and completed AP coursework gained exposure and preparation to related material, and as a result, were more likely to persist with a STEM major. College entrance exam scores, however, do not have the same effect. Robbins and Allen (2010) examined a two-year sample and found that ACT composite scores negatively correlated with the major-interest correlation. As a result, there is uncertainty if higher ACT scores translate into increased major-interest congruence for students. Again, this may be the result of other factors that affect a student's persistence with major choice.

**Academic Fields of Study and Persistence with Major Choice**

Some of the studies focused on college student persistence with their initial major choice within the STEM (science, technology, engineering, and mathematics) disciplines. Rask (2010) found that students with an interest and initial intention to major in biology or mathematics were more likely to continue in that major. For the students with majors other than biology or mathematics, major interest-fit was not necessarily related to persistence with the student's major choice. Persistence with major choice, therefore, was not consistent across all of the STEM disciplines. None of the earlier studies that examined persistence with a major choice considered the undeclared or undecided population of students who enroll in higher education because they are either unable to select the major they want or because major selection at the point of entry is not an option provided by the institution.

## Major Choice

If some students persist with major choice and other students do not, and some students enroll in college without a major, understanding what influences students' choices of major may be helpful. A number of researchers have examined the topic of college students' choice of academic major. The focus of many of the studies has been on trying to determine what might influence a student to choose a particular major. There are some challenges that exist with reviewing literature on students' choice of major, which includes the choice to matriculate as undeclared.

One of the challenges is that there is a deficiency of recent research on the topic. There are a number of dissertations that have examined questions related to major choice and the undeclared student population, but few if any have been peer-reviewed and subsequently published (Ellis, 2011; Kittendorf, 2012; Pringle, 2014). Another challenge is that the literature that each of these dissertations has included as references are the very same dated literature included in this next theme of this review, contributing to a continuing use of dated research on this topic rather than the development of new scholarship. Not only have doctoral students relied heavily on the dated research, but higher education practitioners that assist students with major and career exploration and choice have also relied on the same outdated literature as the basis for their daily work with college students.

This lack of recent research has been recognized by practitioners as problematic and has led to the creation of the recently opened NACADA (formerly the National Academic Advising Association) Center for Research at Kansas State University. The aim of this new center is to expand the body of relevant knowledge so that it is timelier to the needs of current researchers

and practitioners. Additionally, there is an argument in the field of career counseling that researchers should again focus on the topic of career indecision (White & Tracey, 2011).

As a result of those challenges, this section of the chapter is organized chronologically to show the development of the scholarship over time as it relates to undecided students. As such, the lack of recent peer-reviewed, published research will be apparent. This will, however, also help to illustrate the reason for the need for studies like this one to add to the knowledge base.

## The Undecided/Undeclared Student

The earliest research that focused on choice of academic major was derived from studies of vocational decision-making and indecision. The decision about a major was often, and continues to be, treated as synonymous or closely related to vocational choices and career decision-making. Many of the researchers considered career decision-making from the perspective of the reasons for indecision or the challenges associated with making decisions about career choices as a means of defining the undecided student population. Researchers also examined the possible barriers to decision making in an attempt to best understand how a counselor might intervene (Brown & Rector, 2008; Gati & Levin, 2014; Kelly & Lee, 2002; Nauta, 2012). Detailed below is the chronology of the research on undecided students beginning with attempting to define the population in terms of vocational indecision, followed by the shift to comparing undecided students to decided students, which eventually led to research on possible subtypes of undecided and decided students.

**Indecision to comparison: 1950s to 1980s.** For early researchers, a vocationally undecided student's indecision was determined to be a reflection of normal developmental behavior (Akenson & Beecher, 1967; Grites, 1981, 1983; Titley & Titley, 1980). The opposing viewpoint held by other scholars is that many undecided students are experiencing more serious

psychological concerns that impact their decision-making abilities beyond simply choosing a major or career field (Burg & Mayhall, 2005; Fuqua & Hartman, 1983; Hartman & Fuqua, 1983; Mayhall & Burg, 2002).

The first studies to delineate the possibility of vocational indecision as a normal behavior versus a more serious psychological concern were conducted in the 1950s and 1960s (Ginzberg, Ginzburg, Axelrod, & Herman, 1951; Tyler, 1969). These researchers described indecision and indecisiveness as two different concepts. Goodstein (1965) categorized undecided students into two possible groups established on that premise that indecision and indecisiveness are distinct. In the first group were those with indecision, Goodstein includes students who lack the information, development, and/or maturity to make an appropriate decision about which academic major and/or career path to pursue. These students are often challenged by the pressure to decide early in their enrollment about a major, which only compounds the anxiety and worry they already have as a result of being in a state of indecision. In contrast, the second group displays an inability to make decisions, in general, not simply decisions about major and/or career. These students lack an ability to make decisions of any kind. Personal counseling may be necessary for these students before they can begin to explore, choose, or eventually declare a major.

Indecision and indecisiveness, Osipow (1999) agreed, are two distinct concepts. Indecision, a temporary state of being, is considered part of the normal development of individuals throughout their lifetime. Indecisiveness, in contrast, is a personality trait that the individual has across all situations in their life that demand decisions. This can lead to frequent and recurring difficulty, or even avoidance with, decision-making. Students identified as having this personality trait may need to seek counseling to in order to gain the ability to make decisions free from anxiety. Though some undecided students may be in need of counseling to address an

indecisiveness trait, Osipow argues being undecided is not synonymous with indecisiveness. Individuals can be undecided about their major without being indecisive.

Holland and Holland (1977) agree that "it is probably a mistake to treat all undecided students as if they had an indecisive disposition" (p.413). In their research, Holland and Holland studied vocational indecision among high school and college juniors. Holland determined that only a small number of students display debilitating levels of indecisiveness, which supports the possible existence of undecided student subtypes. This finding may help explain the difficultly in defining undecided students as one consistently homogeneous collective. Holland and Holland also found that identity and maturity differed significantly when comparing undecided and decided students. The undecided students have less developed vocational identities and lower levels of vocational maturity. Still, Holland and Holland suggest that undecided and decided students are much more alike than not. Additional studies have determined that students who are uncertain about educational and vocational choices lack some level of identity development (Grites, 1983; Jones & Chenery, 1980; Rose & Elton, 1971). Holland and Holland (1977) concluded that there were at least three possible subgroups of undecided students based on varying levels of maturity and vocational identity.

Although the undecided student may be more likely to display a lack in vocational identity development, Grites (1981) believed that a student's decision to be undecided was a healthy approach to college, and to life beyond college. Grites argued that most college students lack enough information about themselves, majors, and career opportunities. Students also require an increased understanding of the resources that an institution provides to students to assist them with the processes of major and career exploration. Additionally, students must contend with internal and external pressures from a variety of sources including parents/family,

teachers, academic advisors, guidance counselors, peers, as well as themselves. Grites (1983) reiterates that advisors must be intentional about seeking to distinguish between those students who self-select "undecided" on an admission's application (state of indecision) and those who are actually undecided as well as indecisive (trait of indecisiveness). Although some students might be dealing with the more serious issues of indecisiveness, Grites argued that students making the thoughtful choice to start out as undecided are not likely to have a chronic problem with making decisions.

Hartman and Fuqua (1983), in contrast, believed that this perspective too easily encouraged indecisiveness among undecided students. They acknowledge that major and career exploration, for some students, could be part of a normal a developmental process. For most others, however, Hartman and Fuqua felt vocational indecision was reflected of serious psychological dysfunction which required a more serious intervention. They identified undecided students as lacking a well-developed sense of themselves. This conclusion was consistent with the earlier research by Holland and Holland (1977). Hartman and Fuqua (1983) also argued that undecided students had higher levels of anxiety, a clear sign of psychological personality dysfunction, which affected their identity development.

This lack of consensus also emerges in the literature exploring the reasons students may be undecided. In an examination of factors related to major and career indecision among vocationally undecided students, Taylor (1982) found that the reasons for vocational indecision are different for every individual. It would follow that if some undecided students were indecisive while others only faced a temporary state of indecision, the reasons for one undecided student's indecision would be different than those of another student. It would also mean that there are likely an infinite number of factors that can lead to student vocational uncertainty.

Numerous additional studies have considered possible correlates of indecision such as: anxiety (Hawkins, Bradley, & White, 1977; Kimes, & Troth, 1974), career salience (Greenhaus, 1971; Greenhaus & Simon, 1977), locus of control (Hartman, & Fuqua, 1983), and self-efficacy (Taylor & Betz, 1983).

***Academic performance.*** Early researchers not only compared undeclared and declared students in terms of their level of vocational certainty, but also in terms of their academic performance in college. The findings from research about undecided students have included results that undecided students are both less academically successful and more academically successful than decided students. Some researchers determined that students who started college undecided about their major and/or career choices achieved more academic success than students who had made a choice. The results from Lewallen's (1995) study, based upon a national sample of over 20,000 students, revealed that higher GPAs were earned by undecided students. Students' pre-college academic aptitude and achievement affected student attrition at a higher rate than selection of degree program. Foote (1980) explains, "high school percentile rank and ACT entrance test scores appeared to be more related to persistence in college than major designation" (p. 33). Students, whether undecided or decided, earning higher college entrance exam scores and being ranked higher in their high school senior class were more likely to persist.

In a comparison of undecided, decided, and major changing students, Anderson, Creamer, and Cross (1989), however, found decided students more academically successful than those who are undecided about a major. Decided students earned significantly higher grades in college than their undecided peers. The disagreement in the literature suggests that there exist a number of other factors that affect college student academic performance beyond the choice to enroll in college without a major.

***Major changing behavior.*** For some students, it may not be about difficulty with making vocational decisions. Often, major choices are made with a lack of information about majors or a lack of experience with decision-making (Gordon, 2007). At Colorado State University (CSU), Titley and Titley (1980) estimated that 65% to 70% of students would change their major at least once before graduation. In a longitudinal study of nine cohorts at Brigham Young University (BYU), Kramer, Higley, and Olsen (1994) determined that an average of 85% of students changed their major at least once. This translates into a small percentage of decided students graduating with the same major they initially declared upon their application for admission. Major changing behavior also reflects a lack of persistence with major choice. Students who do not persist with their initial major choice, as a result, often change majors.

**Subtypes of undecided and decided students: 1980s to 2000s.** With the assumption that there may exist a difference between indecision and indecisiveness, it is possible that the findings from studies on both sides of the disagreement are correct. If the undecided student population cannot be characterized as a homogenous group (Gordon, 2007), there may exist students within the population who are simply faced with vocational indecision and others who are seriously indecisive. Some of the research that followed, as a result, considered the possibility that subtypes of undecided and decided students may exist (Barak & Friedkes, 1981; Fuqua, Newman, & Seaworth, 1988; Jones & Chenery, 1980; Kelly & Pulver, 2003; Larson, Heppner, Ham & Dugan, 1988; Lucas & Epperson, 1988, 1990; Savickas & Carden, 1992; Van Matre & Cooper, 1984; Vondracek, Hostetler, Schulenberg, & Shimizu, 1990; Wanberg & Muchinsky, 1992).

According to Gordon (1995), "it is useful to identify multiple subtypes of undecided students on individual campuses in order to tailor educational and career related interventions to

help them become more focused." (p. x). Gordon (1998) provided a comprehensive synthesis of the research completed regarding subtypes conducted through the 1990s, and concluded there existed seven subgroups of undecided, decided, and indecisive students.

***Decided subtypes.*** There are three types of decided students: the very decided, somewhat decided, and unstable decided (Gordon, 1998). Students categorized in the very decided subtype are characterized by low levels of anxiety, high levels of self-esteem, and high levels of confidence in decision-making. As one moves from the very decided to somewhat decided to unstable decided subtypes, the levels of anxiety increase, the levels of self-esteem decrease, and the students exhibit lowered levels of self-confidence. The very decided students typically require confirmation of their initial decision of major. The other two decided subtypes, in contrast, need to learn how they make decisions and either confirm, reject, or revise their initial choices. These two decided subtypes lack understanding of past decisions and are likely to have relied on others to make decisions for them. Often, these students require a more intrusive advising approach, especially the unstable decided as they do not see an immediate need to explore, confirm, or reject a decision.

***Undecided subtypes.*** There are also three types of undecided students: the tentatively undecided, developmentally undecided, and seriously undecided (Gordon, 1998). Similar to the decided subtypes, the undecided subtypes also start with higher levels of self-esteem and confidence in decision-making to decreasing levels of self-esteem and self-confidence. There are also, however, decreasing levels of vocational identity. The tentatively undecided students require more intrusive advising approaches to encourage exploration of majors and careers. These students also need assistance in gaining competence with decision-making. All three undecided subtypes need to create a plan for major and career exploration that enables them to

fill in the gaps in their levels of self, educational, and occupational knowledge. Often, the developmentally and seriously undecided subtypes need greater understanding of their decision-making history. The seriously undecided may also need some personal counseling to address other personal issues that may be a barrier to exploration and decision.

***Chronically indecisive subtype.*** The final subgroup Gordon (1998) describes as the chronically indecisive. The chronically indecisive students are not usually developmentally ready for the exploration process. For students in this subtype of students, there is a need to work out other issues that are often non-academic in nature before they can engage in the process of exploration. This need may require long-term counseling for excessive levels of anxiety and indecisiveness.

**Career decision-making difficulties: 2000s to the present.** During the late 1990s into the early 2000s, researchers examining vocational indecision shifted focus from possible subcategorization of populations by level of indecision to a return to seeking to understand the sources of indecision related to career choices (Brown & Rector, 2008; Leong & Chervinko, 1996; Page, Bruch, & Haase, 2008; Saka & Kelly, 2008; White & Tracey, 2011). The number of research studies related to the vocationally undecided, however, were already in decline.

The research focused on understanding why students might be undecided about their major first emerged from vocational psychology. The intention was to try to define the undecided students as one homogenous population, first in terms of vocational indecision and later in terms of comparison to decided students. The inability to define the undecided student population as anything but heterogeneous led to the development of research on possible sub-classifications of undecided and decided students. There exist some commonalities among the various categories that scholars developed, so the research on subtypes shifted focus again, this

time on understanding the correlates of indecision. As stated previously, only one study in the past 30 years has compared persistence of undecided and decided students. Leppel (2001) examined undecided student performance and found that undecided students were lower academic performers and had lower rates of persistence in college. Within the last ten years, researchers have advocated for a need for more recent research on these topics (Blustein, 2008; White & Tracey, 2011).

## Factors Influencing Major Selection/Choice

While some of the early researchers focused on indecision, other scholars were examining the reasons why decided students selected a particular academic major over another. As with the research on the undecided student, some of the literature on factors influencing major selection is dated, but is included to show the shift over time in the focus of research studies on potential influences that might have an effect on a student's choice of major.

**Early research.** Some of the early researchers examining academic major selection considered the potential external factors that influenced the choices students made. Cebula and Lopes (1982) found that students chose majors based upon external factors such as starting salary differentials between possible careers related to possible major choices. Mauldin, Crain, and Mounce (2000) also concluded that career opportunities and money served as external factors that influenced students' decisions to select accounting as a possible major. The findings from those studies are not surprising, given the emphasis by colleges and universities placed upon the undergraduate degree serving as a means to accessing specific career fields and opportunities. Looking at how this occurs within a specific discipline, Leppel, Williams, and Waldauer (2001) discovered that students were more likely to select business as their major when they believed that financial success was an important outcome of earning a college degree. Montmarquette,

Cannings, and Mahseredjain (2002) also found that students' choices of majors depended on what they perceived the potential salary earnings would be after college. These sorts of external factors, however, are not likely to affect every student in the same way, nor are they likely to influence how every student selects a particular major. There may be other factors, as a result, that may influence decision making about majors and careers.

***Gender.*** Although external factors such as potential salary may affect choice of major, Montmarquette, Cannings, and Mahseredjian (2002) determined that there was no universal set of attitudes among students, even students within one academic major. Gender, for example, was an important factor that influences students' attitudes about the importance of projected future earnings when it comes to selecting a major. If gender is an important factor in determining a student's attitudes towards earning power and major choice, it stands to reason that gender would also be an important factor influencing college major choice in general. Women, for example, were more likely to select majors in disciplines thought to traditionally have a female gender role orientation (Lackland, 2001).

Worthington and Higgs (2003) found that gender had an effect on whether students chose to major in finance, but at a lower level of influence than other factors such as interest in finance as a profession and student perceptions of finance related occupations. Though gender may affect choice of major, it does not necessarily translate into influence on career choice. When examining the choice of economics as a major, Worthington and Higgs (2004) determined that gender was again a factor, but interest in the major had a greater effect. Gender, as a result, may be said to influence a student's choice of major, but the influence of gender alone may be mediated by other variables. Porter and Umbach's (2006) findings suggest that females were

significantly more likely than males to choose social science disciplines or interdisciplinary options over science majors.

***Parents, family, and teachers.*** The results from a study of the major decision-making process for marketing and non-marketing business students by Newell, Titus, and West (1996) reflected that "students reported that parents and fellow college students are the most influential sources of information when deciding on a future course of study" (p. 60-61). Though parents and family members may influence the choice of major, parental educational background was not found to be a factor. Pearson and Dellman-Jenkins (1997) compared the level of undecidedness for first-generation and non-first-generation students and found no differences between the two groups of students.

In contrast to the above studies, Pearson and Dellman-Jenkins (1997) found that the influence of teachers on decision-making about major was higher than that of the influence of parents and other family members. This suggests that, for some students, the relationship built with other key figures in their community may be more important to their decision-making than are the relationships with or the opinions of parents and/or family members.

When considering family backgrounds and socioeconomic status along with gender, women from high socioeconomic status families were less likely to choose a major in business (Leppel, Williams, & Waldauer, 2001). Men from those same family backgrounds, on the other hand, were more likely to major in business. This may be as the result of traditionally held beliefs regarding gender and professional opportunities.

**Recent studies.** During the past decade, the research on factors that potentially influence a student's choice of academic major have continued to examine some of the same topics, such as gender and parental influence. The focus, however, also expanded to consider other variables such as a student's racial/ethnic background and personality type.

***Gender.*** In one study, it appears that gender continues to influence the selection of particular academic fields of study over others. Ewert (2012) found that more women chose to major in education or health than men. These disciplines have historically been thought of as fields of study for women. Men conversely, according to Ewert (2012), participated in majors in engineering, physical sciences, and mathematics at a higher rate than women.

In a longitudinal study across a 20-year period, Gati and Perez (2014) found that choices were still affected by societal and traditional perceptions of career opportunities typically held by men and women. For example, women continued to be more likely to select areas requiring less use of technical skills. Their findings, however, indicated that men's preferences were similar to women's and that the findings reflected a decrease in gender differences.

***Ethnicity.*** As with gender, ethnicity may influence students to choose a particular field of study over another. Porter and Umbach (2006) found that Black students were more likely than White students to select a major in one of the social sciences or interdisciplinary studies than one of the sciences majors. White students were also less likely than Hispanic students to select a major in the arts and humanities, social sciences, or interdisciplinary studies than in one of science disciplines.

Keshishian, Brocavich, Boone, and Pal (2010) concluded that African American and Hispanic students were less likely to seek a major in pharmacy. Asian students, however, pursued pharmacy at a higher rate. The self-reported race/ethnic backgrounds of students

appeared to have a stronger correlation with the decision to pursue or not to pursue a degree in pharmacy than did any external influence. Some of the reasons for the differences across racial/ethnic groups may not be explained by a student's direct experiences within the institution. Rather, differences may be related to career expectations of various cultures or possibly due to parental influence. Porter and Umbach (2006) believe that personality type is a key factor in why there exist differences across racial/ethnic groups.

***Personality types.*** Pringle, Dubose, and Yankey (2010) examined business majors and determined that college students select their academic majors based on which of those majors are most compatible with their personality type, often based upon commonly-held social stereotypes. For example, students who chose to major in accounting were the most introverted and most likely to conform. Pringle et al. found that the most extroverted students majored in marketing. These findings suggest that, in addition to perceptions about possible future earnings and salary, traditional stereotyping of personality associated with academic majors and careers can be a factor in the choice of academic major. This conclusion also supports the premise of Holland's (1973) theory of careers which argues that individuals will seek out career environments that match most closely with the individual's personality type.

In an examination of another personality trait, Soria and Stebleton (2013) found that internal and external motivational factors differently affect a student's choice of a particular major. Students were less likely to select a major based upon external extrinsic motivations. Internal extrinsic motivation, however, appears to positively influence how students felt about a major. Some of the reason for the negative influence from external motivation may be the result of mixed messaging the students receive about the processes of exploring and choosing a major.

***Parents and family.*** Parents and family members, it appears, continue to be a factor in a student's choice of major or career. Students look to parents and family members for assistance and advice with decisions about major and career (Simmons, 2008). Raymund, Garcia, Restubog, Toledano, Tolentino, and Rafferty (2012) examined parent-student relationships and their influence on student academic and career decision making. Raymund, et al., found that students expressed higher levels of career decision-making self-efficacy and learning goal orientation when self-ratings of parental support were high.

Although parent-student relationships may increase student self-efficacy with making a decision about a career, parental or familial influence may not be as much a factor in determining the specific major a student selects. Porter and Umbach (2006), for example, did not find that family had an effect on student major choices. More specifically, in terms of a particular academic field, Keshishian, et al., (2010) concluded that family members did not have an influence on whether a student elected to pursue a major in pharmacy. Students majoring in pharmacy were less likely to select pharmacy as the result of external factors such as others people's opinions about their decision. Given the small amount of data on the subject and difficulties linking the specific research question asked from one study to the next, it is difficult to conclude with certainty whether family background alone has a significant effect on major selection.

Gender still appears to be a factor, often influencing students to select majors fitting with societal and traditional perceptions of the past (Ewert, 2012; Gati & Perez, 2014). Students also continue to look to individuals of importance, such as parents and family members, for assistance with making decisions about what to study in college (Simmons, 2008). The level of influence a student might attribute to a parent or family member, however, may be mediated by other

variables (Keshishian, Brocavich, Boone, & Pal, 2010). The reasons why students make the choices they make, and the influences that have the greatest effect, appear to vary when variables such as race/ethnicity and personality types are included (Porter & Umbach, 2006; Pringle, Dubose, & Yankey, 2010). Simply, the factors that influence students to select one discipline over another vary from student to student.

## Summary

As college completion is a current priority for higher education, understanding the effects of a variety of variables on college student persistence becomes important for colleges and universities. The mixed results in the research considering demographic characteristics of students and persistence reflect the complexity of college student persistence. There appears little agreement across the literature in terms of which students are more likely to persist to degree completion, whether defined by gender (Blecher, 2006; Cech, Rubineau, Silbey, & Seron, 2011; DesJardins, Kim, & Rzonca, 2003; Rigali-Oiler & Kurpius, 2013), race/ethnicity (Wolfle, 2012), or other demographic variables (Astin, 2005-2006; Ishitani, 2003; Oseguera & Rhee, 2009).

With gender, the findings from the research studies reviewed suggest a lack of agreement about the effect on whether students are more likely to graduate. In some studies, women were less likely to persist and in others they were more likely to persist (DesJardins, Kim, & Rzonca, 2003; Ewert, 2012). Some of the findings were based in self-perception of intent to persist which may not be an effective measure of whether one gender actually persists at a higher rate than another (Cech, Rubineau, Silbey, & Seron, 2011).

Unlike gender, surprisingly there did not appear a correlation between race/ethnicity alone and persistence in the research (Rigali-Oiler & Kurpius, 2013). It is possible that other factors, such as socioeconomic status, play a more significant role in persistence as with, for

example, Mendoza, Mendez, and Malcolm's (2009) findings regarding students with incomes above $40,000 persisting at the highest rates. Still, those findings were for White and Native American students only.

When examining first-generation status, regardless of family income, the findings suggest first-generation students may be at greater risk of dropping out than continuing-generation students (Ishitani, 2003). First-generation status may be one characteristic where there appears to be consensus that it is an influencing factor when determining college student persistence (Ishitani, 2006; Soria & Stebleton, 2012). Still, first-generation students can be found in all race/ethnic groups, socioeconomic statuses, or gender groups, so there may be a need to investigate more deeply how these subpopulations of first-generation students persist or fail to persist.

When considering the relationship between academic achievement and persistence, generally the higher the earned GPA in college, the higher the likelihood that a student will persist (Stewart, Lim, & Kim, 2015). When students enroll full-time in college and register for a higher number of credit hours during their first year, the result is often higher persistence rates (DesJardins, Kim, & Rzonca, 2003). There is little disagreement with respect to college GPA and enrollment in the literature. This may be because earned college GPA and number of enrolled units are more easily defined variables than many others. Even still, one research study's findings included a higher likelihood of drop out for African American students who earned high grades during their first year (St. John, Hu, Simmons, Carter, & Weber, 2004).

Part of the challenge in research on college student persistence is there is little rigidity to what some of the variables mean given the lack of clear consistent definitions of those variables. Again, the exception being GPA, which is easily defined, which may be the reason for the

general agreement across the research findings. With respect to college student persistence, there does not appear to be agreement about the effects of certain variables on the likelihood to persist. This suggests that the intersection of these variables and the uniqueness of each individual student lead to varied results in terms of persistence and attrition rates. It is not easy to generalize when terms have not been defined clearly or consistently.

In terms of undecided students, the research findings also lack agreement. Yet, there is a belief that once a student selects a major, he or she is more likely to graduate. As Titley and Titley (1980) describe:

> It has been our experience that all too often many parents, college administrators, faculty, counselors, and academic advisers, while mildly tolerant of those who have not chosen a major, seem to assume that a student's selection of major represents a fully crystallized choice rather than a mere manifestation of the normal trial and exploratory phase of this developmental span. (p. 293)

Though perception is that once students declare a major they are more likely to persist and graduate in a timely manner, there is no recent study that has determined whether this is actually true. The findings reviewed reflect that students may not be certain of their initial choices given major changing behavior and lack of persistence with major choices. However, here again, inconsistent and unclear definitions across the literature makes it difficult to generalize the findings. In contrast, this study intended to provide some consistency and clarity of what being undecided means and as it relates to the relationship between persistence and major choice or lack thereof at the time of initial enrollment.

As there is a lack of research on the relationship between college student persistence and a student's initial choice to enroll with or without a major, and due to the lack of agreement in

the literature about undecided students, the perception of the need to declare early continues to prevail. With this study, the intention was to provide a clearer operationalized definition of the undecided/undeclared college student population so as to begin developing a body of literature. This would allow for the research findings to be more easily generalized across institutions, regardless of institutional type, so that the perception of undecided students is not what drives the institutional responses to student persistence concerns, but rather the findings from a more comprehensive base of knowledge.

## Conceptual Framework

The conceptual framework for this study was Astin's (1993) input-environment-output (I-E-O) model as it provides a structure for assessing the effects of college on students. As the purpose of this study was to examine the relationship between matriculating with or without a declared major and college student persistence, the model will examine how college affects undeclared and declared students differently, if at all. The model also lends itself to quantitative studies, such as this one (Aston & antonio, 2012).

Too often, research on the effects of college on students has been incomplete, examining only outcomes, only the effects of environments on outcomes, or only the effects of inputs on outcomes (Astin & antonio, 2012). Important in this model is that it requires that researchers not simply attribute the outcomes to the experiences that a student has while in college, or to attribute the outcomes solely to the student. The I-E-O model, as a result, is a more complete framework since it not only examines the relationship between college experiences and outcomes, but also considers the ways in which the inputs the student brings may interact with the environment and influence the likelihood of the outputs being measured. Therefore, the I-E-O model is a helpful conceptual way to frame studying the effects of college on students.

### Inputs

When students matriculate to colleges and universities, they bring into the environment a variety of qualities. These characteristics and attributes are referred to in the I-E-O model as inputs. Inputs may include: demographic and background characteristics; pre-college academic achievement and preparation; personal, educational, and career goals and aspirations; self-ratings; values, beliefs, and attitudes; and student behaviors (Astin & antonio, 2012). Inputs are those personal characteristics that the student introduces to the environment.

### Environment

Within the I-E-O model, the environment involves those experiences and interactions that occur between the student and some variable within the institution. More specifically, environments include the courses in which students enroll, the programs and activities in which students participate, and the individuals with whom students interact. Environmental variables might often interchangeably be referred to as interventions, experiences, practices, and/or programs (Astin & antonio, 2012). It is important, as reflected by how inputs interact with environments, to understand that to some extent, the environment is something that in part is created or developed by the student as the student may make choices about whether to engage or participate in some of the experiences provided within the environment.

### Outputs

Outputs are rarely only affected by inputs, but rather are affected by inputs, environments, and the interaction of inputs together within the environment. As Astin and antonio (2012) explain, outputs are "the 'talents' we are trying to develop in our educational program" (p. 19). The outputs in the I-E-O model are those measureable outcomes of the study

that are desired to achieve. In the case of this study, the outputs are college student persistence and degree completion.

# CHAPTER III:

# RESEARCH METHODS AND METHODOLOGY

## Introduction

For this study, the primary research question was, does there exist a difference in persistence through to degree completion when a student matriculates as undeclared versus declared? Some students, parents, faculty, staff, and higher education administrators perceive a lack of an early decision about a major as reflective of being at risk of not successfully completing a degree. There has been, however, as explained in chapter two, little agreement about whether there actually exists differences in the persistence of college students based on whether they begin college with a major or not. Considering the increased interest placed on degree completion in today's higher education environment, understanding if persistence is correlated with initial status as declared or not is integral to the college completion agenda.

In this chapter, the research methodology for this study is explained including the conceptual framework, research questions, descriptions of the institution from which the data were collected, the research methods, student populations, variables examined, methods of data collection, ethical considerations, and how that data were analyzed.

## Methodological Approach

The study employed a quantitative approach. As the research questions included in this study focused on understanding the possible relationships or associations between two or more variables, it was more specifically a quantitative study with a correlational design. Descriptive, comparative, and multivariable statistical hypotheses were tested in this study to determine

whether the "variables are related or whether one can predict another" (Creswell, 2012, p. 21). Data collected from institutional databases were used to analyze college student persistence and its relationship to outcomes of persistence and graduation, as mediated by different input and environmental factors.

The results of this study may have implications for institutional policies about major selection, as well as how colleges and universities provide programs and support services to both undeclared and declared students. For example, if the findings suggest that declaring a major upon initial enrollment is integral to persistence and timely graduation, college and university leaders may want to make it policy to require that students declare upon entry. If not, however, campus policy may need to be designed to provide students time to explore possible academic majors before deciding.

**Philosophical Assumptions**

For this study, the research was examined through a lens influenced by both a post-positivist and a transformational framework. Post-positivists are not of the mind that a strict cause and effect exists. Instead, post-positivists acknowledge that all cause and effect can be seen as a probability that may or may not happen (Creswell, 2013). I do not necessarily believe that one variable alone can solely predict a particular result. Likely, a variety of causes are responsible for whether students persist or not in college.

Through my work in the academic advising profession, I have come to believe that in higher education, undeclared students are often misperceived as a collective group that is "less than" that of declared students. As Mertens, Bledsoe, Sullivan, and Wilson (2010) explain "the transformative ontological belief emphasizes that which seems 'real' may instead be reified structures that are taken to be real because of historical situations" (p. 8-9). Because of this, if we

want to have equitable institutional outcomes for students, we need to question the stated and unstated "truths" within our institutions that perceived some groups of students as more capable than others. This study, as a result, was motivated by the desire to more clearly understanding the correlations that may or may not exist with being undeclared versus declared and college student persistence. Ultimately, the aim was to determine if the undecided students really are "less than" their declared peers.

**Researcher Positionality**

As mentioned above, I viewed this study through the post-positivist and transformational lenses. I have spent much of the past two decades assisting undecided students with major exploration and choice, as well as working with declared students to confirm, revise, or reject and replace their initial choices of major. At the same time, I was not undecided about my college major upon entering higher education. I have found, in the one-to-one interactions with my students, that no two students are alike. Each brings with them a unique set of intersections of identities, beliefs, values, interests, and goals. From that experience, and fitting with the post-positivist perspective, I entered into this study believing that a student's persistence would not be affected solely by the student starting college without a declared major. I had previously often wondered, however, if there might be some truth to the idea that undecided students may in fact be at more at risk of not completing college than their declared peers. This resulted in the desire to ask the whether there existed a relationship between being undecided and college student persistence.

I have been fortunate in my professional experiences to have the opportunity to develop an advising program designed to assist students who are undecided or in transition between majors. This occurred on a campus that understood there existed a need to provide better support

to those populations. Even on that campus, however, there was a perception that undecided students were less likely to succeed in college and as a result more likely to dropout. As the transformational perspective seeks to make positive change for groups that have often been mistakenly marginalized, some of the interest I had in this study was the hope that the results may help to change that view of the undecided as less than their peers. As a result, I did bring both personal student and staff perspectives and some biases that influenced the research I conducted with this study. In an attempt to limit some of my bias, I did not examine the profession of academic advising in this study. Though the findings may influence how advising services are designed for undeclared and declared students alike, the study focused on the relationship between college student persistence and academic major, or lack thereof, at the point of entry.

**Conceptual Framework**

Astin's (1993) input-environment-outputs (I-E-O) model was used as a conceptual framework for conducting this study. The I-E-O model allows for the researcher to examine how pre-college characteristics and attributes of students, as well as environmental characteristics and interactions, may affect student outcomes (Renn & Reason, 2013). As a result, I have mapped the input and environmental variables, as well as the outputs measured, to the I-E-O model as displayed in Figure 3, to operationalize the study variables within the conceptual framework.

## Research Questions

This study examined whether matriculating with a declared academic major or as undeclared was a significant factor in the persistence through to degree completion of first-time in college students. Table 1 shows each of the research questions and the statistics that were

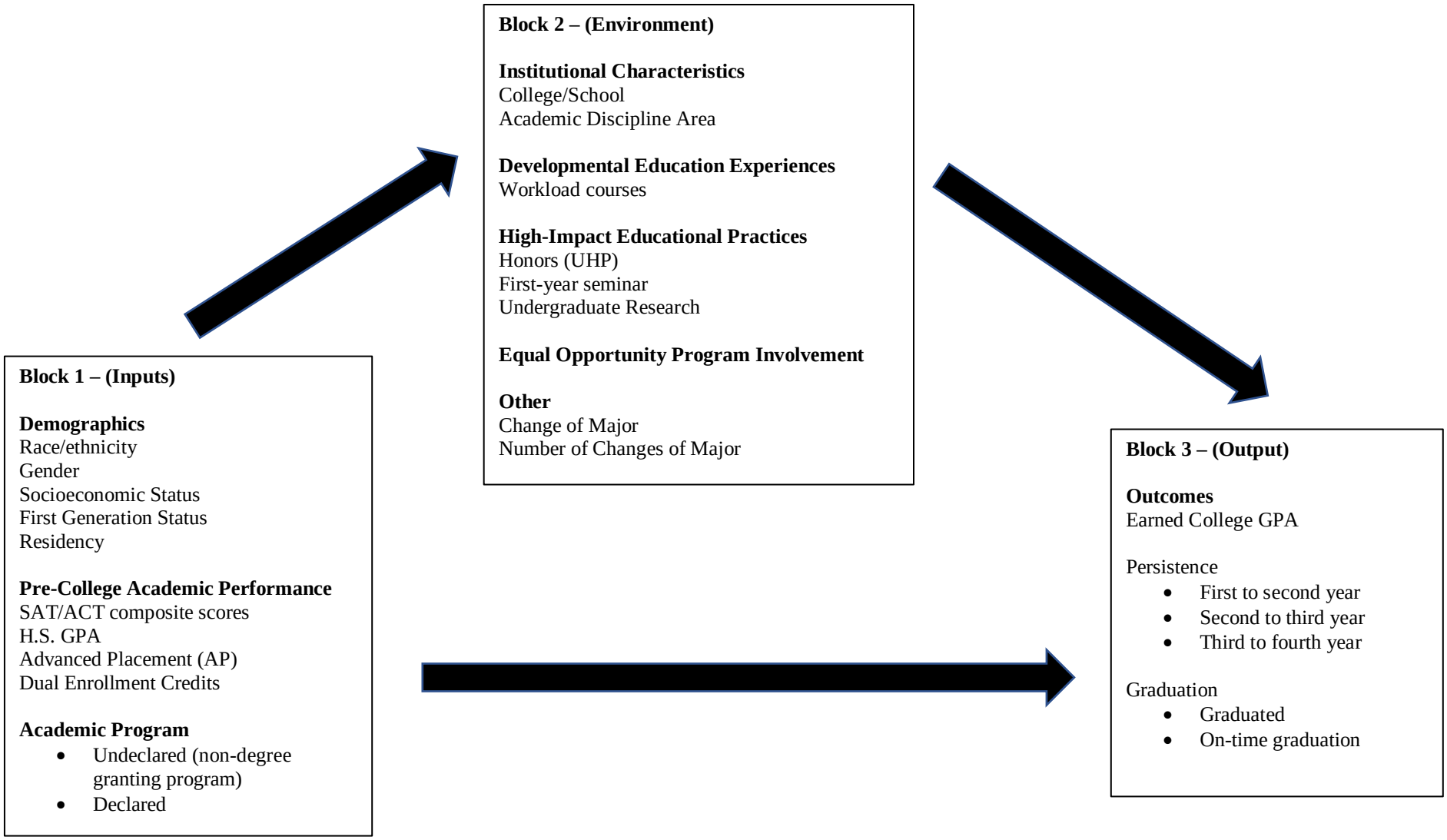


*Figure 3.* Variables for this study operationalized into the conceptual framework of Astin's (1993) I-E-O model.

calculated to find the results for each question. The research questions guiding this study were as follows:

1. What are the demographic characteristics of first-time in college freshmen that matriculated to the institution in the fall 2010 quarter as undeclared and declared?
2. What are the pre-college academic performance, developmental/workload course enrollment, and high-impact educational practice participation characteristics of first-time in college freshmen that matriculated to the institution in the fall 2010 quarter as undeclared and declared?
3. Are there statistically significant differences in college academic performance (earned college GPA) of first-time in college freshmen that matriculated to the institution as undeclared and declared?
4. To what extent, if any, do first-time in college freshmen that matriculated to the institution as undeclared and declared change their major?
5. To what extent do the variables included in this study predict college student persistence of first-time in college freshmen?
6. To what extent do the variables included in this study predict graduation of first-time in college freshmen?

## Data Sources

The sources of data obtained for this study included a number of units at the research site. These sources of data included student record information from institutional databases maintained by the Office of the Registrar and student participation and involvement data from a number of programs and support services across the campus. The data were obtained with assistance from staff in the Center for Educational Effectiveness as that unit was able to

Table 1

*Research Questions, Variables, and Statistical Tests*

| Research question | Dependent Variable | Independent Variable(s) | Test(s) |
|---|---|---|---|
| 1. What are the demographic characteristics of first-time in college freshmen who matriculated to the institution in the fall 2010 quarter as undeclared and declared? | | | frequency, percent |
| 2. What are the pre-college academic performance, developmental/ workload course enrollment, and high-impact educational practice participation characteristics of first-time in college freshmen who matriculated to the institution in the fall 2010 quarter as undeclared and declared? | | | frequency, percent, independent t-test |
| 3. Are there statistically significant differences in the within college academic performance (earned college GPA) of first-time in college freshmen who matriculated to the institution as undeclared and declared? | earned college GPA | academic program (undeclared, declared) | one-way ANOVA |
| 4. To what extent, if any, do first-time in college freshmen who matriculated to the institution as undeclared and declared change their major? | change of major | academic program (undeclared, declared) | one-way ANOVA |

Table 1 (continued)

| Research question | Dependent Variable | Independent Variable(s) | Test(s) |
|---|---|---|---|
| 5. To what extent do the input and environmental variables predict college student persistence of first-time in college freshmen? | persistence | *background* (race/ethnicity, gender, SES, first-generation status, residency, H.S. GPA, SAT, AP, dual credit, academic program) *environment* (college, academic discipline area, developmental/workload courses, first-year seminar, undergraduate research, EOP) | logistic multiple regression, one-way ANOVA |
| 6. To what extent do the input and environmental variables predict graduation of first-time in college freshmen? | graduation | *background* (race/ethnicity, gender, SES, first-generation status, residency, H.S. GPA, SAT, dual credit, H.S. rank, academic program) *environment* (college, academic discipline area, developmental/workload courses, honors, first-year seminar, undergraduate research, EOP) | logistic multiple regression |

collectively provide data about each of the variables included in this study and remove the student identification numbers.

**Research Site**

The institution for which the data were examined in this study, was categorized as a Carnegie Doctoral/Research-Extensive institution located in the Western United States of America. This university was established in 1905 and is a part of a larger state system consisting of 10 institutions of higher education. The university consists of four undergraduate colleges that award bachelor's degrees from 104 different degree programs. There are an additional 99 graduate and professional degree programs offered at the institution as well.

The university currently has over 36,000 students enrolled, with nearly 30,000 undergraduate students. Of that undergraduate student population, the gender distribution is 59% women, 41% men. The racial/ethnic background of students is 35% Asian/Pacific Islander, 26% White, 21% Hispanic, 4% African American/Black, 1% American Indian/Alaskan Native, with 2% of the population not reporting their racial/ethnic background. An additional 12% of the student population are the international students enrolled at the university. The undergraduate student population could also be delineated by first-generation status. Currently, 41% of undergraduates are considered first-generation, and 59% as non-first-generation.

The institution receives over 67,000 first-time in college applications for admission each year, and typically offers admission to over 28,000 of those applicants. Of that number, the institution yields in its admission efforts a freshman class just over 5,700. The university reports a first to second year retention rate for first-time in college freshmen at 92% for the fall 2015 cohort of students. The average number of quarters (fall, winter, spring) to degree completion for first-time in college freshmen is 12.3 quarters. The four-year graduation rate has steadily

increased from 53.5% for the fall 2008 cohort to 60.6% for the fall 2012 cohort. The six-year graduation rate has also increased from 81.3% for the fall 2006 cohort to 84.5% for the fall 2010 cohort.

### Student Sample

The data collected examined the entering fall 2010 cohort of full-time enrolled, first-time in college undergraduate students, from their first quarter of matriculation through the Summer 2016 term at the research site described above. For this cohort, 4,489 students enrolled as first-time in college freshmen at the institution in the fall 2010 quarter. More detailed specifics about the demographics of the cohort are described in chapter 4 as part of the findings associated with the first two research questions. The student sample does not include new transfer students, students enrolled part-time (less than 12 units), or graduate students. Students who were pursuing a second baccalaureate degree were not included in the sample as these students had already earned an undergraduate degree.

## Data Collection

In order to begin collection, institutional data were requested from Center for Educational Effectiveness. This included information regarding each student's academic program or major at time of matriculation, in order to note whether the student was to be classified as undeclared or declared. The variables for the study also included student demographic variables, student pre-college and within-college academic performance variables, within college experiences, and outcome measures. More specifically, this study included: race/ethnicity, gender, socioeconomic status, first-generation status, residency (in-state, out-of-state/international), admissions entrance exam scores, high school GPA, advanced placement (AP), dual enrollment credits completed, academic college, academic discipline area, academic program (major), developmental

education/workload course enrollment, honors program involvement, first-year seminar enrollment, undergraduate research participation, Equal Opportunity Program (EOP) participation, earned college GPA, change of major, number of changes of major, persistence to the second year, persistence to the third year, persistence to the fourth year, persistence by total number of quarters enrolled, graduation, and on-time graduation. All of the information was provided in a single spreadsheet. The spreadsheet was organized with column headings for each of the variables being considered in this study. The data were then recoded for the purpose of statistical analyses using IBM SPSS v24.

**Input Variables**

For the purpose of this study, the variables for student demographic characteristics, pre-college academic performance, and academic program were utilized in helping to answer the descriptive and inferential research questions included in this study. These variables were collectively organized into the inputs block of the I-E-O operationalized map of this study. The data in these categories were determined based upon classifications used by the state and/or the institutional site, and/or self-identified and self-disclosed information by students upon their application for admission to the university. Table 2 shows the input variables in more detail and the coding for each of the variables used for this study.

The demographic variables for the study included: race/ethnicity, gender, socioeconomic status, first-generation status, and residency, which are categorized based on the practice at the institutional site. There were multiple categories of race/ethnicity including one category, "Not Reported," for those students who elect not to report their background to the institution. Gender and first-generation status were both dichotomous variables as reported by the institution. For the residency variable, in contrast, a student might have been categorized as either in-state, out-of-

state, or international. As a result, the variable was coded dichotomously as either in-state resident or out-of-state/international resident for the statistical analyses. Coding the residency variable dichotomously allowed for the variable to be included in the logistic regression modeling required for the last two research questions.

The input variables for this study also included those that reflected the academic performance of the student population prior to matriculation. As with the demographic variables, the pre-college academic performance variables were inputs in the I-E-O model. The data for these variables were from test score results as well as high school and college transcripts (in the case of dual enrollment credit earned while in high school). For the high school GPA variable, the data were examined as a continuous variable and by range of GPAs. The results from SAT and ACT composite exams scores were included for those students who completed those exams and have reported scores at the university. For advanced placement (AP) and dual enrollment credit, student records were distinguished by students who earned credit through those means in contrast with those students who did not. AP data was collected both as a dichotomous variable that represented whether students earned AP credit or not, and the number of AP exams passed. Dual enrollment credit received and the number of dual enrollment courses completed were also collected.

The final input variable was the student's academic program status. Students were coded as either undeclared or declared. For this study, as the definition of undeclared was those students matriculating into the institution without a degree-granting program selected, the students in the undeclared academic programs that do not lead to an earned degree were considered undeclared.

Table 2

*Input Variables and Coding*

| Variables | Coding | |
|---|---|---|
| Race/Ethnicity | 1 = African-American/Black | 0 = no, 1 = yes |
| | 2 = American Indian/Alaskan Native | 0 = no, 1 = yes |
| | 3 = Asian/Asian-American | 0 = no, 1 = yes |
| | 4 = Latino/Chicano | 0 = no, 1 = yes |
| | 5 = Pacific Islander | 0 = no, 1 = yes |
| | 6 = White/Caucasian | |
| | 7 = Not Reported | |
| Gender | 1 = Female | |
| | 0 = Male | |
| Socioeconomic Status | 1 = Not Lower Income Status | |
| | 0 = Lower Income Status | |
| First-Generation Status | 1 = First-Generation Status | |
| | 0 = Non-First-Generation Status | |
| Residency | 1 = In-State Resident | |
| | 0 = Out-of-State/International Resident | |
| High School GPA | Between 0.000 to 4.000 | |
| ACT composite scores | Between 1 and 36 | |
| ACT score ranges | 0 = No score reported | |
| | 1 = 0 to 9.99 | |
| | 2 = 10 to 18.99 | |
| | 3 = 19 to 27.99 | |
| | 4 = 28 to 36 | |
| SAT composite scores | Between 400 and 1600 | |
| SAT score ranges | 0 = No score reported | |
| | 1 = Less than 600 | |
| | 2 = 600 to 1199 | |
| | 3 = 1200 to 1799 | |
| | 4 = 1800 to 2400 | |
| AP exams passed | Between 0 to 13 | 0 = no, 1 = yes |

Table 2 (continued)

*Input Variables and Coding*

| Variables | Coding |
|---|---|
| Dual credit | 0 = Did not complete dual credit<br>1 = Completed dual credit |
| Number of dual credit courses | Between 0 to 30 |
| Academic Program | 0 = Undeclared (programs of no formal award)<br>1 = Declared (programs) |

**Environmental Variables**

The environmental variables in this study, as depicted in the operationalization of Astin's (1993) I-E-O model, may be factors that are correlated with the output variables for this study. For this block of the model, variables related the undergraduate academic college of initial entry, academic discipline area, developmental education coursework, high-impact educational practices (i.e. honors program, first-year seminars, and undergraduate research, Equal Opportunity Program) are included. The environmental variables for this are detailed in Table 3.

The undergraduate academic college of entry may be an environmental factor that influences persistence and graduation as each college's academic support services are structured differently from one to the next. Additionally, the policies and procedures within each college may not be consistent with all of the other colleges. The data for this variable were coded based on which of the four undergraduate colleges at the university within which the student's academic program is located. Each of the colleges was recoded into dichotomous variables for the logistic regression calculation with the exception of the College of Engineering, which was selected as the dummy variable for the statistical analyses as engineering was the college with the lowest number of students and did not contain an undeclared academic program code.

Each of the academic degree programs was also categorized within the institutional databases under a specific academic discipline area. Each of these nine academic discipline areas, much like each college, may have some unique environmental characteristics, such as the resources available to support students, how academic advising services are provided, or the culture of the academic units that fall within each area. Each of the academic discipline areas was recoded into dichotomous variables for the logistic regression calculations with the exception of the AES-Collegewide programs discipline area. This was designated as the dummy variable for analyses as it contained only the undeclared/exploratory program students which were accounted for in other variables. In some of the regressions that only selected declared student, the social sciences academic discipline area was selected as the dummy variable.

For some students, there may have been a need to enroll in developmental education coursework designed to remediate a deficiency in math, science, and/or writing ability at the time of matriculation. At the institution included in this study, developmental education coursework is referred to as workload courses. Some of these workload courses are taught by instructors at the university, while other courses are taught on campus by instructors from a nearby community college. The data for this variable were coded based on if students had any workload courses versus no workload courses.

Three additional environmental variables include student participation in high-impact educational practices (HIPs). The first of which, the honors program, contains students enrolled in a variety of majors across the different undergraduate colleges at the institution. The data were coded based on participation or not in honors which is reflected in enrollment in the Integrated Studies (IST) coursework required of the program. The second of the HIPs, first-year seminars, are courses in which first-year students may opt to enroll. These courses, however, are not

Table 3

*Environmental Variables and Coding*

| Variables | Coding | |
|---|---|---|
| College | 1 = Agricultural & Environmental Sciences | 0 = no, 1 = yes |
| | 2 = Biological Sciences | 0 = no, 1 = yes |
| | 3 = Engineering | |
| | 4 = Letters & Science | 0 = no, 1 = yes |
| Academic Discipline Area | 1 = Agricultural Sciences | 0 = no, 1 = yes |
| | 2 = Ag Collegewide Programs | |
| | 3 = Environmental Sciences | 0 = no, 1 = yes |
| | 4 = Human Sciences | 0 = no, 1 = yes |
| | 5 = Biological Sciences | 0 = no, 1 = yes |
| | 6 = Engineering | 0 = no, 1 = yes |
| | 7 = Humanities, Arts | 0 = no, 1 = yes |
| | 8 = Math and Physical Sciences | 0 = no, 1 = yes |
| | 9 = Social Sciences | 0 = no, 1 = yes |
| Developmental Education/ Workload Courses | 0 = Did not enroll in developmental education/workload<br>1 = Did enroll in developmental education/workload | |
| Number of Developmental Education/Workload Courses | Between 0 to 13 | |
| Honors Program (IST) | 0 = Did not participate<br>1 = Participated | |
| First-Year Seminar | 0 = Did not enroll in a first-year seminar<br>1 = Enrolled in a first-year seminar | |
| Undergraduate Research | 0 = Did not participate<br>1 = Participated | |
| Equal Opportunity Program (EOP) | 0 = Did not participate<br>1 = Participated | |
| Number of Changes of Major | Between 0 to 5 | |
| Change of Major | 0 = Did not change major<br>1 = Made one or more changes of major | |

required of all students. The data collected also contains information about which students enrolled in those courses.

The third of the high-impact educational practices (HIPs) variables was undergraduate research. As the site of the study is a research institution, students may seek out and participate in undergraduate research. Student participation in undergraduate research was determined based on enrollment in specific course numbers designated for such activity. Again, the data were coded based on participation or not in undergraduate research. Other high-impact educational practices were not included in this study due to challenges, including: lack of, or difficulty collecting data about those programs; lack of some other HIPs at the institution, and inconsistent tracking of student participation.

For some students from underrepresented student populations, the option of participating in the Equal Opportunity Program (EOP) was offered. Students were not required to participate and as a result, some students elected to opt out. This data for this variable included categorization based on participation in EOP or not.

The institution assigns all students an academic program, from a list that includes academic programs in which students may earn an undergraduate degree, as well as categories of program options such as the various types of college undecided/undeclared. This tracking of academic programs throughout a student's enrollment enabled examination of whether changes of major, or the number of changes of major, have an effect on persistence and graduation. Although there exist six types of undecided/undeclared academic programs at the institution, again, these are program designations which are not actual majors in which students may earn degrees. Students may apply to the institution as undeclared or declared.

For this study, a change of major occurred when a student changed from one degree-granting academic program designation to another degree-granting academic program designation. A change of major was not counted, however, when an undeclared student first declared a degree-granting program. In other words, when an undeclared student changed their initial non-degree "undeclared" academic program designation to one of the degree granting programs, it was identified as their first declaration of a major. Only after declaring a program, could a change of major be measured. Similarly, when a student changed from a degree granting undergraduate program designation to undeclared or another non-degree granting designation, it was not considered a change of major as the student had not changed from one degree-granting program to another. This is an important consideration as the behavior of making an initial decision or choice of major is not the same as having already made a choice of one degree-granting program and then changing that selection to a new degree-granting program. Moving from an undeclared, non-degree-granting program, in contrast, would involve making a decision that changes the student from a place of uncertainty of choice to an academic program in which they could earn a degree. Whereas changing from one degree-granting program to another involves leaving one possible place of certainty about a degree path for another.

**Output Variables**

The purpose of this study was to examine the relationship between enrolling undeclared versus declared major and college student persistence from initial matriculation to completion of a degree. As a result, the first of the output variables was student persistence in college. Student persistence was measured in two different ways. First, persistence from year to year was determined by tracking if the student remained enrolled each subsequent fall quarter from one year of college to the next. Measuring from year to year is important as it enables institutional

leaders to know where possible points of intervention exist to increase the likelihood of student progress to degree completion (Mortgenson, 2012). This was only tracked for the first four years. Tracking beyond the fourth year is complicated by the possibility that many students graduated and would be counted as non-persisters because they did not enroll for an additional year. Second, persistence was also measured by total number of quarters enrolled. This was important as student enrollment patterns for students are not always continuous and some students may elect to take a quarter or year or more off from college (Goldrick-Rab, 2006; Hagedorn, 2012).

The second output variable, graduation, was measured in terms of whether a student graduated or not, and whether those students who graduated did so on-time. On-time graduation for first-time in college, full-time students, also referred to as normal time to completion (National Center for Educational Statistics, 2017), is defined as within four years of initial enrollment, through the Summer after their fourth year of enrollment. The institutional site, similarly to the National Center for Educational Statistics, includes the summer following the fourth year in the four-year graduation rate. As a result, students who completed a degree during the summer 2014 term were included as graduating in four years to be consistent with institutional practice. Similarly, students who graduated at the end of the summer 2016 term following the end of their sixth year were included as part of the six-year graduation rate. Table 4 details the output variables operationalized in the I-E-O conceptual model, and how they were coded for this study.

One additional output variable, the cumulative earned college GPAs variable was identified from the institutional databases for each of the students in the fall 2010 entering cohort. There was no need to calculate GPA. All GPAs were based upon a 4.0 scale (four points earned for each hour of A, three for each hour of B, two for each hour of C, one for each hour of

Table 4

*Dependent Variables and Coding*

| Variables | Coding | |
|---|---|---|
| Earned College GPA | Between 0.000 to 4.000 | |
| Persistence to second year | 0 = Did not persist, did not graduate<br>1 = Persisted to second year | |
| Persistence to third year | 0 = Did not persist, did not graduate<br>1 = Persisted to third year | |
| Persistence to fourth year | 0 = Did not persist, did not graduate<br>1 = Persisted to fourth year | |
| Persistence by quarters | Between 1 to 18 | |
| Graduation | 0 = Did not graduate<br>1= Graduated | |
| On-time Graduation | 0 = Did not graduate<br>1 = Graduated in four years<br>2 = Graduated in six years | <br>0 = no, 1 = yes<br>0 = no, 1 = yes |

D, and zero for each hour of F). For this study, all earned college GPAs were reported up to three significant figures to remain consistent with institutional practice at the site. Of note, the earned college GPA does not include grades from developmental education/workload courses. The earned college GPAs were reported as a continuous variable for analyses.

## Data Access and Security Concerns

Approval from the Institutional Review Board at the University of Alabama (see Appendix A) was obtained before the collection of data occurred. For the institution included in this study, inquiry about whether additional approval from the institutional site's review board was determined to not be necessary upon receipt of the approval from the University of Alabama. Although use of student identification numbers was necessary for the Center for

Educational Effectiveness at the institutional site to collect the information from the student records, confidentiality was assured as student records were de-identified prior to being provided for the study. As a result, no identification numbers were used in the statistical data or reported in the study. The data obtained from the institution were secured on a separate external drive that was used for this study only. The external drive was initialized with a password protection as an additional measure of security.

## Statistical and Data Analysis

Descriptive, inferential, and multivariate analyses were conducted to analyze the effects of the input and environmental variables on the outputs of persistence and graduation and answer the research questions. Descriptive analyses are helpful in determining if the data contains any overall trends (Creswell, 2012) and helped to answer the first two research questions as described in more detail below. For questions two, three, and four, inferential statistical analyses were necessary, as these questions were comparing a number of independent variables by students who selected undeclared versus declared academic programs at the time of matriculation. Analyses involving the comparison of two or more variables should involve inferential statistics (Astin & antonio, 2012; Creswell, 2012; Tabachnick & Fidell, 2007). The inferential statistics calculated are described in more detail in the next pages.

For the final two questions, multivariate analyses were conducted using logistic multiple regression modeling, as the relationship of multiple independent variables on one dependent variable (academic program) was being examined. Such analyses require the use of multiple regression (Creswell, 2012). The data were analyzed with IBM SPSS v24. For the regression analyses, list-wise deletion was utilized when a student's record was missing data for one or more of the variables being studied. As mentioned above, Table 1 displayed the research

questions, variables, and statistical tests in more detail. The statistical tests for each research question are also described in the next pages.

Research Question One: What are the demographic characteristics of first-time in college freshmen who matriculated to the institution in the fall 2010 quarter as undeclared and declared?

For this first question, the answer was calculated through the use of descriptive statistics to determine the characteristic make-up of the undeclared and declared populations, using cross-tabulation. Cross-tabulation provided information about overall trends in the data for undeclared and declared student populations. The student characteristics included gender, ethnic/racial background, residency, first-generation status, and socioeconomic status distributions for both the undeclared and declared populations.

Research Question Two: What are the pre-college academic performance, developmental/workload course enrollment, and high-impact educational practice participation characteristics of first-time in college freshmen who matriculated to the institution in the fall 2010 quarter as undeclared and declared?

For this question, descriptive and inferential statistics were calculated. The descriptive statistics were determined using cross-tabulations to distinguish if any differences exist between undeclared and declared students. The descriptive statistics calculated provided an increased understanding of students' pre-college academic performance, developmental/workload enrollment characteristics, and high-impact educational practices (HIPs) participation characteristics.

To compare the pre-college academic performance of students who matriculate as undeclared versus declared, a comparison of the means for pre-college academic performance of each of the student populations was calculated using an independent t-test statistic. Additionally,

the homogeneity of variance assumption was tested using the Levine Test to examine if the two groups, undeclared and declared have different statistical variances. Independent t-tests were also calculated comparing the undeclared and declared populations with respect to enrollment in development/workload courses and to high-impact educational practice (HIP) participation.

Research Question Three: Are there statistically significant differences in the within college academic performance (earned college GPA) of first-time in college freshmen who matriculated to the institution as undeclared and declared?

As this question examined one independent variable, status as undeclared or declared, and compared the means for earned college GPA of each of the student populations to determine if there were any statistical differences, a one-way analysis of variance (ANOVA) was calculated. The null hypothesis for this question was that there is no significant difference in the means for the earned college GPA for those students who matriculate as undeclared versus declared. Additionally, the homogeneity of variance assumption was tested using the Levine Test to examine if the two groups, undeclared and declared, had different statistical variances.

The two student academic program categories have different sample sizes, and as this question involved comparing two or more means to check for statistically significant differences, it required a comparison of the means for each of the variables. Although, an independent t-test could be calculated to compare the means of two sample sizes, given the large difference in the number of students in each group, the results might not have been conclusive in terms of statistical significance (Witte & Witte, 2010). As a result, to conduct the comparison, a one-way ANOVA, was calculated. The homogeneity of variance assumption was also tested using the Levine statistic and the Welch *F* statistic to determine if there was a significant difference in variance for the undeclared versus declared populations.

Research Question Four: To what extent, if any, do first-time in college freshmen who matriculated to the institution as undeclared and declared change their major?

For this question, as with question three, an analysis of variance was calculated using a one-way ANOVA. The homogeneity of variance assumption was again tested using the Levine Test to examine if the two groups, undeclared and declared, have different statistical variances in terms of likelihood of changing majors. The null hypothesis for this question was that there is no significant difference in the means for number of changes of major for those students who matriculate as undeclared versus declared

Research Question Five: To what extent do the variables included in this study predict college student persistence of first-time in college freshmen?

Research Question Six: To what extent do the variables included in this study predict graduation of first-time in college freshmen?

To answer these two questions, logistic multiple regression analyses were calculated to determine if there is an effect for each of the types of input and environmental variables on the outcomes. Logistic multiple regression is useful to predict the likelihood of a possible outcome (Witte & Witte, 2010). For the logistic multiple regression statistic, dependent variables such as race/ethnicity, college, academic discipline area, where multiple labels were in use for example, were coded as dichotomous variables using “0 and “1”. One category or label was left un-coded and served as a dummy variable to ensure the appropriate degrees of freedom for analyses. Doing so allowed for the level of influence of each of the variables to be analyzed separately from each other.

Logistic multiple regression analyses were calculated to determine if there was a varying level of effect on the predictability of the outcome measures of persistence and graduation. More

specifically, the analyses allowed for the examination of the relationship between enrolling with or without a declared major and college student persistence and degree completion as well as the other input and environmental variables included in the study. The findings for each of the analyses are presented in more detail in chapter four of the study.

## Limitations

There exist some limitations to this study. First, the study is limited by the use of one institutional site. Each institution of higher education is unique in a variety of ways, including but not limited to, size, location, student population, degree programs offered, geography, technology, and mission. As a result, the use of one institution in this study may limit the applicability of the results to other institutions, especially those institutions that differ the most from the site used in the study.

Although this study was conducted using an institution classified as a research institution, there exist a variety of different institutions within the category of research institution. One such difference illustrated in this study is the research site's use of a quarter-based academic calendar as opposed to a semester-based academic calendar. Similarly, another limitation is that, although the institution is part of a larger state-wide system of institutions of higher education, each of the 10 institutions in the system is unique from the others in many ways. In the future, it may be worth considering the research questions from this study in the context of the larger system, or possibly across multiple research institutions.

In addition, this study was limited by the data that were available through the various sources at the institution. There may be other variables that mediate the effects of the inputs and the environment interactions on the measured outcomes of this study. More specifically, the study was limited in the number of high-impact educational practices (HIPs) and, as a result, the

findings would not include the effects of the all ten types of HIPs on persistence and graduation. Additionally, some of the effects of programs and interactions that were measured in this study may have changed over time due to changes in those structured programs, changes in individuals associated with those programs, and unique interactions students have within the environment.

This study was also limited in its applicability given that it only included full-time, first-time in college students. The findings, as a result, may not be the same for students who elected to enroll as part-time. Additionally, the applicability may be limited for transfer students or second baccalaureate students, those students who have previously attended college.

## Delimitations

This study had the following delimitations as determined by the researcher:

1. The student population for this study did not include students who transferred into the institutions from other colleges and universities. Only students who were first-time in college students were included in the study. Students who completed dual enrollment credit, college coursework while in high school, were included, however, as the institutional site classifies these students as first-time in college students and not as transfer students.
2. Only students who were first-time in college students who initially matriculated to the institution in the fall 2010 quarter were included in this study. Students who matriculated prior to or after the fall 2010 quarter were not included. Additionally, students pursuing a second baccalaureate degree were not included given that these students were not in college for the first time.
3. The site for this study was a large, public, research-intensive university. Institutions of higher education of different types, such as small, private, liberal arts, two-year, and/or

for profit institutions, for example, were not included in this study. Institutions not classified as research-intensive were also not included.

4. The site for this study was an institution located in the western United States. Institutions from different geographical regions of the country were not included in this study.
5. Only full-time enrolled students, as measured by enrollment in 12 or more units during their first quarter of enrollment, the fall 2010 quarter, were included in this study. Part-time students, as measured by having enrolled in fewer than 12 units during their first quarter of enrollment were not included in this study.

## Summary

Among a variety of constituents in higher education, there is a perception that undeclared students are at risk of not successfully completing their college degree. The literature, however, reflects that differences exist among results that are ultimately inconclusive as to whether the persistence of college students is impacted by whether they begin college with a major or as an undeclared student. With increased pressure on institutions to increase degree completion, it is necessary to examine whether persistence is correlated to initial status as declared or not is necessary. The results of this study provide valuable information that could have implications on institutional policies about major selection, and on the organization of the support services provided to both undeclared and declared students.

This chapter described the research methodology for this study. It discussed the study's framing through the lenses of post-positivism and transformational ontological philosophy as well as within the conceptual framework of the Astin I-E-O model (1993). The chapter also included an explanation of the quantitative approach including the use of institutional databases, the framing of the research questions, the descriptions of the institution from which the data were

collected, the research methods and student populations, the variables examined, the methods of data collection, the ethical considerations that have been made, and how the data were analyzed.

# CHAPTER IV:

# RESULTS

This chapter includes the findings from the statistical analyses of this study. The chapter is organized into sections by each of the research questions and the corresponding statistical analyses. For the first section, a cross-tabulation by students undeclared and declared about a major was conducted on the demographic characteristic variables included in this study. The results of the frequencies and cross-tabulations are presented in four tables. These results answer the first research question.

For the second section, the results presented answer the second of the research questions. Again, cross-tabulation by students undeclared and declared about a major was conducted. Compared were the variables for pre-college academic performance (high school GPA, ACT and SAT composite scores, dual enrollment courses, and AP exam passed), developmental/workload enrollment, and high-impact educational practices (HIPs) (honors, first-year seminars, undergraduate research, and the Equal Opportunity Program) by undeclared versus declared students in the study. Additional independent t-tests were calculated to determine if statistical differences existed between undeclared and declared students with respect to pre-college academic performance, developmental/workload enrollment, and high-impact educational practices (HIPs) participation. The results of the frequencies, cross-tabulations, and independent t-tests for this section are presented in eighteen tables and five figures.

The third section of this chapter includes findings from statistical analysis of college academic performance as measured in earned college GPA, answering the third research

question for this study. For this section, a one-way analysis of variance (ANOVA) was calculated to determine if a difference existed in the earned college GPAs of those students who matriculated as undeclared and those who matriculated as declared. The earned college GPA was utilized as the dependent variable for the one-way ANOVA. The descriptive statistics and results from the one-way ANOVA, including the Levine statistic for homogeneity of variance and the Welch's *F* statistics as a robust test of equality of means, are presented in two tables.

The fourth section includes findings from statistical analyses from one-way ANOVAs. ANOVAs were completed to answer the fourth research question regarding possible differences in changes of major by undeclared versus declared academic program. The dependent variable for the first of the one-way ANOVAs was changes of major. A subsequent one-way ANOVA was completed to determine if possible differences exist in the number changes of major by undeclared versus declared academic program. The dependent variable for this one-way ANOVA was the number of changes of major. Again, the descriptive statistics and results from each of the one-way ANOVAs, including the Levine statistics for homogeneity of variance and the Welch's *F* statistics as a robust test of equality of means, are presented in four tables.

For the fifth section, the results are presented that answer the fifth of the research questions. To answer this question, logistic multiple regression models were calculated, using Astin's (1993) conceptual model, distributing the variables into two blocks: one for the input variables and one for environmental variables. A regression analysis was calculated for each of the measures of persistence as an output variable (persistence to the second year, persistence to the third year, and persistence to the fourth year) using the same samples, with the exception of the persistence to the fourth year measure which excluded students who had graduated prior to the start of the fourth year from the sample. The findings for each block, within each regression

calculated, are presented in three tables. Included in the findings is the Nagelkerke $R^2$ statistic which provided an estimate of the percentage of cases that were classified correctly. Also included was the Hosmer and Lemeshow Test statistic which reported goodness of fit for the regression models. A one-way ANOVA was also conducted to determine if differences existed in persistence by quarters enrolled for undeclared versus declared students. Additional regression models for each persistence from year to year measure were also calculated selecting only undeclared or only declared students to determine in any within group differences existed. Those findings for those regressions are presented in six tables.

The final section includes the findings from two logistic multiple regression analyses. This section, more specifically, answers the sixth and final research question which pertains to the variables regarding graduation and on-time graduation. Again, the variables were sorted into the same two blocks for input and environmental variables per the operationalization of the study into the I-E-O conceptual model. A regression was conducted for each of the measures of graduation (graduated and on-time graduation), again using the same samples for both measures. The inclusion of all of the four-year graduates in both samples is consistent with how graduation rates are reported in IPEDS as the six-year graduation rates include all of the students who graduated within four years. The results included the Nagelkerke $R^2$ statistic as a measure of the percentage of cases that were classified correctly by the regression model. The Hosmer and Lemeshow Test statistic which reported goodness of fit for the regression models was also included in the results. The results are presented in this section in two tables. Additional regression models for each graduation measure were also calculated selecting only undeclared or only declared students to determine in any within group differences existed. The findings for those additional regressions are presented in two tables.

## Demographic Characteristics

The first research question for this study was: what are the demographic characteristics of first-time in college freshmen who matriculated to the institution in the fall 2010 quarter as undeclared and declared? In order to answer this question, cross-tabulations were conducted to determine the frequencies of each of the demographic characteristics and whether the entering major was undeclared versus a declared degree program. For three of the demographic variables, there existed some missing cases due to non-responses. For the race/ethnicity variable, the non-response was 38 ($n$ = 38*)*. Missing cases for socioeconomic status were 823 ($n$ = 823) and for first-generation status were 233 ($n$ = 233).

### Race/Ethnicity

As displayed in Table 5, Asian/Asian-American students were the largest reported ethnic group at the institution in this entering cohort at 42.1% ($n$ = 1891). Nearly two-thirds of the students reported an ethnic background other than White. None of the remaining ethnic groups make up more than 10.0% of the students in the cohort.

Table 5

*Summary of Race/Ethnicity*

| Variable | Total | |
|---|---|---|
| | *n* | % |
| Race/Ethnicity | | |
| African American/Black | 141 | 3.1 |
| American Indian/Alaskan Native | 45 | 1.0 |
| Asian/Asian-American | 1891 | 42.1 |
| Latino/Chicano | 823 | 18.3 |
| Pacific Islander | 16 | .4 |
| White/Caucasian | 1401 | 31.2 |
| Not Reported | 134 | 3.0 |
| Missing Cases | 38 | .8 |
| Total | 4489 | 100.0 |

More specifically, utilizing the cross-tab function, Table 6 exhibits the percentages of students who enrolled as undeclared or declared for each of the racial/ethnic groups reported. The percentage of students who reported their ethnic background and who first enrolled in one of the six undeclared academic programs ranged from a low as 8.9% ($n$ = 4) of American Indian/Alaskan Native students to as high as 22.1% ($n$ = 310) of White students. Of the students who opted not to report their race/ethnicity, 100.0% ($n$ = 134) first matriculated to the institution with a declared major. The overall percentage of undeclared students was 19.9% ($n$ = 896) and declared students was 80.1% ($n$ = 3593), but with the unknown race/ethnicity not included, the percentages were 19.3% ($n$ = 858) undeclared and 80.7% ($n$ = 3593) declared. Asian/Asian-American (44.3%) and White (36.1%) were the categories with the largest percentages of undeclared students.

Table 6

*Race/Ethnicity by Undeclared and Declared Academic Program*

| | Undeclared | | | Declared | | |
|---|---|---|---|---|---|---|
| Variable | *n* | % by race | % undeclared | *n* | % by race | % declared |
| Race/Ethnicity | | | | | | |
| African American/Black | 26 | 18.4 | 3.0 | 115 | 81.6 | 3.2 |
| American Indian/Alaskan Native | 4 | 8.9 | .5 | 41 | 91.1 | 1.1 |
| Asian/Asian-American | 380 | 20.1 | 44.3 | 1511 | 79.9 | 42.1 |
| Latino/Chicano | 136 | 16.5 | 15.9 | 687 | 83.5 | 19.1 |
| Pacific Islander | 2 | 12.5 | .2 | 14 | 87.5 | .4 |
| White/Caucasian | 310 | 22.1 | 36.1 | 1091 | 77.9 | 30.4 |
| Not Reported | 0 | 0 | 0 | 134 | 100.0 | 3.7 |
| Total | 858 | 19.3 | 100.0 | 3593 | 80.7 | 100.0 |

**Gender, Socioeconomic Status, First-Generation Status, and Residency**

Other demographic characteristics, as displayed in Table 7, provide more detail about the students in the fall 2010 cohort. The reported gender distribution shows a larger percentage of

females at 54.9% (*n* = 2463) then males at 45.1% (*n* = 2026). The socioeconomic status of students, as mentioned before, contained 823 student records with no response. The students identified as lower socioeconomic status represented 32.5% (*n* = 1458) of the cohort. As a result, nearly one-third of the students were categorized in the lower socioeconomic status group.

In terms of first-generation status, the largest group in the cohort was the non-first-generation students at 56.8% (*n* = 2549). First-generation status students represented 38.0% (*n* = 1707) of the cohort, with an additional 5.2% (*n* = 233) of student records identified as non-responses. With residency, only a small percentage, 3.3% (*n* = 148), were from out-of-state and/or international residents. As a result, most of the students, 96.7% (*n* = 4341), were from in-state.

Table 7

*Summary of Gender, Socioeconomic Status, First-Generation Status, and Residency*

| Variable | Total *n* | Total % |
|---|---|---|
| Gender | | |
| Female | 2463 | 54.9 |
| Male | 2026 | 45.1 |
| Socioeconomic Status | | |
| Lower Status | 1458 | 32.5 |
| Not Lower Status | 2208 | 49.2 |
| Income Level Non-Response | 823 | 18.3 |
| First-Generation Status | | |
| First-Generation Status | 1707 | 38.0 |
| Non-First-Generation Status | 2549 | 56.8 |
| First-Generation Status Non-Response | 233 | 5.2 |
| Residency | | |
| In-State Resident | 4341 | 96.7 |
| Out-of-State/International Resident | 148 | 3.3 |

The cross-tabulation of the breakdown of gender, socioeconomic status, first-generation status, and residency by undeclared versus declared program of study, as shown in Table 8, provides more detail about the cohort examined in this study. Undeclared students, when distributed by female (21.9%, *n* = 515) or male (18.8%, *n* = 381), represent roughly one in five students for each gender. For those students with responses for socioeconomic status, again the results were that nearly one in five students in each status subgroup matriculated as undeclared. Specifically, within low socioeconomic status, undeclared students were 18.4% (*n* = 268) of the subgroup, while similarly, 19.1% (*n* = 422) of students in the not lower status subgroup were undeclared.

Table 9

*Other Demographic Characteristics by Undeclared and Declared Academic Program*

| | Undeclared | | | Declared | | |
|---|---|---|---|---|---|---|
| Variable | *n* | % by category | % undeclared | *n* | % by category | % declared |
| Gender | | | | | | |
| Female | 515 | 20.9 | 57.5 | 1948 | 79.1 | 54.2 |
| Male | 381 | 18.8 | 42.5 | 1645 | 81.2 | 45.8 |
| Socioeconomic Status | | | | | | |
| Lower Status | 268 | 18.4 | 29.9 | 1190 | 81.6 | 33.1 |
| Not Lower Status | 422 | 19.1 | 47.1 | 1786 | 80.9 | 49.7 |
| Income Level Non-Response | 206 | 25.0 | 23.0 | 617 | 75.0 | 17.2 |
| First-Generation Status | | | | | | |
| First-Generation Status | 322 | 18.9 | 35.9 | 1385 | 81.1 | 38.5 |
| Non-First-Generation Status | 518 | 20.3 | 57.8 | 2031 | 79.7 | 56.5 |
| First-Gen. Non-Response | 56 | 24.0 | 6.3 | 177 | 76.0 | 4.9 |
| Residency | | | | | | |
| In-State Resident | 866 | 19.9 | 96.7 | 3475 | 80.1 | 96.7 |
| Out-of-State/International | 30 | 20.3 | 3.3 | 118 | 79.7 | 3.3 |

Within the first-generation status subgroupings and the residency subgroupings, again, there existed a similar distribution of undeclared and declared students. Undeclared students represent 18.9% (*n* = 322) of the first-generation status subgroup and 20.3% (*n* = 518) of the non-first-generation status subgroup. In terms of residency, undeclared students were 19.9% (*n* = 866) of in-state students and 20.3% (*n* = 30) of out-of-state/international students. The distribution of undeclared versus declared students across each of these demographic variables was also consistent with the overall cohort distribution.

## Pre-College Academic Performance, Developmental Education/Workload Courses, and High-Impact Educational Practices

The second research question for this study was: what are the pre-college academic performance, developmental/workload course enrollment, and high-impact educational practice participation characteristics of first-time in college freshmen who matriculated to the institution in the fall 2010 quarter as undeclared and declared? To answer this question, cross-tabulations were again conducted to determine the frequencies of each of the variable and whether the entering major was undeclared versus a declared degree program.

For three of the pre-college academic variables, there existed some missing cases due to non-responses recorded in the institutional databases. For the high school GPA variable, there were two missing cases where a high school GPA was not reported. As not all students were required to take the ACT and/or SAT, 59.5% (n = 2763) of the student records do not include an ACT score and .2% (n = 9) of the student records do not include an SAT score. As nearly all of the student records had an SAT composite score, there was no need to convert ACT scores to SAT equivalent scores. There were no missing values for the developmental education/workload coursework or high-impact variables.

**High School GPA**

For high school GPA, the first of the pre-college academic performance variables, as displayed in Table 9, the largest group of matriculated students at 48.1% (*n* = 2158) of the cohort earned grade point averages between 3.500 and 3.999. The next largest group, 40.1% (*n* = 1799) earned high school GPAs of 4.000 or above. Collectively, over 88.0% of students in the fall 2010 cohort matriculated having earned high school GPAs of 3.500 or above.

When conducting the cross-tabulation of high school GPA by undeclared versus declared major, as shown in Table 10, the largest percentage of undeclared students, 30.8% (*n* = 4) are those who earned high school GPAs between 2.500 and 2.999. The largest group, by number of

Table 9

*Summary of High School GPA Range*

| Variable | Total *n* | Total % |
|---|---|---|
| High School GPA | | |
| 4.000 or above | 1799 | 40.1 |
| 3.500-3.999 | 2158 | 48.1 |
| 3.000-3.499 | 517 | 11.5 |
| 2.500-2.999 | 13 | .3 |
| 2.000-2.499 | 0 | 0 |
| 1.999 or below | 0 | 0 |
| No High School GPA reported | 2 | 0 |

students (*n* = 476, 22.1%), however, were the students who earned high school GPAs between 3.500 and 3.999. The percentages of undeclared students in each high school GPA range increase as the high school GPA range decreases. The percentages increase from 16.5% (*n* = 297) for students in the 4.000 or above range to 22.1% (*n* = 476) to 30.8% (*n* = 4) for students in the 2.500 to 2.999 GPA range. None of the students, whether undeclared or declared earned high school GPAs below 2.500.

Table 10

*High School GPA Range by Undeclared and Declared Academic Program*

| | Undeclared | | | Declared | | |
|---|---|---|---|---|---|---|
| Variable | *n* | % by range | % undeclared | *n* | % by range | % declared |
| High School GPA | | | | | | |
| 4.000 or above | 297 | 16.5 | 33.1 | 1502 | 83.5 | 41.8 |
| 3.500-3.999 | 476 | 22.1 | 53.1 | 1682 | 77.9 | 46.8 |
| 3.000-3.499 | 119 | 23.0 | 13.3 | 398 | 77.0 | 11.1 |
| 2.500-2.999 | 4 | 30.8 | .4 | 9 | 69.2 | .3 |
| 2.000-2.499 | 0 | 0 | 0 | 0 | 0 | 0 |
| 1.999 or below | 0 | 0 | 0 | 0 | 0 | 0 |

To determine if undeclared and declared students earn different high school GPAs, an independent t-test to compare the means of each group was conducted. The results of the independent t-test are presented in Table 11 and Figure 4. When examining the homogeneity of variance assumption as tested by using the Levine Test ($F$ = .139, $p$ = .709) the two groups do not appear to have different variances.

Table 11

*Comparison of Undeclared and Declared Majors by High School GPA Earned*

| Test | *n* | Mean | SD | *t* | *p* |
|---|---|---|---|---|---|
| Undeclared | 896 | 3.821 | .29541 | -4.338 | .000 |
| Declared | 3591 | 3.869 | .29515 | | |

There is, however, significant difference at the $p < 0.001$ level in the mean high school GPA for students enrolled as undeclared majors versus the mean high school GPA for students enrolled as declared majors ($t$ = -4.338, $p$ = .000). As a group, students who matriculate as undeclared have lower high school GPAs ($\bar{x}$ = 3.821) as compared to their declared peers ($\bar{x}$ = 3.869).

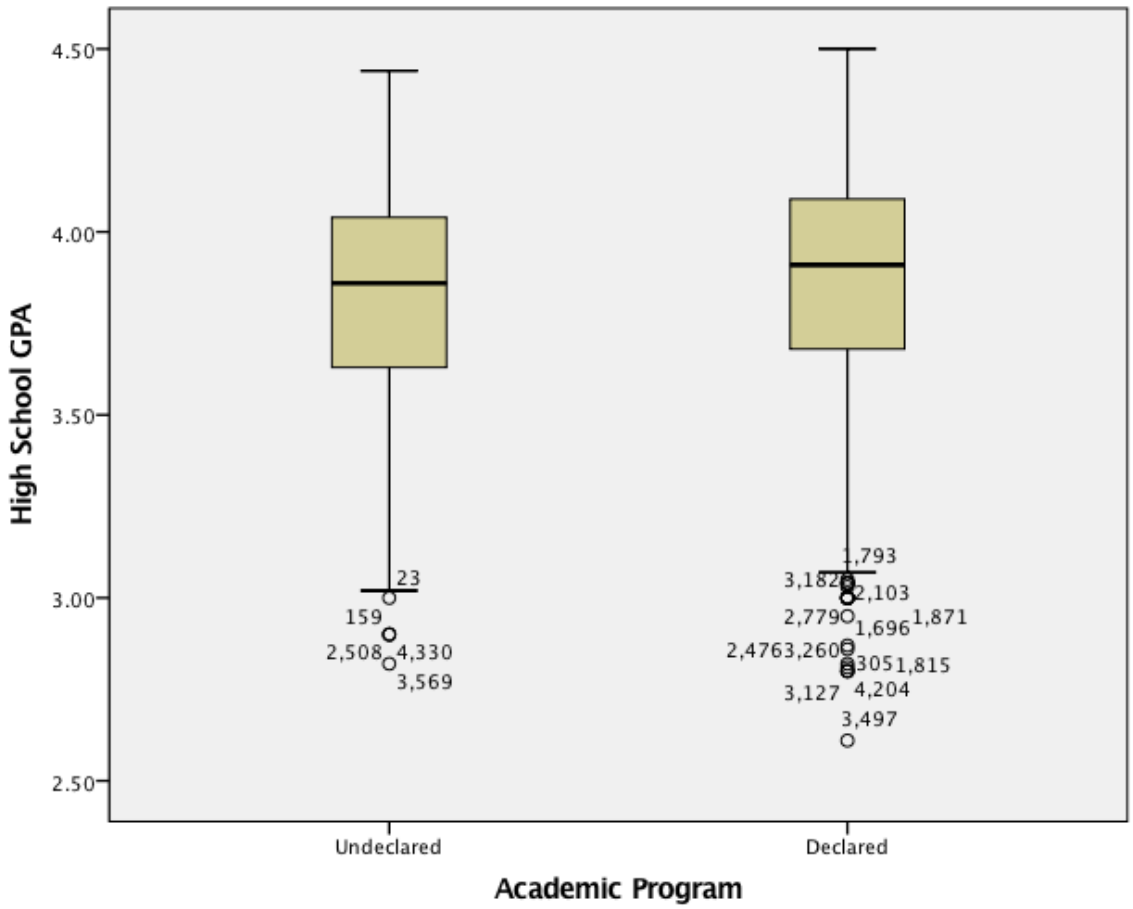


*Figure 4.* Box-and-whiskers plot comparing the high school GPA earned by declared and undeclared academic program (major) groupings.

**ACT and SAT Composite Scores**

For ACT composite scores, as displayed in Table 12, the largest group of students did not take the ACT exam, again, at 59.5% (*n* = 2763) of the fall 2010 cohort. Of those students who took the ACT exam, 58.4% (*n* = 1816) earned scores between 19 and 27.99. An additional 36.6% (*n* = 664) earned scores of 28 or higher. The remaining 5.0% (n = 91) of students with ACT composite scores earned scores between 10 and 18.99.

As mentioned above, only nine students did not take the SAT exam. Of those students who did take the SAT exam, the largest group at 57.8% (*n* = 2590) earned scores between 1800

and 2400 out of a total possible score of 2400. Another 41.6% (*n* = 1865) earned scores between 1200 and 1799. Only .6% (*n* = 25) of students earned scores below 1200. As a result, over 99% of students earned SAT composite scores above 1200.

Table 12

*Summary of ACT and SAT Composite Score Ranges*

| Variable | Total *n* | Total % |
|---|---|---|
| ACT Composite Scores | | |
| 28 to 36 | 664 | 36.6 |
| 19 to 27.99 | 1061 | 58.4 |
| 10 to 18.99 | 91 | 5.0 |
| 0 to 9.99 | 0 | 0 |
| SAT Composite Scores | | |
| 1800 to 2400 | 2590 | 57.8 |
| 1200 to 1799 | 1865 | 41.6 |
| 600 to 1199 | 25 | .6 |
| Less than 600 | 0 | 0 |

When conducting the cross-tabulation of ACT and SAT composite scores by undeclared versus declared major, as shown in Table 13, the largest percentage of undeclared students in an ACT composite score subgroup, 20.5% (*n* = 136), were those students who earned ACT composite scores between 28 and 36 out of 36. The next largest percentage of undeclared was 19.8% (*n* = 18) of the subgroup that earned ACT composite scores between 10 and 18.99. Undeclared students also represented 17.4% (n = 185) of the subgroup that earned scores between 19 and 27.99. For SAT composite scores, the largest percentage of undeclared students in a particular subgroup, 24.0% (*n* = 6) were those students who earned scores between 600 and 1199. It is worth noting that the number of students in this subgroup, however, represent less than one percent of the fall 2010 cohort. The next largest percentage by SAT composite score

subgroup of undeclared students was 20.8% ($n$ = 540) and were the students who earned scores between 1800 and 2400. Undeclared students also represented 18.7% ($n$ = 348) of the students who earned SAT composite scores between 1200 and 1799.

Table 13

*ACT and SAT Composite Score Ranges by Undeclared and Declared Academic Program*

| | Undeclared | | | Declared | | |
|---|---|---|---|---|---|---|
| Variable | *n* | % by range | % undeclared | *n* | % by range | % declared |
| ACT Composite Scores | | | | | | |
| 28 to 36 | 136 | 20.5 | 40.1 | 528 | 79.5 | 35.7 |
| 19 to 27.99 | 185 | 17.4 | 54.6 | 876 | 82.6 | 59.3 |
| 10 to 18.99 | 18 | 19.8 | 5.3 | 73 | 80.2 | 4.9 |
| 0 to 9.99 | 0 | 0 | 0 | 0 | 0 | 0 |
| SAT Composite Scores | | | | | | |
| 1800 to 2400 | 540 | 20.8 | 60.4 | 2050 | 79.2 | 57.2 |
| 1200 to 1799 | 348 | 18.7 | 38.9 | 1517 | 81.3 | 42.3 |
| 600 to 1199 | 6 | 24.0 | .7 | 19 | 76.0 | .5 |
| Less than 600 | 0 | 0 | 0 | 0 | 0 | 0 |

To determine if undeclared and declared students earn different ACT and SAT composite scores, an independent t-test to compare the means of each group was conducted for each test. The results of the independent t-tests are presented in Tables 14 and 15 and Figures 5 and 6. For ACT composite scores, when examining the homogeneity of variance assumption as tested by using the Levine Test ($F$ = 2.127, $p$ = .145) the two groups do not have different variances.

Table 14

*Comparison of Undeclared and Declared Majors by ACT Composite Score Earned*

| Test | *n* | Mean | SD | *t* | *p* |
|---|---|---|---|---|---|
| Undeclared | 339 | 26.3687 | 3.97283 | .887 | .375 |
| Declared | 1477 | 26.1468 | 4.19582 | | |

There was no significant difference in the mean ACT composite scores for students enrolled as undeclared majors versus the mean ACT composite scores for students enrolled as declared majors ($t$ = .887, $p$ = .375). Though not statistically significant, the mean ACT composite scores for students categorized in one of the six undeclared academic programs was slightly higher ($\bar{x}$ = 26.369) than for students who matriculated directly into a degree-granting academic program as declared ($\bar{x}$ = 26.147).

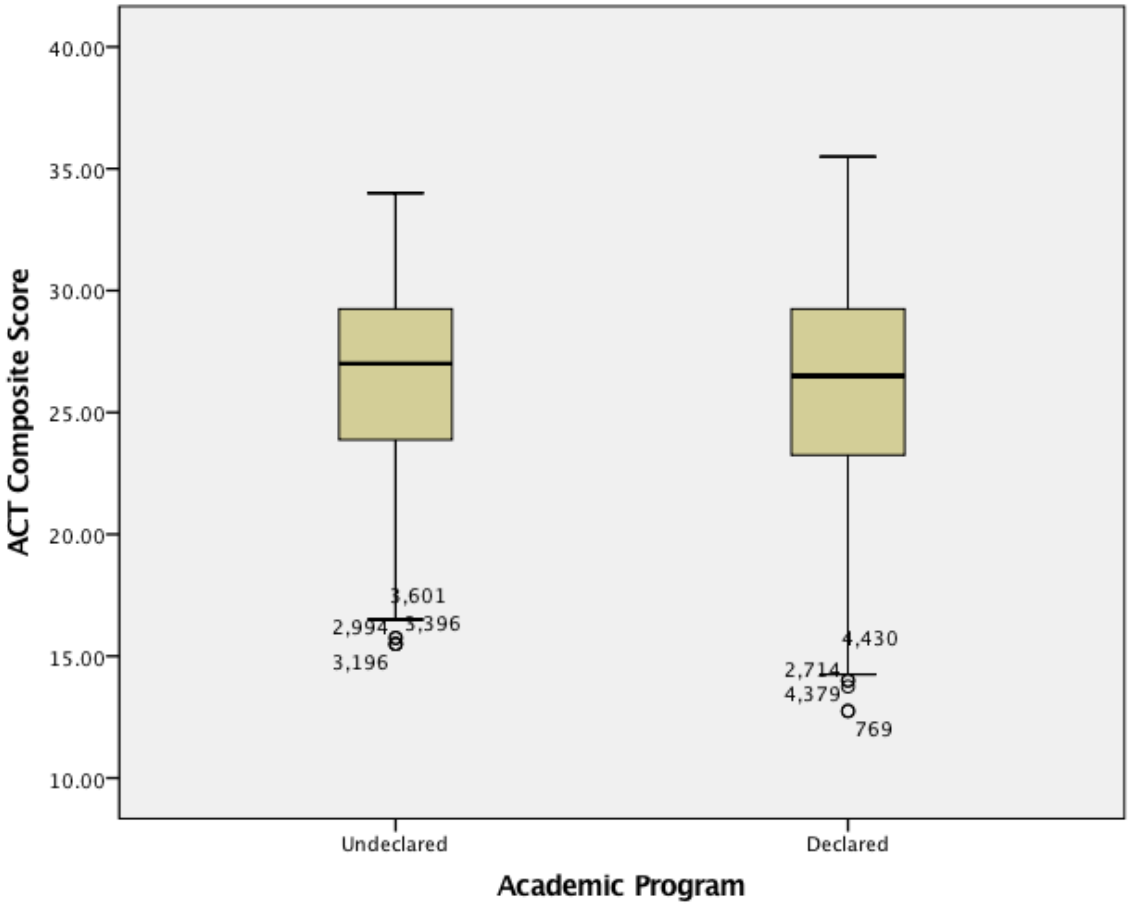


*Figure 5.* Box-and-whiskers plot comparing the ACT composite score earned by declared and undeclared academic program (major) groupings.

For the independent t-test conducted for the SAT composite scores, when examining the homogeneity of variance assumption as tested by using the Levine Test ($F$ = .081, $p$ = .776),

the undeclared students do not appear to have different variances from the declared students.

Table 15

*Comparison of Undeclared and Declared Majors by SAT Composite Score Earned*

| Test | *n* | Mean | SD | *t* | *p* |
|---|---|---|---|---|---|
| Undeclared | 894 | 1827.59 | 229.907 | 1.198 | .776 |
| Declared | 3586 | 1817.42 | 226.596 | | |

There was no significant difference in the mean SAT composite scores for students enrolled as undeclared majors versus the mean SAT composite scores for students enrolled as declared majors ($t$ = 1.198., $p$ = .231). Though not statistically significant, as with the ACT composite scores, the mean SAT composite scores for undeclared students was slightly higher ($\bar{x}$ = 1827.59) than for declared students ($\bar{x}$ = 1817.42).

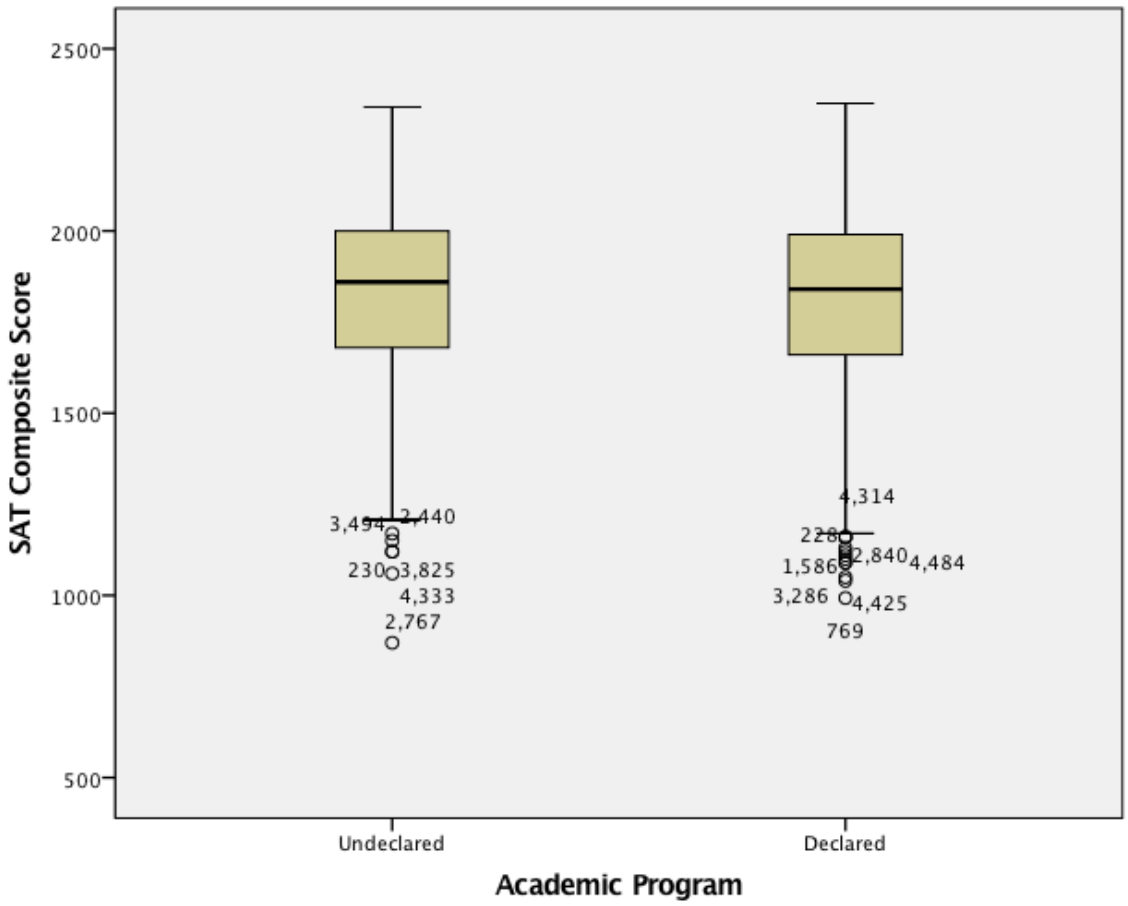


*Figure 6.* Box-and-whiskers plot comparing the SAT composite score earned by declared and undeclared academic program (major) groupings.

**Advanced Placement**

Advanced placement (AP) exams taken while in high school provide another measure of pre-college academic performance, as depicted in Table 16, for the fall 2010 cohort. Only 22.2% (*n* = 997) of the students in this study did not pass at least one AP exam prior to matriculation at the institution. The largest group of students who passed at least one AP exam, at 14.1% (*n* = 633), were the students who passed just one AP exam. Fewer than 20.0% of students passed six or more AP exams.

Table 16

*Summary of Number of AP Exams Passed*

| Variable | *n* | % | cumulative % |
|---|---|---|---|
| AP Exams Passed | | | |
| 0 | 997 | 22.2 | 22.2 |
| 1 | 633 | 14.1 | 36.3 |
| 2 | 592 | 13.2 | 49.5 |
| 3 | 599 | 13.3 | 62.8 |
| 4 | 501 | 11.2 | 74.0 |
| 5 | 415 | 9.2 | 83.2 |
| 6 | 315 | 7.0 | 90.3 |
| 7 | 200 | 4.5 | 94.7 |
| 8 | 119 | 2.7 | 97.4 |
| 9 | 54 | 1.2 | 98.6 |
| 10 | 44 | 1.0 | 99.6 |
| 11 | 13 | .3 | 99.8 |
| 12 | 3 | .1 | 99.9 |
| 13 | 4 | .1 | 100.0 |
| Total | 4489 | 100.0 | 100.0 |

The cross-tabulation of the number of AP exams passed by undeclared and declared major, as shown in Table 17, resulted in the largest percentage by exams passed of undeclared students at 33.3% ($n$ = 1) and were for the subgroup that passed 12 AP exams. Of note, however, this subgroup only included three students. The next largest percentage of undeclared students, at 23.2% ($n$ = 116) was found in the subgroup that passed four AP exams. The percentage of undeclared students across the subgroups of number of exams passed ranged from 0.0% ($n$ = 0) to 33.3% ($n$ = 1). For the subgroup of students who passed 13 AP exams, there were no undeclared students, and only four declared students. In all other subgroups, both undeclared and declared students were represented.

Table 17

*AP Exams Passed by Undeclared and Declared Academic Program*

| | Undeclared | | | Declared | | |
|---|---|---|---|---|---|---|
| Variable | *n* | % by exams | % undeclared | *n* | % by exams | % declared |
| AP exams passed | | | | | | |
| 0 | 213 | 21.4 | 23.8 | 784 | 78.6 | 21.8 |
| 1 | 120 | 19.0 | 13.4 | 513 | 81.0 | 14.3 |
| 2 | 127 | 21.5 | 14.2 | 465 | 78.5 | 12.9 |
| 3 | 125 | 20.9 | 14.0 | 474 | 79.1 | 13.2 |
| 4 | 116 | 23.2 | 12.9 | 385 | 76.8 | 10.7 |
| 5 | 80 | 19.3 | 8.9 | 335 | 80.7 | 9.3 |
| 6 | 42 | 13.3 | 4.7 | 273 | 86.7 | 7.6 |
| 7 | 32 | 16.0 | 3.6 | 168 | 84.0 | 4.7 |
| 8 | 22 | 18.5 | 2.5 | 97 | 81.5 | 2.7 |
| 9 | 10 | 18.5 | 1.1 | 44 | 81.5 | 1.2 |
| 10 | 7 | 15.9 | .8 | 37 | 84.1 | 1.0 |
| 11 | 1 | 7.7 | .1 | 12 | 92.3 | .3 |
| 12 | 1 | 33.3 | .1 | 2 | 66.7 | .1 |
| 13 | 0 | 0 | 0 | 4 | 100.0 | .1 |

To determine if undeclared and declared students performed similarly on AP exams, an independent t-test to compare the means of each group was conducted. The results of the independent t-test are depicted in Table 18 and Figure 7. When examining the Levine Test ($F$ = 5.938, $p$ = .015), undeclared academic program and declared academic program do appear to have different variances.

Table 18

*Comparison of Undeclared and Declared Majors by AP Exams Passed*

| Test | *n* | Mean | SD | *t* | *p* |
|---|---|---|---|---|---|
| Undeclared | 896 | 2.73 | 2.407 | -2.435 | .015 |
| Declared | 3593 | 2.96 | 2.563 | | |

There is a significant difference, at the $p < .05$ level, in the mean number of AP exams passed for undeclared students versus declared students ($t = -2.435$, $p = .015$). The mean number of AP exams passed for undeclared students ($\bar{x} = 2.73$) was lower than for declared students ($\bar{x} = 2.96$).

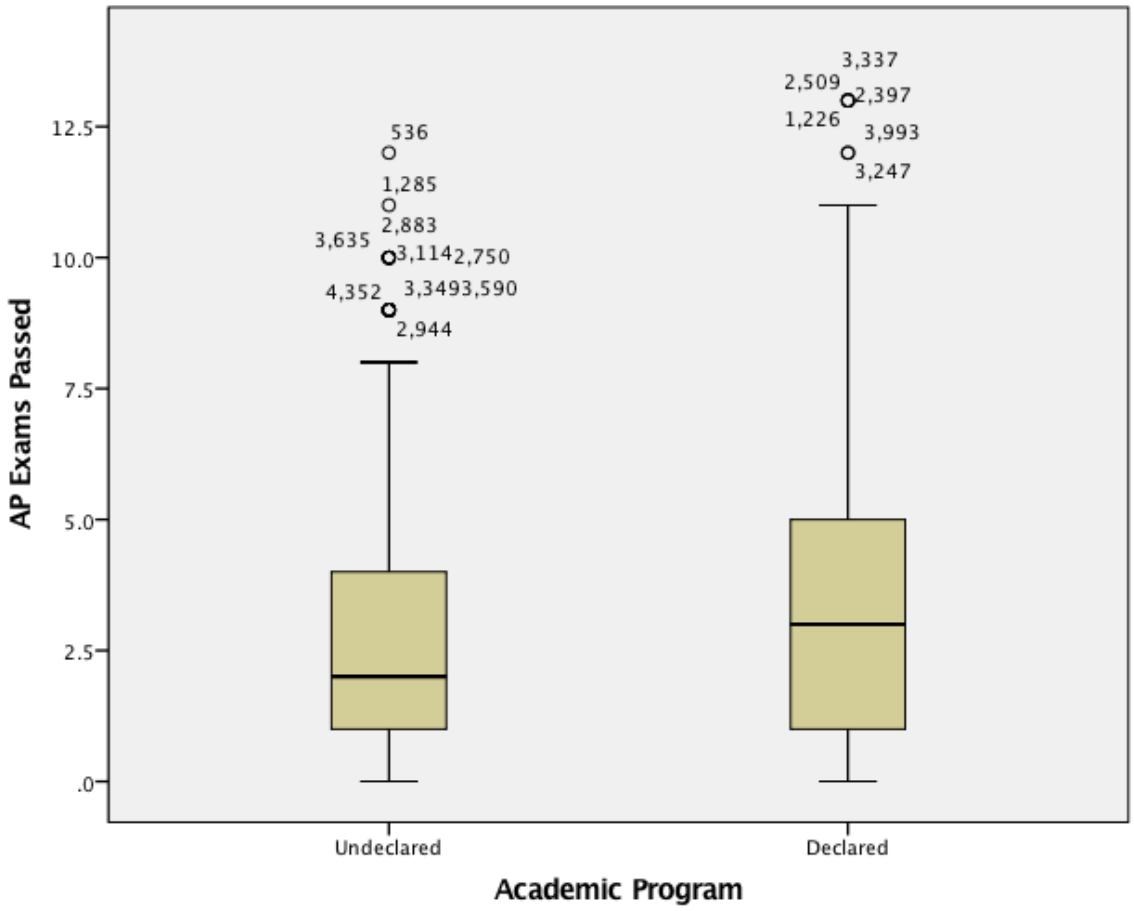


*Figure 7.* Box-and-whiskers plot comparing the number of AP exams passed by declared and undeclared academic program (major) groupings.

**Dual Enrollment Credit**

Students may have, as part of their pre-academic college performance, completed dual enrollment courses in which students enrolled in college courses while still enrolled in high school. Table 19 displays the distribution of students by whether they earned dual credit or not.

A sizeable percentage of students in the fall 2010 cohort, 70.1% (*n* = 3147), had earned college credit prior to matriculating as a new first-time in college student.

Table 19

*Summary of Dual Enrollment Credit Earned*

| Variable | Total *n* | Total % |
|---|---|---|
| Dual Enrollment Credit | | |
| Completed dual credit | 3147 | 70.1 |
| Did not complete dual credit | 1342 | 29.9 |
| Total | 4489 | 100.0 |

The cross-tabulation by undeclared versus declared major, as shown in Table 20, revealed that the largest percentage of undeclared students, 22.3% (*n* = 299), were those students who did not earn dual credit which in high school. Of those students who did earn dual credit while in high school, undeclared students represent 19.0% (*n* = 597) of the subgroup. Similar to other variables, roughly one in five students in each subgroup were undeclared about a major upon entry into the institution.

Table 20

*Dual Enrollment Credit Earned by Undeclared and Declared Academic Program*

| | Undeclared | | | Declared | | |
|---|---|---|---|---|---|---|
| Variable | *n* | % by category | % undeclared | *n* | % by category | % declared |
| Dual Enrollment Credit | | | | | | |
| Completed dual credit | 597 | 19.0 | 66.6 | 2050 | 81.0 | 71.0 |
| Did not complete dual credit | 299 | 22.3 | 33.4 | 1043 | 77.7 | 29.0 |

To determine if undeclared and declared students earned dual enrollment credits at different rates, an independent t-test to compare the means of each group was conducted. The

results of the independent t-test are displayed in Table 21 and Figure 8. When examining the homogeneity of variance assumption as tested by using the Levine Test ($F = 5.938$, $p = .025$), the two groups do appear to have different variances that are statistically significant, at the $p < .05$ level.

Table 21

*Comparison of Undeclared and Declared Majors by Dual Enrollment Credit*

| Test | *n* | Mean | SD | *t* | *p* |
|---|---|---|---|---|---|
| Undeclared | 896 | 2.35 | 2.585 | | |
| | | | | -2.501 | .012 |
| Declared | 3593 | 2.62 | 2.935 | | |

There is a significant difference in the number of dual enrollment courses for undeclared students versus declared students ($t = -2.501$, $p = .012$) at the $p < .05$ level. Undeclared students, with a mean of 2.35 dual enrollment courses, completed a lower number of courses than declared students, with a mean of 2.62 dual enrollment courses.

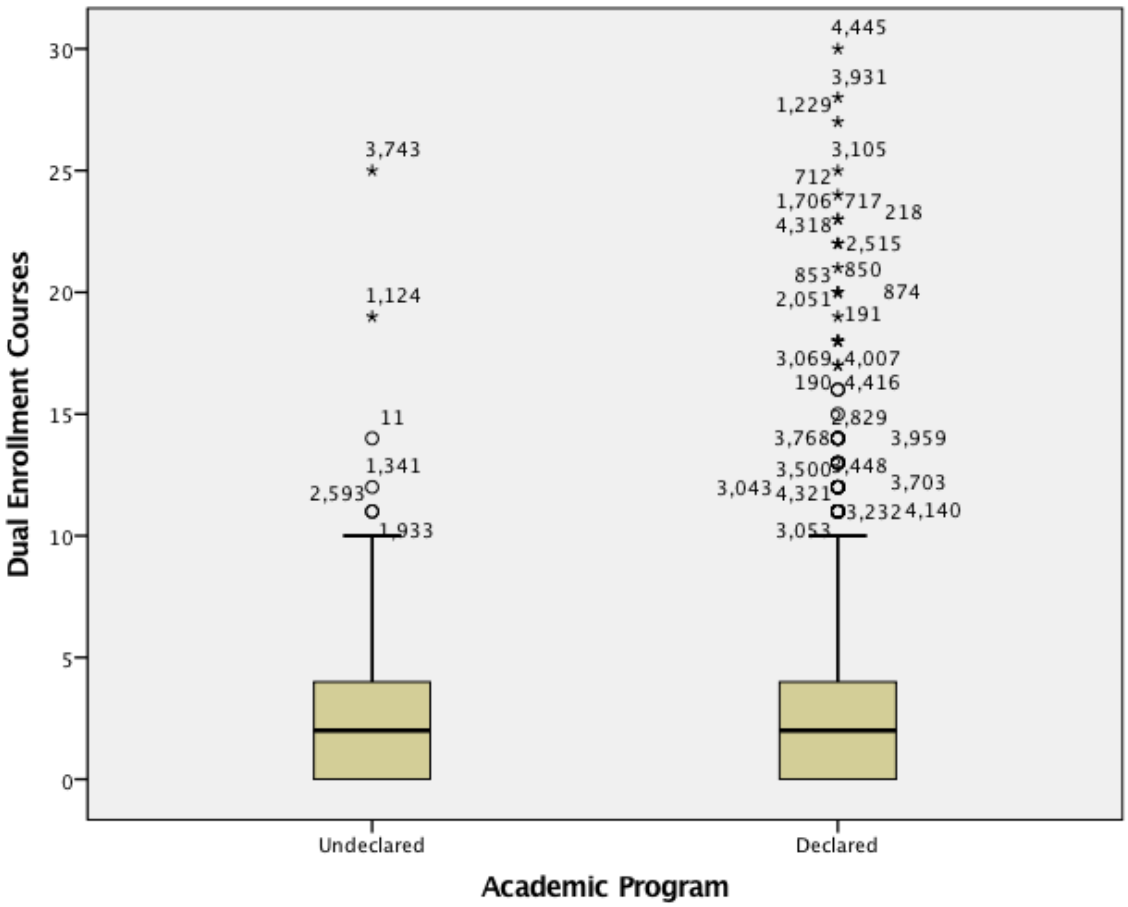


*Figure 8.* Box-and-whiskers plot comparing the dual enrollment credit by declared and undeclared academic program (major) groupings.

**Developmental Education/Workload Enrollment**

Once students transition to the institution, some were required to complete developmental education coursework to remediate gaps in preparation in the disciplines of mathematics, English, and/or chemistry. At the institution in this study, developmental education coursework is also referred to as workload coursework. Table 22 displays the distribution of students by whether they are required to complete developmental education/workload courses. Of the students in the fall 2010 entering cohort of full-time, first-time in college students, two out of

every five students, or 41.4% (*n* = 1860), enrolled in at least one workload course to remediate mathematics, English, and/or chemistry.

Table 22

*Summary of Student Enrollment in Developmental Education/Workload Coursework*

| Variable | Total *n* | Total % |
|---|---|---|
| Developmental education/workload coursework | | |
| Enrolled in coursework | 1860 | 41.4 |
| Did not enroll in coursework | 2629 | 58.6 |
| Total | 4489 | 100.0 |

The cross-tabulation of developmental education/workload coursework by undeclared versus declared academic program, as shown in Table 23, resulted in again about one in five students in each subgroup as matriculating to the institution in one of the six undeclared academic program designations. For students who enrolled in developmental education coursework, 19.4% (*n* = 360) were initially undeclared. Of students who did not enroll in developmental education/workload coursework, 20.4% (*n* = 536) were undeclared.

Of note, a higher number of undeclared students were not required to complete remediation through developmental education/workload coursework than the number of undeclared students who were required to do so. Only 360 undeclared students were in need of remediation in mathematics, English, or chemistry. In contrast, 536 undeclared students arrived on campus as college ready in those subjects.

Table 23

*Students Enrolled in Developmental Education/Workload Coursework by Undeclared and Declared Academic Program*

| | Undeclared | | | Declared | | |
|---|---|---|---|---|---|---|
| Variable | *n* | % by category | % undeclared | *n* | % by category | % declared |
| Developmental education/workload coursework | | | | | | |
| Enrolled in coursework | 360 | 19.4 | 40.2 | 1500 | 80.6 | 41.7 |
| Did not enroll in coursework | 536 | 20.4 | 59.8 | 2093 | 79.6 | 58.3 |

To determine if undeclared and declared students earned dual enrollment credits at different rates, an independent t-test to compare the means of each group was conducted. The results of the independent t-test are represented in Table 24. When examining the homogeneity of variance assumption as tested by using the Levine Test ($F = 2.199$, $p = .138$) the two groups do not appear to have different variances.

Table 24

*Comparison of Academic Program Variable (Undeclared and Declared Majors) by Number of Developmental Education/Workload Courses*

| Test | *n* | Mean | SD | *t* | *p* |
|---|---|---|---|---|---|
| Undeclared | 896 | .70 | 1.189 | | |
| | | | | -1.312 | .189 |
| Declared | 3593 | .76 | 1.269 | | |

There was no significant difference when comparing the number of developmental education/workload courses taken by undeclared students versus declared students ($t = -1.312$, $p = 0.189$). Though not statistically significant, students who matriculated into one of the six undeclared academic programs took on average fewer ($\bar{x} = .70$) developmental education/workload courses than students in a declared academic program ($\bar{x} = .76$).

**High-Impact Educational Practices**

Some of the students opted or were selected to participate in one or more of the high-impact educational practices (HIPs) examined in this study (shown in Table 25). As students in the honors program are selected, numbers were fairly low with only 2.9% (*n* = 128) of the fall 2010 cohort participating. The largest percentage of students participated in first-year seminars (43.1%, *n* = 1935). The next largest percentage was for the Equal Opportunity Program (EOP) at 26.2% (*n* = 1178). In terms of undergraduate research opportunities at the institution, 20.0% (*n* = 898) of students in the fall 2010 cohort engaged in research during their enrollment.

Table 25

*Summary of Student Participation in High-Impact Educational Practices Program*

| | Total | |
|---|---|---|
| Variable | *n* | % |
| Honors (IST) | | |
| Did not participate | 4361 | 97.1 |
| Participated | 128 | 2.9 |
| First-year seminar | | |
| Did not enroll in a seminar | 2554 | 56.9 |
| Did enroll in a seminar | 1935 | 43.1 |
| Undergraduate Research | | |
| Did not participate | 3591 | 80.0 |
| Participated | 898 | 20.0 |
| Equal Opportunity Program (EOP) | | |
| Did not participate | 3311 | 73.8 |
| Participated | 1178 | 26.2 |

When participation was examined using cross-tabulation by undeclared versus declared major (Table 26) the percentages of students who did participate were very similar to the percentages of students who did not. For the honors program, 20.0% (*n* = 873) of non-

participants and 18.0% ($n$ = 23) of participants were undeclared. In terms of registration in first-year seminars, 17.9% ($n$ = 458) of students who did not enroll and 22.6% ($n$ = 438) of students who did enroll in a seminar matriculated as undeclared majors. The percentage of undeclared students who opted to engage research opportunities at the institution (19.5%, $n$ = 175) was very similar to the percentage of undeclared students who did not (20.1%, $n$ = 721). The results from the cross-tabulation of EOP participation indicated that 20.4% ($n$ = 677) of the participants and 18.6% ($n$ = 219) of the non-participants were in one of the six undeclared academic program designations.

Table 26

*Student Participation in High-Impact Educational Practices by Undeclared and Declared Academic Program*

| | Undeclared | | | Declared | | |
|---|---|---|---|---|---|---|
| Variable | *n* | % by category | % undeclared | *n* | % by category | % declared |
| Honors (IST) | | | | | | |
| Did not participate | 873 | 20.0 | 97.4 | 3488 | 80.0 | 97.1 |
| Participated | 23 | 18.0 | 2.6 | 105 | 82.0 | 2.9 |
| First-year seminars | | | | | | |
| Did not enroll in a seminar | 458 | 17.9 | 51.1 | 2096 | 82.1 | 58.3 |
| Did enroll in a seminar | 438 | 22.6 | 48.9 | 1497 | 77.4 | 41.7 |
| Undergraduate Research | | | | | | |
| Did not participate | 721 | 20.1 | 80.5 | 2870 | 79.9 | 79.9 |
| Participated | 175 | 19.5 | 19.5 | 723 | 80.5 | 20.1 |
| Equal Opportunity Program (EOP) | | | | | | |
| Did not participate | 677 | 20.4 | 75.6 | 2634 | 79.6 | 73.3 |
| Participated | 219 | 18.6 | 24.4 | 959 | 81.4 | 26.7 |

To determine if undeclared and declared students participate in high impact educational practices (HIPs) at different rates, an independent t-test to compare the means of each group was

conducted. The results of the independent t-tests are represented in Table 27. When examining the homogeneity of variance assumption of participation in HIPs, as tested by using the Levine Test, the two groups do not appear to have different variances in terms of participation in the honors program ($F$ = 1.314, $p$ = .252) or undergraduate research ($F$ = .634, $p$ = .426). There does appear to be different variances for the two groups in terms of enrollment in first-year seminars ($F$ = 24.581, $p$ = .000) and participation in the EOP program ($F$ = 7.930, $p$ = .005).

Table 27

*Comparison of Participation of Undeclared and Declared Majors in High-Impact Educational Programs*

| Test | *n* | Mean | SD | *t* | *p* |
|---|---|---|---|---|---|
| Honors (IST) | | | | | |
| Undeclared | 896 | .0257 | .15824 | | |
| | | | | -0.572 | .568 |
| Declared | 3593 | .0292 | .16846 | | |
| First-year seminars | | | | | |
| Undeclared | 896 | .4888 | .50015 | | |
| | | | | 3.910 | .000 |
| Declared | 3593 | .4166 | .49307 | | |
| Undergraduate Research | | | | | |
| Undeclared | 896 | .1953 | .39666 | | |
| | | | | -.396 | .692 |
| Declared | 3593 | .2012 | .40097 | | |
| Equal Opportunity Program (EOP) | | | | | |
| Undeclared | 896 | .2444 | .42998 | | |
| | | | | -1.369 | .171 |
| Declared | 3593 | .2669 | .44241 | | |

There was no significant difference when comparing the participation in the honors program ($t$ = -.572, $p$ = .568), undergraduate research ($t$ = -.396, $p$ = .692), or the Equal Opportunity Program (EOP) ($t$ = -1.369, $p$ = .171) for undeclared students versus declared students. There was,

however, a significant difference in the enrollment in first-year seminars for students who matriculated as undeclared as compared to those who matriculated as declared ($t = 3.910$, $p = .000$) at the $p < .001$ level. Undeclared students, on average ($\bar{x} = .4888$), enrolled in first-year seminars at a higher rate than declared students ($\bar{x} = .4166$).

## College Academic Performance

The third research question for this study was: are there statistically significant differences in the within college academic performance (earned college GPA) of first-time in college freshmen who matriculated to the institution as undeclared and declared? To answer this question, a one-way analysis of variance (ANOVA) was conducted to determine if a difference existed in the academic performance of undeclared and declared students. The one-way ANOVA applied the academic program (undeclared or declared entering major) as the independent variable and the earned college GPA as the dependent variable. Although there were 4489 students in the fall 2010 cohort, only 4430 records included a reported earned college GPA. As a result, there were 59 missing cases that were excluded from the analysis. These 59 students left or withdrew prior to the end of the first quarter and did not earn a college GPA. The earned college GPA value collected was the cumulative GPA earned by each student. Table 28 displays the descriptive statistics for earned college GPA by undeclared versus declared academic program.

Table 28

*Comparison of Mean Earned College GPA by Undeclared versus Declared Academic Program*

| | *n* | Mean | SD |
|---|---|---|---|
| Undeclared | 883 | 3.007 | .57157 |
| Declared | 3547 | 2.935 | .60732 |
| Total | 4430 | 2.950 | .60098 |

The results of the one-way ANOVA, as shown in Table 29, indicate that there exists a significant interaction between a student's academic program upon matriculation and that student's earned college GPA, $F(1, 4428) = 10.054$, $p < .005$. The effect size, or $\eta^2$, was found to be .2% ($\eta^2 = .002$), representing a small effect size (Witte & Witte, 2010).

The Levine statistic was calculated in order to test the homogeneity of variances and the result was significant, $W(1, 4428) = 4.139$, $p < .05$. As a result, equal variances could not be assumed. Therefore, Welch's $F$ statistic was utilized as a robust test of the equality of means with heterogeneity of variances. The Welch $F(1, 1419.583) = 10.815$, $p < .005$, also indicated the difference among the two groups to be significant. Undeclared students ($\bar{x} = 3.007$) earned a higher college GPA then their declared peers ($\bar{x} = 2.935$).

Table 29

*One-Way Analysis of Variance of Earned College GPA by Undeclared and Declared Academic Program*

| | *df* | *SS* | *MS* | *F* | *p* |
|---|---|---|---|---|---|
| Between groups | 1 | 3.624 | 3.624 | 10.054 | .002 |
| Within groups | 4428 | 1596.057 | .360 | | |
| Total | 4429 | 1599.681 | | | |

## Change of Major

The fourth research question for this study was: to what extent, if any, do first-time in college freshmen who matriculated to the institution as undeclared and declared change their major? Similar to the previous research question, to answer this question, one-way ANOVAs were conducted. The first of the tests was run to determine if a difference existed in terms of whether undeclared versus declared students change their academic program, or major. The independent variable was academic program (undeclared or declared entering major) and the

dependent variable was change of major. There were no missing cases for the change of major variable. The descriptive statistics for the change of major variable by undeclared versus declared academic program are represented in Table 30. For this study, as mentioned in chapter three, a change of major occurred when a student changed from one degree-granting academic program designation to another degree-granting academic program designation. A change of major was not counted, however, when an undeclared student first declared a degree-granting program. In other words, when an undeclared student changed their initial non-degree "undeclared" academic program designation to one of the degree granting programs, it was identified as their first declaration of a major. Only after declaring a program, could a change of major be measured. Similarly, when a student changed from a degree granting undergraduate program designation to undeclared or another non-degree granting designation, it was not considered a change of major as the student had not changed from one degree-granting program to another.

Table 30

*Descriptive Statistics for Change of Major by Undeclared and Declared Academic Program*

| | *n* | Mean | SD |
|---|---|---|---|
| Undeclared | 896 | .1830 | .38691 |
| Declared | 3593 | .5232 | .49953 |
| Total | 4489 | .4553 | .49806 |

The results of the one-way ANOVA, as exhibited in Table 31, indicate that there exists a significant interaction between a student's academic program upon matriculation and changes of major, $F(1, 4487) = 361.485$, $p < .001$. The effect size, or $\eta^2$, was found to be 7.46% ($\eta^2 = .0746$), representing a small effect size (Witte & Witte, 2010).

Table 31

*One-Way Analysis of Variance of Change of Major by Undeclared and Declared Academic Program*

| | *df* | *SS* | *MS* | *F* | *p* |
|---|---|---|---|---|---|
| Between groups | 1 | 83.003 | 83.003 | 361.485 | .000 |
| Within groups | 4487 | 1030.292 | .230 | | |
| Total | 4488 | 1113.295 | | | |

The Levine statistic was calculated in order to test the homogeneity of variances and the result was significant, $W(1, 4487) = 2304.197$, $p < .001$. As a result, equal variances could not be assumed. Therefore, Welch's $F$ statistic was utilized as a robust test of the equality of means with heterogeneity of variances. The Welch $F(1, 1719.656) = 489.329$, $p < .001$, also indicated the difference among the two groups to be significant. Undeclared students were less likely to change their major than declared students.

The second of the tests was conducted to determine if a difference existed in the number of changes of major made by undeclared and declared students. The one-way ANOVA applied the academic program (undeclared or declared entering major) as the independent variable and the number of changes of major as the dependent variable. The descriptive statistics for the number of changes by undeclared versus declared academic program are represented in Table 32.

Table 32

*Descriptive Statistics for the Number of Changes of Major by Undeclared and Declared Academic Program*

| | *n* | Mean | SD |
|---|---|---|---|
| Undeclared | 896 | .200 | .436 |
| Declared | 3593 | .600 | .631 |
| Total | 4489 | .520 | .618 |

As with the first test, the results of the second one-way ANOVA, as exhibited in Table 33, indicate that there exists a significant interaction between a student's academic program upon matriculation and the number of changes of major, $F(1, 4487) = 319.267$, $p < .001$. The effect size, or $\eta^2$, was found to be 6.64% ($\eta^2 = .066$), representing a small effect size (Witte & Witte, 2010).

Table 33

*One-Way Analysis of Variance of the Number of Changes of Major by Undeclared and Declared Academic Program*

| | *df* | *SS* | *MS* | *F* | *p* |
|---|---|---|---|---|---|
| Between groups | 1 | 113.793 | 113.793 | 319.267 | .000 |
| Within groups | 4487 | 1599.254 | .356 | | |
| Total | 4488 | 1713.047 | | | |

The Levine statistic was calculated in order to test the homogeneity of variances and the result was significant, $W(1, 4487) = 560.182$, $p < .001$. As a result, equal variances could not be assumed. Therefore, Welch's *F* statistic was utilized as a robust test of the equality of means with heterogeneity of variances. The Welch $F(1, 1942.013) = 491.587$, $p < .001$, also indicated the difference among the two groups to be significant. Declared students ($\bar{x} = .60$) changed majors more times than undeclared students ($\bar{x} = .20$).

## Persistence

The fifth question of this study was: to what extent do the variables included in this study predict college student persistence of first-time in college freshmen? Answering this question involved analyses using logistic multiple regression for each of the persistence measures (persistence to second year, persistence to third year, and persistence to fourth year). Before running the regression calculations, a one-way ANOVA was conducted to see if differences

existed between undeclared and declared students in terms of persistence by number of quarters completed. The one-way ANOVA applied the academic program (undeclared or declared entering major) as the independent variable and the persistence by number of quarters as the dependent variable. Table 34 displays the descriptive statistics for persistence by number of quarters by undeclared and declared academic program. Undeclared students ($\bar{x}$ = 11.71) persisted for more quarters then their declared peers ($\bar{x}$ = 11.44).

Table 34

*Descriptive Statistics for Persistence by Number of Quarters by Undeclared and Declared Academic Program*

| | *n* | Mean | SD |
|---|---|---|---|
| Undeclared | 896 | 11.71 | 2.800 |
| Declared | 3593 | 11.44 | 3.064 |
| Total | 4489 | 11.49 | 3.015 |

The results of the one-way ANOVA, as exhibited in Table 35, indicate that there exists a significant interaction between a student's academic program upon matriculation and the number of quarters the student persists, $F(1, 4487) = 6.003$, $p < .05$. The effect size, or $\eta^2$, was found to be 1.3% ($\eta^2 = .0013$), representing a small effect size (Witte & Witte, 2010).

Table 35

*One-Way Analysis of Variance of the Persistence by Number of Quarters Enrolled by Undeclared and Declared Academic Program*

| | *df* | *SS* | *MS* | *F* | *p* |
|---|---|---|---|---|---|
| Between groups | 1 | 54.491 | 54.491 | 6.003 | .014 |
| Within groups | 4487 | 40731.338 | 9.078 | | |
| Total | 4488 | 40785.828 | | | |

The Levine statistic was calculated in order to test the homogeneity of variances and the result was significant, $W(1, 4487) = 9.615$, $p < .001$. As a result, equal variances could not be assumed. Therefore, Welch's $F$ statistic was utilized as a robust test of the equality of means with heterogeneity of variances. The Welch $F(1, 1476.458) = 6.688$, $p < .05$, also indicated the difference among the two groups to be statistically significant.

**Persistence by Year**

A logistic regression was calculated for persistence to the second year using two blocks. These blocks were based on Astin's (1993) I-E-O conceptual model utilized for this study. Block one included the inputs, or demographic and pre-college academic performance variables, with the exception of ACT composite scores. ACT composite scores were removed as the number of valid cases, meaning records with scores reported, was limited and caused most of the student records to be excluded from analyses. Included in block one, as well, was the academic program (undeclared versus declared) variable as an input. Block two also included the environmental variables of college, academic discipline area, developmental education/workload course enrollment, undergraduate research, first-year seminars, and equal opportunity program (EOP). Participation in honors was also not included as only 128 students participated in the honors program and showed no effect in the regression.

Linearity of the continuous variables of SAT composite score, high school GPA, and dual enrollment credits, with respect to the dependent variable was tested using the Box-Tidwell (Box & Tidwell, 1962) procedure. After this, a Bonferroni correction was applied using all 30 terms in the regression model resulting in statistical significance being accepted when $p < .0017$ (Tabachnick & Fidell, 2013). Based on the Box-Tidwell procedure and Bonferroni correction, all continuous independent variables included in the persistence modeling were found to be linearly

related to the logit of the dependent variable. As a result, the assumption of linearity was not violated.

This study was intending to determine if starting with or without a major was a predictor of persistence and degree completion. Still, additional regression analyses were conducted after temporarily only selecting if undeclared, and then temporarily selecting if declared, for each year to year persistence output to see if each academic program sample had different predictors of persistence and degree completion. In both of these cases, the academic program variable was not included as an input variable in the regression models. This allowed the opportunity to test whether a difference in the effects of other variables on persistence existed, controlling for each group.

**Persistence to the second year (first-year persistence).** The findings for this regression are depicted in Table 36. For block one, the regression model was statistically significant $\chi^2(15) = 120.334$, $p < .001$. The model explained 7.9% (Nagelkerke $R^2$) of the variance in persistence to the second year at the institutional site and classified correctly 92.5% of the cases. The Hosmer and Lemeshow test was not statistically significant $\chi^2(8) = 11.589$, $p = .171$, resulting in a goodness of fit for the model.

In terms of the demographic input variables, race/ethnicity appeared to not result in any statistically significant difference in the likelihood of persisting to the second year for any one ethnic group as compared to the dummy variable of "White." With gender, females were 1.297 (*Exp. (B)* = 1.295, $p < .05$) times more likely to persist than males, through the first year, and into the second year. In-state resident students were 2.272 (*Exp. (B)* = 2.307, $p < .01$) times more likely to persist beyond the first year than out-of-state/international residents.

With the pre-college academic performance variables, the odds ratios resulted in higher

Table 36

*Logistic Regression Analysis for Persistence to the Second Year (First-Year Persistence)*

| | Model 1 | | | Model 2 | | |
|---|---|---|---|---|---|---|
| *n* = 3624 | B | Sig. | Exp. (B) | B | Sig. | Exp. (B) |
| Block 1: Input Variables | | | | | | |
| *Ethnicity* | | | | | | |
| African American/Black | .186 | .583 | 1.205 | .097 | .779 | 1.102 |
| American Indian/Alaskan Native | -.053 | .924 | .948 | .069 | .902 | 1.072 |
| Asian/Asian American | .278 | .103 | 1.321 | .279 | .107 | 1.322 |
| Latino/Chicano | -.050 | .800 | .951 | -.007 | .974 | .993 |
| Pacific Islander | .060 | .955 | 1.062 | .269 | .799 | 1.309 |
| *Other demographic variables* | | | | | | |
| Female | .260 | .047* | 1.297 | .212 | .129 | 1.237 |
| Non-lower socioeconomic status | .111 | .500 | 1.117 | .156 | .470 | 1.169 |
| First-generation | .018 | .916 | 1.018 | -.007 | .970 | .993 |
| In-state resident | .820 | .005** | 2.272 | .790 | .008** | 2.203 |
| *Pre-college academic performance* | | | | | | |
| High school GPA | 1.177 | .000*** | 3.244 | 1.208 | .000*** | 3.346 |
| AP exams | .304 | .065 | 1.355 | .327 | .051 | 1.386 |
| SAT composite | .001 | .001** | 1.001 | .001 | .001** | 1.001 |
| Dual enrollment credit | .165 | .373 | 1.179 | .128 | .493 | 1.137 |
| Number of dual enrollment courses | .010 | .746 | 1.010 | .013 | .677 | 1.013 |
| *Academic Program* | | | | | | |
| Declared | -.335 | .060 | .715 | -.168 | .412 | .845 |

Table 36 (continued)

*Logistic Regression Analysis for Persistence to the Second Year (First-Year Persistence)*

| | Model 1 | | | Model 2 | | |
|---|---|---|---|---|---|---|
| *n* = 3624 | B | Sig. | Exp. (B) | B | Sig. | Exp. (B) |
| Block 2: Environmental Variables | | | | | | |
| *College* | | | | | | |
| Agricultural and Environmental Science | | | | .343 | .270 | 1.409 |
| Biological Sciences | | | | -.135 | .503 | .874 |
| Letters and Science | | | | -.029 | .897 | .971 |
| *Academic Discipline Area* | | | | | | |
| AES – Agricultural Sciences | | | | -.733 | .034 | .480 |
| AES – Human Sciences | | | | .613 | .220 | 1.847 |
| Humanities, Arts | | | | .331 | .288 | 1.393 |
| Math and Physical Sciences | | | | .271 | .334 | 1.311 |
| *Developmental education/workload courses* | | | | | | |
| Enrolled in developmental education/workload | | | | .105 | .577 | 1.111 |
| Total number of developmental education/ workload courses | | | | -.001 | .990 | .999 |
| *High-impact educational practices* | | | | | | |
| Undergraduate research | | | | 1.349 | .000*** | 3.855 |
| First-year seminars | | | | .324 | .019* | 1.382 |
| Equal opportunity program (EOP) | | | | .109 | .648 | 1.115 |
| **Cox & Snell $R^2$** | **.033** | | | **.048** | | |
| **Nagelkerke $R^2$** | **.079** | | | **.115** | | |

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

earned high school GPAs and higher SAT composite scores as being associated with higher likelihood of persistence into the second year. For every one unit increase in high school GPA, the odds of persisting increased by 3.244 times at the $p < .001$ level. For each unit increase in SAT composite score, the odds of persisting increased by 1.001 times at the $p < .01$ level. Of note, no statistically significant difference in first year persistence existed between undeclared and declared academic program students.

For block two, the regression model was again statistically significant $\chi^2(12) = 56.563$, $p < .001$. The Nagelkerke $R^2$ statistic explained 11.5% of the variance and classified correctly 92.5% of the cases. Again, the Hosmer and Lemeshow test was not significant $\chi^2(8) = 5.496$, $p = .703$. For this block, in terms of input variables, again, higher high school GPA and higher SAT composite scores were both associated with higher likelihood of persistence in college from year one to two. For every one unit increase in high school GPA, the odds of persisting increased by 3.346 times at the $p < .001$ level, a higher *Exp. (B)* for high school GPA than existed in block one. The *Exp. (B)* for SAT composite score was the same value as in block one. For each unit increase in SAT composite score, the odds of persisting increased by 1.001 times at the $p < .01$ level.

With the demographic variables, gender no longer appeared to result in any statistical significance in the regression. In-state residents, however, were still more likely to persist to the second year than out-of-state/international residents. More specifically, in-state residents were more than twice as likely (*Exp. (B)* = 2.203, $p < .01$) than non-in-state residents. As before, no statistically significant difference in first year persistence existed between undeclared and declared students.

With the environmental variables, the high-impact educational practices (HIPs) of first-year seminars and undergraduate research, both appeared to be statistically significant in the model. Students who participated in undergraduate research opportunities were 3.855 ($p < .001$) times more likely to persist beyond the first year. Additionally, students who enrolled in a first-year seminar were 1.382 ($p < .05$) times more likely to persist to the second year than students who did not enroll in a first-year seminar.

**Persistence to the second year (first-year persistence) for undeclared students.** The findings for this regression model are depicted in Table 37. For undeclared students, block one of the regression model was statistically significant $\chi^2(12) = 25.\ 261$, $p < .05$. As such, this model was not as significant as the model which included both undeclared and declared students. This model explained 9.8% (Nagelkerke $R^2$) of the variance in persistence to the second year at the institutional site and classified correctly 93.8% of the cases. The Hosmer and Lemeshow test was not statistically significant $\chi^2(8) = 13.934$, $p = .084$, resulting in a goodness of fit for the model. In terms of the input variables, only AP exams passed was significant. With AP exams, those undeclared students who passed one or more exams were 3.577 ($p < .01$) times more likely to persist than undeclared students who did not pass an exam, through the first year, and into the second year.

For block two of the regression model, the result was again statistically significant $\chi^2(21) = 33.879$, $p < .05$. As with block one of this model, this model was not as significant as the earlier regression model which included both undeclared and declared students. This model explained 13.1% (Nagelkerke $R^2$) of the variance in persistence to the second year at the institutional site and classified correctly 93.8% of the cases. The Hosmer and Lemeshow test was not statistically significant $\chi^2(8) = 9.665$, $p = .289$, resulting in a goodness of fit for the model. In

Table 37

*Logistic Regression Analysis for Persistence to the Second Year (First-Year Persistence) for Undeclared Students*

| | Model 1 | | | Model 2 | | |
|---|---|---|---|---|---|---|
| *n* = 679 | B | Sig. | Exp. (B) | B | Sig. | Exp. (B) |
| Block 1: Input Variables | | | | | | |
| *Ethnicity* | | | | | | |
| African American/Black | -.121 | .874 | .886 | -.281 | .723 | .755 |
| Asian/Asian American | .293 | .491 | 1.341 | .485 | .263 | 1.624 |
| Latino/Chicano | -.061 | .904 | .941 | .027 | .959 | 1.027 |
| *Other demographic variables* | | | | | | |
| Female | .375 | .269 | 1.455 | .370 | .289 | 1.447 |
| Non-lower socioeconomic status | -.486 | .257 | .615 | -.968 | .187 | .380 |
| First-generation | -.069 | .877 | .933 | .026 | .956 | 1.026 |
| In-state resident | -.502 | .635 | .605 | -.297 | .783 | .743 |
| *Pre-college academic performance* | | | | | | |
| High school GPA | .916 | .103 | 2.500 | .950 | .099 | 2.586 |
| AP exams | 1.274 | .004** | 3.577 | 1.281 | .005** | 3.602 |
| SAT composite | .000 | .634 | 1.000 | .000 | .653 | 1.000 |
| Dual enrollment credit | -.216 | .661 | .806 | -.225 | .656 | .799 |
| Number of dual enrollment courses | .021 | .804 | 1.021 | .024 | .781 | 1.025 |
| Block 2: Environmental Variables | | | | | | |
| *College* | | | | | | |
| Agricultural and Environmental Science | | | | .150 | .770 | 1.162 |
| Biological Sciences | | | | -.464 | .387 | .629 |

Table 37 (continued)

*Logistic Regression Analysis for Persistence to the Second Year (First-Year Persistence) for Undeclared Students*

| | Model 1 | | | Model 2 | | |
|---|---|---|---|---|---|---|
| *n* = 679 | B | Sig. | Exp. (B) | B | Sig. | Exp. (B) |
| Block 2: Environmental Variables (continued) | | | | | | |
| *Academic Discipline Area* | | | | | | |
| Humanities, Arts | | | | .736 | .316 | 2.087 |
| Math and Physical Sciences | | | | .344 | .625 | 1.411 |
| *Developmental education/workload courses* | | | | | | |
| Enrolled in developmental education/workload | | | | .067 | .899 | 1.069 |
| Total number of developmental education/ workload courses | | | | -.016 | .939 | .984 |
| *High-impact educational practices* | | | | | | |
| Undergraduate research | | | | .628 | .218 | 1.874 |
| First-year seminars | | | | .577 | .105 | 1.781 |
| *Other environmental variables* | | | | | | |
| Equal opportunity program (EOP) | | | | -.646 | .415 | .524 |
| **Cox & Snell $R^2$** | **.037** | | | **.049** | | |
| **Nagelkerke $R^2$** | **.098** | | | **.131** | | |

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

terms of the variables, again only AP exams passed was significant. With AP exams, those undeclared students who passed one or more exams were 3.602 ($p < .01$) times more likely to persist than undeclared students who did not pass an exam, through the first year, and into the second year. None of the environmental variables were statistically significant in this regression model.

**Persistence to the second year (first-year persistence) for declared students.** The findings for this regression are depicted in Table 38. For block one of this model for declared students, the regression model was statistically significant $\chi^2(12) = 104.314$, $p < .001$. The model explained 8.2% (Nagelkerke $R^2$) of the variance in persistence to the second year and classified correctly 92.2% of the cases. The Hosmer and Lemeshow test was not statistically significant $\chi^2(8) = 12.495$, $p = .130$, resulting in a goodness of fit for the model.

In terms of the input variables, residency, high school GPA, and SAT composite scores were the only variables that were statistically significant. In-state resident students were 2.758 ($p < .01$) times more likely to persist beyond the first year than out-of-state/international residents. For every one unit increase in high school GPA, the odds of persisting increased by 3.403 times at the $p < .001$ level. For each unit increase in SAT composite score, the odds of persisting increased by 1.001 times at the $p < .01$ level.

For block two of the regression model, the result was again statistically significant $\chi^2(25) = 158.435$, $p < .001$. This model explained 12.4% (Nagelkerke $R^2$) of the variance in persistence to the second year and classified correctly 92.2% of the cases. The Hosmer and Lemeshow test was not statistically significant $\chi^2(8) = 4.458$, $p = .814$, resulting in a goodness of fit for the model. In terms of the input variables, in-state resident students were 2.687 ($p < .01$) times more likely to persist beyond the first year than out-of-state/international residents. For every one unit

Table 38

*Logistic Regression Analysis for Persistence to the Second Year (First-Year Persistence) for Declared Students*

| | Model 1 | | | Model 2 | | |
|---|---|---|---|---|---|---|
| *n* = 679 | B | Sig. | Exp. (B) | B | Sig. | Exp. (B) |
| Block 1: Input Variables | | | | | | |
| *Ethnicity* | | | | | | |
| African American/Black | -.121 | .874 | .886 | -.281 | .723 | .755 |
| Asian/Asian American | .293 | .491 | 1.341 | .485 | .263 | 1.624 |
| Latino/Chicano | -.061 | .904 | .941 | .027 | .959 | 1.027 |
| *Other demographic variables* | | | | | | |
| Female | .375 | .269 | 1.455 | .370 | .289 | 1.447 |
| Non-lower socioeconomic status | -.486 | .257 | .615 | -.968 | .187 | .380 |
| First-generation | -.069 | .877 | .933 | .026 | .956 | 1.026 |
| In-state resident | -.502 | .635 | .605 | -.297 | .783 | .743 |
| *Pre-college academic performance* | | | | | | |
| High school GPA | .916 | .103 | 2.500 | .950 | .099 | 2.586 |
| AP exams | 1.274 | .004** | 3.577 | 1.281 | .005** | 3.602 |
| SAT composite | .000 | .634 | 1.000 | .000 | .653 | 1.000 |
| Dual enrollment credit | -.216 | .661 | .806 | -.225 | .656 | .799 |
| Number of dual enrollment courses | .021 | .804 | 1.021 | .024 | .781 | 1.025 |
| Block 2: Environmental Variables | | | | | | |
| *College* | | | | | | |
| Agricultural and Environmental Science | | | | .150 | .770 | 1.162 |
| Biological Sciences | | | | -.464 | .387 | .629 |

Table 38 (continued)

*Logistic Regression Analysis for Persistence to the Second Year (First-Year Persistence) for Declared Students*

| | Model 1 | | | Model 2 | | |
|---|---|---|---|---|---|---|
| *n* = 838 | B | Sig. | Exp. (B) | B | Sig. | Exp. (B) |
| Block 2: Environmental Variables (continued) | | | | | | |
| *Academic Discipline Area* | | | | | | |
| Humanities, Arts | | | | .736 | .316 | 2.087 |
| Math and Physical Sciences | | | | .344 | .625 | 1.411 |
| *Developmental education/workload courses* | | | | | | |
| Enrolled in developmental education/workload | | | | .067 | .899 | 1.069 |
| Total number of developmental education/ workload courses | | | | -.016 | .939 | .984 |
| *High-impact educational practices* | | | | | | |
| Undergraduate research | | | | .628 | .218 | 1.874 |
| First-year seminars | | | | .577 | .105 | 1.781 |
| *Other environmental variables* | | | | | | |
| Equal opportunity program (EOP) | | | | -.646 | .415 | .524 |
| **Cox & Snell $R^2$** | **.037** | | | **.049** | | |
| **Nagelkerke $R^2$** | **.098** | | | **.131** | | |

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

increase in high school GPA, the odds of persisting increased by 3.435 times at the $p < .001$ level. For each unit increase in SAT composite score, the odds of persisting increased by 1.001 times at the $p < .01$ level. In terms of environment, only undergraduate research appeared to be significant. Declared students who participated in undergraduate research were 4.894 ($p < .001$) times more likely to persist to the second year than those students who did not participate.

**Persistence to the third year (second year persistence).** The logistic regression calculated for persistence to the third year was again completed using two blocks, and is represented in Table 39. The blocks contained the same independent variables as the model for persistence to the second year. For block one, the regression model was again statistically significant $\chi 2(15) = 159.962$, $p < .001$. The model explained 8.1% (Nagelkerke R2) of the variance in persistence to the third year and classified correctly 87.4% of the cases. The Hosmer and Lemeshow test was not statistically significant $\chi 2(8) = 4.906$, $p = .768$, resulting in a goodness of fit for the model.

In terms of input variables, race/ethnicity again appeared to not result in any statistically significant difference in the likelihood of persisting, this time to the third year, for any one ethnic group as compared to the dummy variable of "White" with one exception: Asian/Asian-American. Asian/Asian-American students were 1.488 ($p < .01$) times more likely to persist than White students. With gender, female students were 1.297 ($p < .05$) times more likely to persist than male students into the third year. In-state resident students were 1.930 ($p < .05$) times more likely to persist beyond the second year than out-of-state/international residents.

With the pre-college academic performance variables, the odds ratios resulted in higher earned high school GPAs and higher SAT composite scores as being associated with higher likelihood of persistence into the third year. For every one unit increase in high school GPA, the

Table 39

*Logistic Regression Analysis for Persistence to the Third Year (Second Year Persistence)*

| | Model 1 | | | Model 2 | | |
|---|---|---|---|---|---|---|
| *n* = 3624 | B | Sig. | Exp. (B) | B | Sig. | Exp. (B) |
| Block 1: Input Variables | | | | | | |
| *Ethnicity* | | | | | | |
| African American/Black | .322 | .266 | 1.380 | .344 | .248 | 1.411 |
| American Indian/Alaskan Native | -.147 | .738 | .863 | -.047 | .916 | .954 |
| Asian/Asian American | .397 | .003** | 1.488 | .419 | .002** | 1.521 |
| Latino/Chicano | -.168 | .280 | .846 | -.114 | .473 | .892 |
| Pacific Islander | -.096 | .902 | .908 | .172 | .828 | 1.188 |
| *Other demographic variables* | | | | | | |
| Female | .260 | .013* | 1.297 | .040 | .721 | 1.041 |
| Non-lower socioeconomic status | .078 | .554 | 1.081 | -.116 | .511 | 1.123 |
| First-generation | -.129 | .339 | .879 | -.140 | .319 | .869 |
| In-state resident | .657 | .010* | 1.930 | .632 | .017* | 1.881 |
| *Pre-college academic performance* | | | | | | |
| High school GPA | 1.087 | .000*** | 2.966 | 1.128 | .000*** | 3.089 |
| AP exams | .291 | .030* | 1.337 | .283 | .039* | 1.327 |
| SAT composite | .001 | .022* | 1.001 | .001 | .039* | 1.001 |
| Dual enrollment credit | .205 | .166 | 1.227 | .176 | .244 | 1.192 |
| Number of dual enrollment courses | .008 | .736 | 1.008 | .006 | .785 | 1.007 |
| *Academic Program* | | | | | | |
| Declared | -.196 | .155 | .822 | -.061 | .708 | .941 |

Table 39 (continued)

*Logistic Regression Analysis for Persistence to the Third Year (Second Year Persistence)*

| | Model 1 | | | Model 2 | | |
|---|---|---|---|---|---|---|
| *n* = 3624 | B | Sig. | Exp. (B) | B | Sig. | Exp. (B) |
| Block 2: Environmental Variables | | | | | | |
| *College* | | | | | | |
| Agricultural and Environmental Science | | | | .456 | .048* | 1.577 |
| Biological Sciences | | | | .557 | .001** | 1.745 |
| Letters and Science | | | | .499 | .005** | 1.648 |
| *Academic Discipline Area* | | | | | | |
| AES – Agricultural Sciences | | | | -.069 | .807 | .934 |
| AES – Human Sciences | | | | .521 | .134 | 1.684 |
| Humanities, Arts | | | | .414 | .115 | 1.512 |
| Math and Physical Sciences | | | | -.165 | .438 | .848 |
| *Developmental education/workload courses* | | | | | | |
| Enrolled in developmental education/workload | | | | .108 | .474 | 1.114 |
| Total number of developmental education/ workload courses | | | | -.054 | .281 | .947 |
| *High-impact educational practices* | | | | | | |
| Undergraduate research | | | | 1.734 | .000*** | 5.661 |
| First-year seminars | | | | .129 | .239 | 1.138 |
| Equal opportunity program (EOP) | | | | .124 | .528 | 1.132 |
| **Cox & Snell $R^2$** | **.043** | | | **.073** | | |
| **Nagelkerke $R^2$** | **.081** | | | **.137** | | |

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

odds of persisting increased by 2.966 times at the $p < .001$ level. For each unit increase in SAT composite score, the odds of persisting increased by 1.001 times at the $p < .05$ level. Students who passed AP exams were 1.337 ($p < .05$) times more likely to persist into the third year than students who did not pass an AP exam. Of note, no statistically significant difference in second year persistence existed between undeclared and declared students.

For block two, the regression model was again statistically significant $\chi^2(27) = 273.026$, $p < .001$. The Nagelkerke $R^2$ statistic explained 13.7% of the variance and classified correctly 87.6% of the cases. Again, the Hosmer and Lemeshow test was not significant $\chi^2(8) = 3.367$, $p = .909$. For this block, in terms of input variables, again, Asian/Asian-American, in-state residency, high school GPA, SAT composite scores, and AP exams passed were significant. Asian/Asian-American students were 1.521 ($p < .01$) times more likely than White students to persist to the third year. In-state residents were 1.881 ($p < .05$) times more likely than non-in-state residents. Higher high school GPA and higher SAT composite scores were both associated with higher likelihood of persistence in college from year two to three. For every one unit increase in high school GPA, the odds of persisting increased by 3.089 times at the $p < .001$ level, a higher *Exp. (B)* for high school GPA than existed in block one. The *Exp. (B)* for SAT composite score was the same value as in block one. For each unit increase in SAT composite score, the odds of persisting increased by 1.001 times at the $p < .05$ level. Students who passed AP exams were 1.327 ($p < .05$) times more likely to persist to the third year than students who did not. No statistically significant difference in second year persistence existed between undeclared and declared students.

In terms of the environmental variables, undergraduate research appeared to be statistically significant. Students who participated in undergraduate research opportunities were

5.661 ($p < .001$) times more likely to persist beyond the second year. Additionally, students who first enrolled in the College of Biological Sciences were 1.745 ($p < .01$) times more likely to persist than students in the College of Engineering (dummy variable). Students who first enrolled in the College of Letters and Science were 1.648 ($p < .01$) times more likely than College of Engineering students to persist to the third year. Finally, students who first enrolled in the College of Agricultural and Environmental Sciences students were 1.577 ($p < .05$) times more likely than College of Engineering students.

**Persistence to the third year (second year persistence) for undeclared students.** For block one of the model, as shown in Table 40, the result was again statistically significant $\chi^2(12) = 21.645$, $p < .05$. As such, this model was not as significant as the model which included both undeclared and declared students. This model explained 6.2% (Nagelkerke $R^2$) of the variance in persistence to the third year and classified correctly 88.7% of the cases. The Hosmer and Lemeshow test was not statistically significant $\chi^2(8) = 7.051$, $p = .531$ resulting in a goodness of fit for the model. In terms of the demographic input variables, Asian/Asian-American undeclared students were 2.048 ($p < .05$) times more likely to persist than White undeclared students. Only high school GPA appear statistically significant in terms of pre-college academic performance. For every one unit increase in high school GPA, the odds of persisting increased by 2.563 times at the $p < .05$ level.

For block two of the regression model, the result was again statistically significant $\chi^2(20) = 53.747$, $p < .001$. This model explained 15.0% (Nagelkerke $R^2$) of the variance in persistence to the third year and classified correctly 88.5% of the cases. The Hosmer and Lemeshow test was not statistically significant $\chi^2(8) = 14.105$, $p = .079$, resulting in a goodness of fit for the model. In terms of the demographic input variables, Asian/Asian-American undeclared students were

Table 40

*Logistic Regression Analysis for Persistence to the Third Year (Second Year Persistence) for Undeclared Students*

| | Model 1 | | | Model 2 | | |
|---|---|---|---|---|---|---|
| *n* = 679 | B | Sig. | Exp. (B) | B | Sig. | Exp. (B) |
| Block 1: Input Variables | | | | | | |
| *Ethnicity* | | | | | | |
| African American/Black | .656 | .349 | 1.928 | .810 | .274 | 2.247 |
| Asian/Asian American | .717 | .021* | 2.048 | .850 | .008** | 2.341 |
| Latino/Chicano | .374 | .339 | 1.453 | .415 | .305 | 1.515 |
| *Other demographic variables* | | | | | | |
| Female | .287 | .261 | 1.333 | .215 | .418 | 1.239 |
| Non-lower socioeconomic status | -.006 | .984 | .994 | .014 | .966 | 1.014 |
| First-generation | .181 | .602 | 1.198 | .084 | .809 | 1.088 |
| In-state resident | .169 | .798 | 1.184 | -.028 | .967 | .973 |
| *Pre-college academic performance* | | | | | | |
| High school GPA | .941 | .029* | 2.563 | .990 | .025* | 2.691 |
| AP exams | .520 | .124 | 1.682 | .444 | .210 | 1.558 |
| SAT composite | .000 | .579 | 1.000 | .000 | .630 | 1.000 |
| Dual enrollment credit | .074 | .841 | 1.077 | .228 | .554 | 1.256 |
| Number of dual enrollment courses | -.009 | .881 | .991 | -.012 | .838 | .988 |
| Block 2: Environmental Variables | | | | | | |
| *College* | | | | | | |
| Agricultural and Environmental Science | | | | .196 | .585 | 1.216 |
| Biological Sciences | | | | .274 | .503 | 1.315 |

Table 40 (continued)

*Logistic Regression Analysis for Persistence to the Third Year (Second Year Persistence) for Undeclared Students*

| | Model 1 | | | Model 2 | | |
|---|---|---|---|---|---|---|
| *n* = 679 | B | Sig. | Exp. (B) | B | Sig. | Exp. (B) |
| Block 2: Environmental Variables (continued) | | | | | | |
| *Academic Discipline Area* | | | | | | |
| Humanities, Arts | | | | 1.491 | .012* | 4.444 |
| Math and Physical Sciences | | | | .339 | .470 | 1.404 |
| *Developmental education/workload courses* | | | | | | |
| Enrolled in developmental education/workload | | | | .382 | .355 | 1.446 |
| Total number of developmental education/ workload courses | | | | -.058 | .748 | .944 |
| *High-impact educational practices* | | | | | | |
| Undergraduate research | | | | 2.379 | .001** | 10.798 |
| First-year seminars | | | | -.287 | .267 | .750 |
| **Cox & Snell $R^2$** | **.031** | | | **.076** | | |
| **Nagelkerke $R^2$** | **.062** | | | **.151** | | |

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

2.341 ($p < .01$) times more likely to persist than White undeclared students. For the pre-college academic performance input variables, for every one unit increase in high school GPA, the odds of persisting increased by 2.691 times at the $p < .05$ level. For the environmental variables, undeclared students who participated in undergraduate research were 10.798 ($p < .001$) times more likely to persist to the third year than those students who did not participate. Additionally, undeclared students in the academic discipline area of arts and humanities in the College of Letters and Science were 4.444 ($p < .01$) times more likely to persist than students in the College of AES-Collegewide area.

**Persistence to the third year (second year persistence) for declared students.** The findings for this regression are depicted in Table 41. For block one of this model for declared students, the regression model was statistically significant $\chi^2(12) = 149.584$, $p < .001$. The model explained 9.2% (Nagelkerke $R^2$) of the variance in persistence to the third year and classified correctly 87.1% of the cases. The Hosmer and Lemeshow test was not statistically significant $\chi^2(8) = 5.150$, $p = .741$, resulting in a goodness of fit for the model.

In terms of the demographic input variables, Asian/Asian-American declared students were 1.591 ($p < .05$) times more likely to persist than White declared students. Female declared students were 1.294 ($p < .05$) times more likely to persist than male declared students. In-state resident students were 2.160 ($p < .01$) times more likely to persist beyond the second year than out-of-state/international residents. For the pre-college academic performance variables, every one unit increase in high school GPA, the odds of persisting increased by 3.068 times at the $p < .001$ level. For each unit increase in SAT composite score, the odds of persisting increased by 1.001 times at the $p < .05$ level.

Table 41

*Logistic Regression Analysis for Persistence to the Third Year (Second Year Persistence) for Declared Students*

| | Model 1 | | | Model 2 | | |
|---|---|---|---|---|---|---|
| *n* = 2945 | B | Sig. | Exp. (B) | B | Sig. | Exp. (B) |
| Block 1: Input Variables | | | | | | |
| *Ethnicity* | | | | | | |
| African American/Black | .231 | .467 | 1.260 | .226 | .489 | 1.253 |
| Asian/Asian American | .307 | .039* | 1.359 | .309 | .042* | 1.362 |
| Latino/Chicano | -.258 | .124 | .772 | -.197 | .253 | .821 |
| *Other demographic variables* | | | | | | |
| Female | .258 | .026* | 1.294 | .004 | .973 | 1.004 |
| Non-lower socioeconomic status | .076 | .600 | 1.079 | .019 | .896 | 1.020 |
| First-generation | -.208 | .158 | .812 | -.193 | .197 | .825 |
| In-state resident | .770 | .006** | 2.160 | .770 | .008** | 2.159 |
| *Pre-college academic performance* | | | | | | |
| High school GPA | 1.121 | .000*** | 3.068 | 1.157 | .000*** | 3.182 |
| AP exams | .261 | .076 | 1.298 | .272 | .070 | 1.313 |
| SAT composite | .001 | .019* | 1.001 | .001 | .031* | 1.001 |
| Dual enrollment credit | .224 | .169 | 1.250 | .161 | .331 | 1.175 |
| Number of dual enrollment courses | .011 | .664 | 1.011 | .009 | .720 | 1.009 |
| Block 2: Environmental Variables | | | | | | |
| *College* | | | | | | |
| Agricultural and Environmental Science | | | | -.221 | .761 | .802 |
| Biological Sciences | | | | .572 | .001** | 1.771 |
| Letters and Science | | | | .582 | .002** | 1.790 |

Table 41 (continued)

*Logistic Regression Analysis for Persistence to the Third Year (Second Year Persistence) for Declared Students*

| | Model 1 | | | Model 2 | | |
|---|---|---|---|---|---|---|
| *n* = 2945 | B | Sig. | Exp. (B) | B | Sig. | Exp. (B) |
| Block 2: Environmental Variables (continued) | | | | | | |
| *Academic Discipline Area* | | | | | | |
| AES – Agricultural Sciences | | | | .621 | .405 | 1.862 |
| AES – Environmental Sciences | | | | .725 | .356 | 2.064 |
| AES – Human Sciences | | | | 1.210 | .117 | 3.355 |
| Humanities, Arts | | | | .071 | .809 | 1.074 |
| Math and Physical Sciences | | | | -.253 | .295 | .777 |
| *Developmental education/workload courses* | | | | | | |
| Enrolled in developmental education/workload | | | | .074 | .657 | 1.076 |
| Total number of developmental education/ workload courses | | | | -.047 | .375 | .954 |
| *High-impact educational practices* | | | | | | |
| Undergraduate research | | | | 1.621 | .000*** | 5.057 |
| First-year seminars | | | | .217 | .076 | 1.242 |
| **Cox & Snell $R^2$** | **.050** | | | **.078** | | |
| **Nagelkerke $R^2$** | **.092** | | | **.146** | | |

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

For block two of the regression model, the result was again statistically significant $\chi^2(24) = 240.580$, $p < .001$. This model explained 14.6% (Nagelkerke $R^2$) of the variance in persistence to the third year and classified correctly 87.3% of the cases. The Hosmer and Lemeshow test was not statistically significant $\chi^2(8) = 8.057$, $p = .428$, resulting in a goodness of fit for the model.

In terms of the demographic input variables, Asian/Asian-American declared students were 1.362 ($p < .05$) times more likely to persist than White declared students. In-state resident students were 2.159 ($p < .01$) times more likely to persist beyond the second year than out-of-state/international residents. For the pre-college academic performance variables, every one unit increase in high school GPA, the odds of persisting increased by 3.182 times at the $p < .001$ level. For each unit increase in SAT composite score, the odds of persisting increased by 1.001 times at the $p < .05$ level.

For the environmental variables, students who first enrolled in the College of Biological Sciences were 1.771 ($p < .01$) times more likely to persist beyond the second year than student who first enrolled in the College of Engineering. Students who first started in the College of Letters and Science were 1.790 ($p < .01$) times more likely to persist beyond the second year than student who first enrolled in the College of Engineering. Declared students who participated in undergraduate research were 5.057 ($p < .001$) times more likely to persist to the third year than those students who did not participate.

**Persistence to the fourth year (third year persistence).** Consistent with the previous models, the logistic regression calculated for persistence to the fourth year was again completed using two blocks. The output measure of persistence to the fourth year did not include cases of students who had graduated ($n = 55$), within three years as persisters or non-persisters. This is because they had not dropped out, but were no longer at the institution. The blocks for this

regression contained the same independent variables as the models for both the persistence to the second year and persistence to the third year and the findings are depicted in Table 42. For block one, the regression model was again statistically significant $\chi^2(12) = 123.638$, $p < .001$. The model explained 6.1% (Nagelkerke $R^2$) of the variance in persistence to the fourth year and classified correctly 85.7% of the cases. The Hosmer and Lemeshow test was not significant $\chi^2(8) = 4.510$, $p = .808$, resulting in goodness of fit for the model.

In terms of the demographic input variables, there was no statistically significant difference in the likelihood of persisting to the second year for any one ethnic group as compared to the dummy variable of "White" with the exception of one group: Asian/Asian-American. Asian/Asian-American students were 1.372 ($p < .05$) times more likely to persist than White students. With gender, female students were 1.418 ($p < .001$) times more likely to persist than male students, through three years, and into the fourth year. In-state resident students were 1.973 ($p < .01$) times more likely to persist beyond the third year than out-of-state/international residents. Of note, no statistically significant difference in third year persistence existed between undeclared and declared students.

With the pre-college academic performance variables, the odds ratios resulted in higher earned high school GPAs as being associated with higher likelihood of persistence into the fourth year. For every one unit increase in high school GPA, the odds of persisting increased by 2.018 times at the $p < .001$ level. Students who passed AP exams were 1.325 ($p < .05$) times more likely to persist to the fourth year than students who did not.

For block two, the regression model was again statistically significant $\chi^2(24) = 234.047$, $p < .001$. The Nagelkerke $R^2$ statistic explained 11.3% of the variance and classified correctly 85.7% of the cases. Again, the Hosmer and Lemeshow test was not significant $\chi^2(8) = 6.848$, $p =$

Table 42

*Logistic Regression Analysis for Persistence to the Fourth Year (Third Year Persistence)*

| | Model 1 | | | Model 2 | | |
|---|---|---|---|---|---|---|
| *n* = 3569 | B | Sig. | Exp. (B) | B | Sig. | Exp. (B) |
| Block 1: Input Variables | | | | | | |
| *Ethnicity* | | | | | | |
| African American/Black | -.539 | .213 | .583 | -.550 | .214 | .577 |
| American Indian/Alaskan Native | -.780 | .161 | .458 | -.728 | .198 | .483 |
| Asian/Asian American | .291 | .421 | .748 | -.340 | .355 | .712 |
| Latino/Chicano | -.719 | .051 | .487 | -.701 | .062 | .496 |
| Pacific Islander | -1.090 | .150 | .336 | -.875 | .254 | .417 |
| *Other demographic variables* | | | | | | |
| Female | .341 | .001** | 1.407 | .141 | .187 | 1.152 |
| Non-lower socioeconomic status | -.171 | .169 | .843 | -.089 | .606 | .915 |
| First-generation | -.228 | .073 | .796 | -.195 | .147 | .823 |
| In-state resident | .698 | .005** | 2.009 | .725 | .005** | 2.064 |
| *Pre-college academic performance* | | | | | | |
| High school GPA | .728 | .000*** | 2.070 | .693 | .000*** | 2.000 |
| AP exams | .284 | .028* | 1.329 | .278 | .035* | 1.321 |
| SAT composite | .000 | .176 | 1.000 | .000 | .414 | 1.000 |
| Dual enrollment credit | .264 | .061 | 1.302 | .244 | .088 | 1.277 |
| Number of dual enrollment courses | -.019 | .367 | .981 | -.021 | .319 | .979 |
| *Academic Program* | | | | | | |
| Declared | .232 | .079 | 1.261 | .158 | .368 | 1.171 |

Table 42 (continued)

*Logistic Regression Analysis for Persistence to the Fourth Year (Third Year Persistence)*

| | Model 1 | | | Model 2 | | |
|---|---|---|---|---|---|---|
| *n* = 3569 | B | Sig. | Exp. (B) | B | Sig. | Exp. (B) |
| Block 2: Environmental Variables | | | | | | |
| *College* | | | | | | |
| Agricultural and Environmental Science | | | | .287 | .284 | 1.332 |
| Biological Sciences | | | | .671 | .000*** | 1.957 |
| Letters and Science | | | | .429 | .011* | 1.535 |
| *Academic Discipline Area* | | | | | | |
| AES – Agricultural Sciences | | | | -.011 | .970 | .989 |
| AES – Environmental Sciences | | | | -.176 | .626 | .838 |
| AES – Human Sciences | | | | .689 | .061 | 1.991 |
| Humanities, Arts | | | | .407 | .107 | 1.502 |
| Math and Physical Sciences | | | | -.083 | .681 | .920 |
| *Developmental education/workload courses* | | | | | | |
| Enrolled in developmental education/workload | | | | .076 | .596 | 1.079 |
| Total number of developmental education/ workload courses | | | | -.070 | .146 | .932 |
| *High-impact educational practices* | | | | | | |
| Undergraduate research | | | | 1.392 | .000*** | 4.022 |
| First-year seminars | | | | .066 | .525 | 1.068 |
| **Cox & Snell $R^2$** | **.036** | | | **.065** | | |
| **Nagelkerke $R^2$** | **.064** | | | **.116** | | |

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

.553. For this block, gender no longer appeared to result in any statistical significance in the regression. In-state residents, however, were still more likely to persist to the fourth year than out-of-state/international residents. More specifically, in-state residents were nearly twice as likely (*Exp. (B)* = 1.995, $p < .01$) than non-in-state residents to persist. Asian/Asian-American students were 1.358 ($p < .05$) times more likely to persist than White students. As before, no statistically significant difference in third year persistence existed between undeclared and declared students.

In terms of pre-college academic performance variables, again, higher high school GPA was associated with higher likelihood of persistence in college from year three to four. For everyone unit increase in high school GPA, the odds of persisting increased by 1.982 times at the $p < .001$ level, but at a lower *Exp. (B)* for high school GPA than existed in block one. Students who passed AP exams were 1.315 ($p < .05$) times more likely to persist to a fourth year than students who did not.

With the environmental variables, in terms of the high-impact educational practices (HIPs) included in this study, only undergraduate research appeared to be statistically significant in the model. Students who participated in undergraduate research opportunities were 4.024 ($p < .001$) times more likely to persist beyond the third year. In terms of initial college of enrollment, students who started in the College of Biological Sciences students were 1.985 ($p < .001$) times more likely to persist, and College of Letters and Science students were 1.567 ($p < .01$) times more likely than students who started in the College of Engineering. Students who started in the College of Agricultural and Environmental Sciences were 1.532 ($p < .05$) times more likely than students who started in the College of Engineering.

**Persistence to the fourth year (third year persistence) for undeclared students.** The findings for this regression are depicted in Table 43. For undeclared students, block one of the regression model was statistically significant $\chi^2(8) = 16.248$, $p < .05$. As such, this model was not as significant as the model which included both undeclared and declared students. This model explained 4.5% (Nagelkerke $R^2$) of the variance in persistence to the fourth year and classified correctly 87.7% of the cases. The Hosmer and Lemeshow test was not statistically significant $\chi^2(8) = 5.932$, $p = .655$, resulting in a goodness of fit for the model. In terms of the input variables, none of the demographic variables were significant. Only high school GPA appeared statistically significant in terms of pre-college academic performance. For every one unit increase in high school GPA, the odds of persisting increased by 2.438 times at the $p < .05$ level.

For block two of the regression model, the result was again statistically significant $\chi^2(15) = 37.585$, $p < .01$. This model explained 10.2% (Nagelkerke $R^2$) of the variance in persistence to the fourth year and classified correctly 87.7% of the cases. The Hosmer and Lemeshow test was not statistically significant $\chi^2(8) = 5.370$, $p = .717$, resulting in a goodness of fit for the model. In terms of the demographic input variables, none of the variables were significant. For the pre-college academic performance input variables, for every one unit increase in high school GPA, the odds of persisting increased by 2.416 times at the $p < .05$ level.

For the environmental variables, undeclared students who participated in undergraduate research were 4.049 ($p < .01$) times more likely to persist to the fourth year than those students who did not participate. Additionally, undeclared students in the academic discipline area of arts and humanities in the College of Letters and Science were 3.333 ($p < .01$) times more likely to persist than students in the AES-Collegewide academic discipline area.

Table 43

*Logistic Regression Analysis for Persistence to the Fourth Year (Third Year Persistence) for Undeclared Students*

| | Model 1 | | | Model 2 | | |
|---|---|---|---|---|---|---|
| *n* = 681 | B | Sig. | Exp. (B) | B | Sig. | Exp. (B) |
| Block 1: Input Variables | | | | | | |
| *Ethnicity* | | | | | | |
| African American/Black | .024 | .968 | 1.024 | -.076 | .902 | .927 |
| Asian/Asian American | .474 | .099 | 1.606 | .544 | .065 | 1.723 |
| Latino/Chicano | .425 | .258 | 1.530 | .337 | .380 | 1.401 |
| *Other demographic variables* | | | | | | |
| Female | -.032 | .897 | .969 | -.128 | .615 | .880 |
| Non-lower socioeconomic status | -.219 | .465 | .804 | -.162 | .597 | .850 |
| *Pre-college academic performance* | | | | | | |
| High school GPA | .891 | .027* | 2.438 | .882 | .033* | 2.416 |
| AP exams | .376 | .200 | 1.456 | .330 | .271 | 1.391 |
| SAT composite | .001 | .259 | 1.001 | .001 | .285 | 1.001 |
| Block 2: Environmental Variables | | | | | | |
| *College* | | | | | | |
| Agricultural and Environmental Science | | | | .082 | .814 | 1.085 |
| Biological Sciences | | | | .295 | .461 | 1.344 |
| *Academic Discipline Area* | | | | | | |
| Humanities, Arts | | | | 1.204 | .027* | 3.333 |
| Math and Physical Sciences | | | | -.044 | .921 | .957 |

Table 43 (continued)

*Logistic Regression Analysis for Persistence to the Fourth Year (Third Year Persistence) for Undeclared Students*

| | Model 1 | | | Model 2 | | |
|---|---|---|---|---|---|---|
| *n* = 681 | B | Sig. | Exp. (B) | B | Sig. | Exp. (B) |
| Block 2: Environmental Variables (continued) | | | | | | |
| *Developmental education/workload courses* | | | | | | |
| Enrolled in developmental education/workload | | | | -.065 | .864 | .937 |
| Total number of developmental education/ workload courses | | | | .096 | .576 | 1.101 |
| *High-impact educational practices* | | | | | | |
| Undergraduate research | | | | 1.399 | .003** | 4.049 |
| **Cox & Snell $R^2$** | **.024** | | | **.054** | | |
| **Nagelkerke $R^2$** | **.045** | | | **.102** | | |

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

**Persistence to the fourth year (third year persistence) for declared students.** The findings for this regression are depicted in Table 44. For block one of this model for declared students, the regression model was statistically significant $\chi^2(12) = 118.654$, $p < .001$. The model explained 7.1% (Nagelkerke $R^2$) of the variance in persistence to the fourth year and classified correctly 85.3% of the cases. The Hosmer and Lemeshow test was not statistically significant $\chi^2(8) = 9.872$, $p = .274$, resulting in a goodness of fit for the model.

In terms of the demographic input variables, gender, first-generation status, and residency were significant. Female declared students were 1.533 ($p < .05$) times more likely to persist than male declared students. First-generation declared students had an odds ratio less than one (*Exp. (B)* = .754) with a negative coefficient ($B = -.283$). Again, this translates to the variable as associated with lower odds of the outcome being tested to occur (Szumilas, 2010). Non-first-generation declared students would be associated with higher odds of the outcome of on-time graduation, with *Exp. (B)* calculated by inverting the odds ratio (1/.754 = 1.326, $p < .05$). Non-first-generation declared students, therefore, were 1.326 ($p < .05$) times more likely to persist to the fourth year than first-generation declared students. In-state resident declared students were 2.272 ($p < .01$) times more likely to persist beyond the third year than out-of-state/international declared students.

For the pre-college academic performance variables, high school GPA and AP exams were significantly associated with higher likelihood of persisting to a fourth year. For every one unit increase in high school GPA, the odds of persisting increased by 1.962 times at the $p < .001$ level. Declared students who passed AP exams were 1.489 ($p < .01$) times more likely to persist to the fourth year than declared students who did not pass AP exams.

For block two of the regression model, the result was again statistically significant $\chi^2(24) = 211.816$, $p < .001$. This model explained 12.4% (Nagelkerke $R^2$) of the variance in persistence to the fourth year and classified correctly 85.4% of the cases. The Hosmer and Lemeshow test was not statistically significant $\chi^2(8) = 11.839$, $p = .159$, resulting in a goodness of fit for the model. In terms of the demographic input variables, first-generation declared students no longer continued to be less likely to persist to the fourth year. In-state resident declared students were 2.307 ($p < .01$) times more likely to persist beyond the third year than out-of-state/international declared students.

For the pre-college academic performance variables, high school GPA and AP exams were significantly associated with higher likelihood of persisting to a fourth year. For every one unit increase in high school GPA, the odds of persisting increased by 1.848 times at the $p < .01$ level. Declared students who passed AP exams were 1.469 ($p < .01$) times more likely to persist to the fourth year than declared students who did not pass AP exams.

For the environmental variables, declared students who first enrolled in the College of Biological Sciences were 1.913 ($p < .001$) times more likely to persist beyond the third year than students who first enrolled in the College of Engineering. Declared students who first started in the College of Letters and Science were 1.532 ($p < .05$) times more likely to persist beyond the third year than student who first enrolled in the College of Engineering. Declared students who first enrolled in the academic discipline area of AES-Human Sciences were 4.842 ($p < .05$) times more likely to persist to the fourth year than students in the social sciences academic discipline area (dummy variable). Declared students who participated in undergraduate research were 3.951 ($p < .001$) times more likely to persist to the fourth year than those students who did not participate.

Table 44

*Logistic Regression Analysis for Persistence to the Fourth Year (Third Year Persistence) for Declared Students*

| | Model 1 | | | Model 2 | | |
|---|---|---|---|---|---|---|
| *n* = 2898 | B | Sig. | Exp. (B) | B | Sig. | Exp. (B) |
| Block 1: Input Variables | | | | | | |
| *Ethnicity* | | | | | | |
| African American/Black | -.026 | .930 | .974 | -.004 | .989 | .996 |
| American Indian/Native Alaskan | -.325 | .467 | .723 | -.234 | .606 | .791 |
| Asian/Asian American | .240 | .091 | 1.271 | .226 | .119 | 1.254 |
| Latino/Chicano | -.240 | .144 | .787 | -.157 | .353 | .855 |
| Pacific Islander | -.234 | .770 | .791 | .061 | .940 | 1.063 |
| *Other demographic variables* | | | | | | |
| Female | .427 | .000*** | 1.533 | .211 | .075 | 1.235 |
| Non-lower socioeconomic status | .198 | .146 | 1.219 | .154 | .271 | 1.167 |
| First-generation | -.283 | .042* | .754 | -.272 | .054 | .762 |
| In-state resident | .821 | .002** | 2.272 | .836 | .003** | 2.307 |
| *Pre-college academic performance* | | | | | | |
| High school GPA | .674 | .000*** | 1.962 | .614 | .001** | 1.848 |
| AP exams | .398 | .002** | 1.489 | .385 | .003** | 1.469 |
| SAT composite | .000 | .208 | 1.000 | .000 | .472 | 1.000 |
| Block 2: Environmental Variables | | | | | | |
| *College* | | | | | | |
| Agricultural and Environmental Science | | | | -.622 | .349 | .537 |
| Biological Sciences | | | | .649 | .000*** | 1.913 |
| Letters and Science | | | | .427 | .016* | 1.532 |

Table 44 (continued)

*Logistic Regression Analysis for Persistence to the Fourth Year (Third Year Persistence) for Declared Students*

| | Model 1 | | | Model 2 | | |
|---|---|---|---|---|---|---|
| *n* = 2898 | B | Sig. | Exp. (B) | B | Sig. | Exp. (B) |
| Block 2: Environmental Variables (continued) | | | | | | |
| *Academic Discipline Area* | | | | | | |
| AES – Agricultural Sciences | | | | .850 | .212 | 2.339 |
| AES – Environmental Sciences | | | | .699 | .324 | 2.011 |
| AES – Human Sciences | | | | 1.577 | .026* | 4.842 |
| Humanities, Arts | | | | .146 | .608 | 1.157 |
| Math and Physical Sciences | | | | -.069 | .763 | .933 |
| *Developmental education/workload courses* | | | | | | |
| Enrolled in developmental education/workload | | | | .093 | .553 | 1.098 |
| Total number of developmental education/ workload courses | | | | -.090 | .076 | .914 |
| *High-impact educational practices* | | | | | | |
| Undergraduate research | | | | 1.374 | .000*** | 3.951 |
| First-year seminars | | | | .154 | .179 | 1.167 |
| **Cox & Snell $R^2$** | **.040** | | | **.070** | | |
| **Nagelkerke $R^2$** | **.071** | | | **.124** | | |

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

## Graduation and On-Time Graduation

The sixth and final research question of this study was: to what extent do the variables included in this study predict graduation of first-time in college freshmen? As with the previous research question, to answer this question, statistical analyses were conducted utilizing logistic multiple regression for each of the graduation variables (graduation, on-time graduation). The logistic regression was calculated for both graduation variables again using a model with three blocks. Block one included the inputs, or demographic and pre-college academic performance variables, again with the exception of ACT composite scores. Block two included the environmental variables of college, academic discipline area, developmental education/workload course enrollment, undergraduate research, first-year seminars, equal opportunity program (EOP), change of major, and earned college GPA.

Linearity of the continuous variables of SAT composite score, high school GPA, and dual enrollment credits, and earned college GPA with respect to the logit of the dependent variable was tested using the Box-Tidwell (1962) procedure. Then a Bonferroni correction was applied using all 30 terms in the regression model resulting in statistical significance being accepted when $p < .0017$ (Tabachnick & Fidell, 2013).

### Graduation (Within Six Years)

The results of the modeling for graduation are indicated in Table 45. With block one, the regression model results were statistically significant $\chi^2(15) = 195.844$, $p < .001$. The model explained 9.3% (Nagelkerke $R^2$) of the variance in the variable for graduation and classified correctly 85.4% of the cases. The Hosmer and Lemeshow Test was not significant $\chi^2(8) = 5.228$, $p = .733$, resulting in goodness of fit for the model.

For the demographic variables, only one of the race/ethnic groups appeared to have a greater or lesser likelihood of graduating. Asian/Asian-American students were 1.470 ($p < .01$) times more likely to graduate than White students. As with persistence, female students were more likely to graduate than male students. More specifically, female students were 1.519 ($p < .001$) times more likely to graduate than their male students. In-state resident students were 2.028 ($p < .01$) times more likely to graduate than out-of-state/international residents. Non-low-income students had an increased likelihood of graduating. Non-low-income status students were 1.310 ($p < .05$) times more likely to graduate than low-income students. Of note, no statistically significant difference in graduation existed between undeclared and declared students.

With the pre-college academic performance variables, higher earned high school GPAs ($p < .001$) were associated with higher likelihood of graduation. For every one unit increase in high school GPA, the odds of graduating increased by 2.418 times at the $p < .001$ level. Students who passed AP exams were 1.460 ($p < .01$) times more likely to graduate than students who did not. None of the other pre-college academic variables resulted in any statistically significant findings.

For block two, the regression model was again statistically significant $\chi^2(30) = 584.324$, $p < .001$. The Nagelkerke $R^2$ statistic explained 26.3% of the variance and classified correctly 86.8% of the cases. The Hosmer and Lemeshow Test was again not significant $\chi^2(8) = 8.163$, $p = .418$, and indicated goodness of fit for this model.

As with block one, Asian/Asian-American students were more likely to graduate. More specifically, Asian/Asian-American students were 1.592 ($p < .01$) times more likely to graduate than White students. The input variable for low-income was no longer statistically significant. In-state resident students and female students continued to be more likely to graduate. Females were 1.260 ($p < .05$) times more likely to graduate than male students. In-state resident students

were 1.984 ($p < .05$) times more likely to graduate than out-of-state/international resident students.

In terms of the pre-college academic performance variables, higher earned high school GPAs ($p < .001$) were associated with higher likelihood of graduation. For every one unit increase in high school GPA, the odds of graduating increased by 2.832 times at the $p < .001$ level. Students who passed AP exams were 1.463 ($p < .01$) times more likely to graduate than students who did not. Declared students were at a decreased likelihood of graduating than undeclared students. Declared students had an odds ratio less than one (*Exp. (B)* = .475) with a negative coefficient. This translates to the variable as associated with lower odds of the outcome being tested to occur (Szumilas, 2010). In this regression, with *Exp. (B)* < 1, then there were lower odds of the outcome of graduating. Inverting the odds ratio provides some clarity by transforming the *Exp. (B)* to a value greater than one (Laerd Statistics, 2018). More specifically in this case, the transformation was conducted with the intention to find the odds ratio for undeclared students. Undeclared would be associated with higher odds of the outcome of graduation, with *Exp. (B)* calculated by inverting the odds ratio (1/.475 = 2.105, $p < .01$). Undeclared students, therefore, were 2.105 ($p < .001$) times more likely to graduate than declared students.

With the environmental variables, in terms of the high-impact educational practices (HIPs) included in this study, only undergraduate research appeared to be statistically significant in the model. Students who participated in undergraduate research opportunities were 4.284 ($p < .001$) times more likely to graduate. In terms of initial college of enrollment, only students who first enrolled in the College of Letters and Science were more likely to graduate than students in the College of Engineering. College of Letters and Science were 1.745 ($p < .01$) more likely to

Table 45

*Logistic Regression Analysis for Graduation (Within Six Year Graduation)*

| | Model 1 | | | Model 2 | | |
|---|---|---|---|---|---|---|
| *n* = 3624 | B | Sig. | Exp. (B) | B | Sig. | Exp. (B) |
| Block 1: Input Variables | | | | | | |
| *Ethnicity* | | | | | | |
| African American/Black | .036 | .889 | 1.037 | -.014 | .960 | .986 |
| American Indian/Alaskan Native | -.050 | .909 | .951 | .402 | .391 | 1.494 |
| Asian/Asian American | .385 | .003 | 1.470 | .465 | .001** | 1.592 |
| Latino/Chicano | -.171 | .246 | .843 | -.013 | .935 | .987 |
| Pacific Islander | .095 | .904 | 1.099 | .688 | .396 | 1.990 |
| *Other demographic variables* | | | | | | |
| Female | .418 | .000*** | 1.519 | .231 | .040* | 1.260 |
| Non-lower socioeconomic status | .270 | .027* | 1.310 | .218 | .208 | 1.244 |
| First-generation | -.181 | .153 | .835 | -.204 | .142 | .815 |
| In-state resident | .707 | .004** | 2.028 | .685 | .011* | 1.984 |
| *Pre-college academic performance* | | | | | | |
| High school GPA | .883 | .000*** | 2.418 | 1.041 | .000*** | 2.832 |
| AP exams | .378 | .003** | 1.460 | .381 | .006** | 1.463 |
| SAT composite | .001 | .050 | 1.001 | .001 | .063 | 1.001 |
| Dual enrollment credit | .024 | .867 | 1.024 | .035 | .817 | 1.036 |
| Number of dual enrollment courses | .041 | .091 | 1.042 | .042 | .106 | 1.043 |
| *Academic Program* | | | | | | |
| Declared | -.163 | .206 | .850 | -.744 | .000*** | .475 |

Table 45 (continued)

*Logistic Regression Analysis for Graduation (Within Six Year Graduation)*

| | Model 1 | | | Model 2 | | |
|---|---|---|---|---|---|---|
| *n* = 3624 | B | Sig. | Exp. (B) | B | Sig. | Exp. (B) |
| Block 2: Environmental Variables | | | | | | |
| *College* | | | | | | |
| Agricultural and Environmental Science | | | | .187 | .499 | 1.205 |
| Biological Sciences | | | | .251 | .125 | 1.285 |
| Letters and Science | | | | .556 | .003** | 1.745 |
| *Academic Discipline Area* | | | | | | |
| AES – Agricultural Sciences | | | | -.135 | .665 | .873 |
| AES – Environmental Sciences | | | | .107 | .794 | 1.113 |
| AES – Human Sciences | | | | .351 | .353 | 1.421 |
| Humanities, Arts | | | | .120 | .627 | 1.128 |
| Math and Physical Sciences | | | | -.841 | .000*** | .431 |
| *Developmental education/workload courses* | | | | | | |
| Enrolled in developmental education/workload | | | | .016 | .917 | 1.016 |
| Total number of developmental education/ workload courses | | | | -.062 | .233 | .940 |
| *High-impact educational practices* | | | | | | |
| Undergraduate research | | | | 1.455 | .000*** | 4.284 |
| First-year seminars | | | | .155 | .154 | 1.168 |
| EOP participation | | | | -.075 | .697 | .928 |
| *Other environmental variables* | | | | | | |
| Change of major | | | | .857 | .089 | 2.355 |
| Number of changes of major | | | | 1.023 | .026* | 2.780 |

Table 45 (continued)

*Logistic Regression Analysis for Graduation (Within Six Year Graduation)*

| | Model 1 | | | Model 2 | | |
|---|---|---|---|---|---|---|
| *n* = 3624 | B | Sig. | Exp. (B) | B | Sig. | Exp. (B) |
| **Cox & Snell $R^2$** | **.053** | | | **.149** | | |
| **Nagelkerke $R^2$** | **.093** | | | **.263** | | |

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

graduate than students in the College of Engineering. For the academic discipline areas, students who first enrolled in the area of math and physical science were less likely to graduate when compared to the AES-Collegewide (dummy variable) students. More specifically, math and physical sciences students were 2.320 ($p < .01$) times less likely to graduate. One additional environmental variable, the number of changes of major, was statistically significant. For each increase in the number of changes of major, students were 2.780 ($p < .05$) times more likely to graduate. Of note, however, students who made a change were not more or less likely to graduate than those who did not make a change.

**Graduation (within six years) for undeclared students.** The findings for this regression model are depicted in Table 46. For undeclared students, block one of the regression model was statistically significant $\chi^2(11) = 25.\ 315$, $p < .01$. This model explained 6.6% (Nagelkerke $R^2$) of the variance in graduation and classified correctly 86.5% of the cases. The Hosmer and Lemeshow test was not statistically significant $\chi^2(8) = 10.691$, $p = .220$, resulting in a goodness of fit for the model. Only SAT composite score was significant. For every one unit increase in SAT composite score, the odds of graduating increased by 1.001 times at the $p < .05$ level.

For block two of the regression model, the result was again statistically significant $\chi^2(19) = 46.134$, $p < .001$. This model explained 11.8% (Nagelkerke $R^2$) of the variance in graduation and classified correctly 86.6% of the cases. The Hosmer and Lemeshow test was not statistically significant $\chi^2(8) = 5.068$, $p = .750$, resulting in a goodness of fit for the model. In terms of the input variables, none of the variables were significant. For the environmental variables, only two were statistically significant. Asian/Asian-American undeclared students had an odds ratio less than one (*Exp. (B)* = .552) with a negative coefficient ($B = -.595$). This translates to the variable as associated with lower odds of the outcome being tested to occur (Szumilas, 2010).

Table 46

*Logistic Regression Analysis for Graduation (Within Six Years) for Undeclared Students*

| | Model 1 | | | Model 2 | | |
|---|---|---|---|---|---|---|
| *n* = 689 | B | Sig. | Exp. (B) | B | Sig. | Exp. (B) |
| Block 1: Input Variables | | | | | | |
| *Ethnicity* | | | | | | |
| African American/Black | -.202 | .735 | .817 | -.175 | .781 | .840 |
| Asian/Asian American | -.525 | .066 | .592 | -.595 | .042* | .552 |
| Latino/Chicano | -.209 | .547 | .812 | -.184 | .605 | .832 |
| *Other demographic variables* | | | | | | |
| Female | -.445 | .058 | .641 | -.357 | .138 | .700 |
| Non-lower socioeconomic status | -.006 | .983 | .994 | -.015 | .958 | .985 |
| In-state resident | .423 | .581 | 1.526 | .492 | .525 | 1.636 |
| *Pre-college academic performance* | | | | | | |
| High school GPA | .551 | .156 | 1.736 | .580 | .143 | 1.786 |
| AP exams | -.351 | .255 | .704 | -.265 | .406 | .767 |
| SAT composite | .001 | .049* | 1.001 | .001 | .070 | 1.001 |
| Dual enrollment credit | -.066 | .846 | .936 | -.002 | .995 | .998 |
| Number of dual enrollment courses | .035 | .590 | 1.036 | .034 | .593 | 1.035 |
| Block 2: Environmental Variables | | | | | | |
| *College* | | | | | | |
| Agricultural and Environmental Science | | | | -.138 | .691 | .871 |
| Biological Sciences | | | | -.088 | .817 | .915 |

Table 46 (continued)

*Logistic Regression Analysis for Graduation (Within Six Years) for Undeclared Students*

| | Model 1 | | | Model 2 | | |
|---|---|---|---|---|---|---|
| *n* = 689 | B | Sig. | Exp. (B) | B | Sig. | Exp. (B) |
| Block 2: Environmental Variables (continued) | | | | | | |
| *Academic Discipline Area* | | | | | | |
| Humanities, Arts | | | | -1.499 | .011* | .223 |
| Math and Physical Sciences | | | | .247 | .558 | 1.281 |
| *Developmental education/workload courses* | | | | | | |
| Enrolled in developmental education/workload | | | | -.025 | .943 | .975 |
| Total number of developmental education/ workload courses | | | | .020 | .887 | 1.020 |
| *High-impact educational practices* | | | | | | |
| Undergraduate research | | | | -1.011 | .010* | .364 |
| First-year seminars | | | | -.072 | .760 | .930 |
| **Cox & Snell $R^2$** | **.036** | | | **.065** | | |
| **Nagelkerke $R^2$** | **.066** | | | **.118** | | |

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

White undeclared students would be associated with higher odds of the outcome of graduation, with *Exp. (B)* calculated by inverting the odds ratio (1/.552 = 1.812, $p < .05$). White undeclared students, therefore, were 1.812 ($p < .05$) times more likely to graduate than Asian/Asian-American undeclared.

Similarly, undeclared students who participated in undergraduate research had an odds ratio less than one (*Exp. (B)* = .364) with a negative coefficient (*B* = -1.011). This translates to undeclared students who did not participate in research as being 2.747 ($p < .05$) times more likely to graduate than undeclared students who did participate. Additionally, undeclared students who first enrolled in the academic discipline area of arts and humanities also had an odds ratio less than one (*Exp. (B)* = .223) with a negative coefficient (*B* = -1.499). This translates to undeclared students who started in academic discipline areas of AES-Collegewide 4.848 ($p < .05$) times more likely to graduate than undeclared arts and humanities students.

**Graduation (within six years) for declared students.** The findings for this regression are depicted in Table 47. For block one of this model for declared students, the regression model was statistically significant $\chi^2(14) = 181.613$, $p < .001$. The model explained 10.5% (Nagelkerke $R^2$) of the variance in graduation and classified correctly 85.1% of the cases. The Hosmer and Lemeshow test was not statistically significant $\chi^2(8) = 11.585$, $p = .171$, resulting in a goodness of fit for the model.

In terms of the demographic input variables, Asian/Asian-American declared students were 1.416 ($p < .05$) times more likely to graduate than White declared students. Female declared students were 1.525 ($p < .001$) times more likely than male declared students to graduate. Declared students from low-income areas were less likely to graduate. Non-low-income declared students were 1.364 ($p < .05$) times more likely to graduate than low-income

declared students. In-state resident declared students were 2.508 ($p < .01$) times more likely to graduate than out-of-state/international declared students.

In terms of pre-college academic performance, high school GPA and AP exams were associated with higher likelihood of degree completion. For every one unit increase in high school GPA, the odds of persisting increased by 2.493 times at the $p < .001$ level. Declared students who passed AP exams were 1.490 ($p < .01$) times more likely to graduate than declared students who did not.

For block two of the regression model, the result was again statistically significant $\chi^2(26) = 274.277$, $p < .001$. This model explained 15.6% (Nagelkerke $R^2$) of the variance in graduation and classified correctly 85.1% of the cases. The Hosmer and Lemeshow test was not statistically significant $\chi^2(8) = 14.026$, $p = .081$, resulting in a goodness of fit for the model. In terms of the demographic input variables, Asian/Asian-American declared students were 1.403 ($p < .05$) times more likely to graduate than White declared students. Female declared students were 1.298 ($p < .05$) times more likely than male declared students to graduate. Declared students from low-income areas were no longer less likely to graduate. In-state resident declared students were 2.500 ($p < .01$) times more likely to graduate than out-of-state/international declared students.

In terms of pre-college academic performance, high school GPA and AP exams were associated with higher likelihood of degree completion. For every one unit increase in high school GPA, the odds of persisting increased by 2.503 times at the $p < .001$ level. Declared students who passed AP exams were 1.514 ($p < .01$) times more likely to graduate than declared students who did not.

With the environmental variables, declared students who first enrolled in College of Letters and Science were 1.539 ($p < .05$) more likely to graduate than declared students in the

Table 47

*Logistic Regression Analysis for Graduation (Within Six Years) for Declared Students*

| | Model 1 | | | Model 2 | | |
|---|---|---|---|---|---|---|
| *n* = 2945 | B | Sig. | Exp. (B) | B | Sig. | Exp. (B) |
| Block 1: Input Variables | | | | | | |
| *Ethnicity* | | | | | | |
| African American/Black | -.056 | .843 | .945 | -.083 | .779 | .920 |
| American Indian/Alaskan Native | -.167 | .709 | .846 | -.018 | .968 | .982 |
| Asian/Asian American | .348 | .015* | 1.416 | .339 | .020* | 1.403 |
| Latino/Chicano | -.235 | .149 | .791 | -.163 | .329 | .849 |
| Pacific Islander | .667 | .532 | 1.948 | .974 | .369 | 2.650 |
| *Other demographic variables* | | | | | | |
| Female | .422 | .000*** | 1.525 | .261 | .028* | 1.298 |
| Non-lower socioeconomic status | .310 | .022* | 1.364 | .251 | .070 | 1.286 |
| First-generation | -.247 | .075 | .781 | -.242 | .084 | .785 |
| In-state resident | .920 | .001** | 2.508 | .916 | .001** | 2.500 |
| *Pre-college academic performance* | | | | | | |
| High school GPA | .914 | .000*** | 2.493 | .917 | .000*** | 2.503 |
| AP exams | .399 | .004** | 1.490 | .415 | .004** | 1.514 |
| SAT composite | .000 | .171 | 1.000 | .000 | .262 | 1.000 |
| Dual enrollment credit | .049 | .752 | 1.050 | -.002 | .992 | .998 |
| Number of dual enrollment courses | .042 | .107 | 1.043 | .041 | .118 | 1.042 |
| Block 2: Environmental Variables | | | | | | |
| *College* | | | | | | |
| Agricultural and Environmental Science | | | | -.215 | .768 | .807 |
| Biological Sciences | | | | .315 | .048* | 1.370 |
| Letters and Science | | | | .431 | .018* | 1.539 |

Table 47 (continued)

*Logistic Regression Analysis for Graduation (Within Six Years) for Declared Students*

| *n* = 2945 | Model 1 B | Model 1 Sig. | Model 1 Exp. (B) | Model 2 B | Model 2 Sig. | Model 2 Exp. (B) |
|---|---|---|---|---|---|---|
| Block 2: Environmental Variables (continued) | | | | | | |
| *Academic Discipline Area* | | | | | | |
| AES – Agricultural Sciences | | | | .192 | .796 | 1.211 |
| AES – Environmental Sciences | | | | .582 | .457 | 1.789 |
| AES – Human Sciences | | | | 1.013 | .187 | 2.754 |
| Humanities, Arts | | | | -.284 | .279 | .753 |
| Math and Physical Sciences | | | | -.312 | .169 | .732 |
| *Developmental education/workload courses* | | | | | | |
| Enrolled in developmental education/workload | | | | .154 | .328 | 1.167 |
| Total number of developmental education/ workload courses | | | | -.083 | .102 | .921 |
| *High-impact educational practices* | | | | | | |
| Undergraduate research | | | | 1.553 | .000*** | 4.726 |
| First-year seminars | | | | .233 | .043* | 1.263 |
| **Cox & Snell $R^2$** | **.060** | | | **.089** | | |
| **Nagelkerke $R^2$** | **.105** | | | **.156** | | |

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

College of Engineering. Declared students who first enrolled in College of Biological Sciences were 1.370 ($p < .05$) more likely to graduate than declared students in the College of Engineering. In terms of high-impact educational practices engagement, participation in undergraduate research was statistically significant. Declared students who participated were 4.726 ($p < .001$) times more likely to graduate than declared students who did not. Additionally, declared students who enrolled in a first-year seminar were 1.263 ($p < .05$) times more likely to graduate than declared students who did not.

**On-Time Graduation (Within Four Years)**

The findings for this regression are displayed in Table 48. With block one, the regression model results for on-time graduation, as measured by graduating within four year of initial matriculation, were statistically significant $\chi^2(15) = 456.672$, $p < .001$. The model explained 15.8% (Nagelkerke $R^2$) of the variance in the variable for on-time graduation and classified correctly 64% of the cases. The Hosmer and Lemeshow Test was again not significant $\chi^2(8) = 8.940$, $p = .347$, and indicated goodness of fit for this model.

With the race/ethnicity input variables, African American/Black students had a decreased likelihood of graduating on-time. African American/Black students had an odds ratio less than one (*Exp. (B)* = .525) with a negative coefficient (*B* = -.644). This translates to the variable as associated with lower odds of the outcome being tested to occur (Szumilas, 2010). In this regression, with *Exp. (B)* < 1, the result is that there were lower odds of the outcome of graduating within four years. Inverting the odds ratio provides some clarity by transforming the *Exp. (B)* to a value greater than one (Laerd Statistics, 2018). More specifically in this case, the transformation was conducted and resulted in White students as associated with higher odds of the outcome of on-time graduation, with *Exp. (B)* calculated by inverting the odds ratio (1/.525 =

1.904, $p < .01$). The result is that White students were 1.904 ($p < .01$) times more likely to graduate on-time. Latino/Chicano students also had decreased odds of graduating on-time, with an odds ratio less than one (*Exp. (B)* = .634) with a negative coefficient ($B = -.455$). White students were 1.577 ($p < .01$) times more likely to graduate on-time.

In terms of gender, female students had a higher likelihood of graduating on-time than male students. More specifically, females were 1.796 ($p < .001$) times more likely to graduate in four years than males. Low-income students, however, had a decreased likelihood of graduating. Non-low-income-status students were more likely to graduate. The result is that as income status increases by one unit, the odds of graduating increase by 1.336 times. Of note, no statistically significant difference in on-time graduation existed between undeclared and declared students.

With the pre-college academic performance variables, higher earned high school GPAs ($p < .001$) and higher SAT composite scores ($p < .001$) were also associated with higher likelihood of on-time graduation. For every one unit increase in high school GPA, the odds of graduating within four years increased by 2.307 times at the $p < .001$ level. For every one unit increase in SAT composite score, the odds of graduating on-time increased by 1.001 times at the $p < .001$ level. Students who passed AP exams were 1.345 ($p < .01$) times more likely to finish their degree in four years than students who did not. Having completed dual enrollment credit was not significant, but the number of dual enrollment credits was associated with a higher likelihood of graduating on-time. For every one unit increase in the number of dual enrollment credits a student earned, the likelihood of graduating within four years increased by 1.031 times at the $p < .05$ level.

Table 48

*Logistic Regression Analysis for On-Time Graduation (Within in Four Years)*

| | Model 1 | | | Model 2 | | |
|---|---|---|---|---|---|---|
| *n* = 3624 | B | Sig. | Exp. (B) | B | Sig. | Exp. (B) |
| Block 1: Input Variables | | | | | | |
| *Ethnicity* | | | | | | |
| African American/Black | -.644 | .004** | .525 | -.522 | .024* | .593 |
| American Indian/Alaskan Native | -.077 | .822 | .926 | -.022 | .950 | .978 |
| Asian/Asian American | .068 | .440 | 1.070 | .091 | .308 | 1.096 |
| Latino/Chicano | -.455 | .000*** | .634 | -.332 | .005** | .717 |
| Pacific Islander | -.655 | .266 | .519 | -.427 | .484 | .653 |
| *Other demographic variables* | | | | | | |
| Female | .585 | .000*** | 1.796 | .437 | .000*** | 1.548 |
| Non-lower socioeconomic status | .289 | .001** | 1.336 | .172 | .153 | 1.188 |
| First-generation | .019 | .830 | 1.020 | .052 | .594 | 1.053 |
| In-state resident | -.007 | .973 | .993 | -.048 | .826 | .953 |
| *Pre-college academic performance* | | | | | | |
| High school GPA | .836 | .000*** | 2.307 | .946 | .000*** | 2.576 |
| AP exams | .297 | .003** | 1.345 | .251 | .016* | 1.285 |
| SAT composite | .001 | .000*** | 1.001 | .001 | .000*** | 1.001 |
| Dual enrollment credit | .201 | .054 | 1.223 | .175 | .102 | 1.192 |
| Number of dual enrollment courses | .031 | .049* | 1.031 | .029 | .068 | 1.029 |
| *Academic Program* | | | | | | |
| Declared | -.064 | .489 | .938 | -.023 | .849 | .977 |

Table 48 (continued)

*Logistic Regression Analysis for On-Time Graduation (Within in Four Years)*

| | Model 1 | | | Model 2 | | |
|---|---|---|---|---|---|---|
| *n* = 3624 | B | Sig. | Exp. (B) | B | Sig. | Exp. (B) |
| Block 2: Environmental Variables | | | | | | |
| *College* | | | | | | |
| Agricultural and Environmental Science | | | | .477 | .015* | 1.612 |
| Biological Sciences | | | | .340 | .003** | 1.404 |
| Letters and Science | | | | .882 | .000*** | 2.416 |
| *Academic Discipline Area* | | | | | | |
| AES – Agricultural Sciences | | | | -.189 | .398 | .827 |
| AES – Environmental Sciences | | | | -.026 | .925 | .975 |
| AES – Human Sciences | | | | .340 | .156 | 1.405 |
| Humanities, Arts | | | | -.184 | .272 | .832 |
| Math and Physical Sciences | | | | -.727 | .000*** | .483 |
| *Developmental education/workload courses* | | | | | | |
| Enrolled in developmental education/workload | | | | .042 | .712 | 1.043 |
| Total number of developmental education/ workload courses | | | | -.209 | .000*** | .811 |
| *High-impact educational practices* | | | | | | |
| Undergraduate research | | | | .465 | .000*** | 1.593 |
| First-year seminars | | | | -.060 | .424 | .942 |
| Equal opportunity program (EOP) | | | | -.104 | .449 | .901 |
| *Other environmental variables* | | | | | | |
| Change of major | | | | .428 | .018* | 1.535 |
| Number of changes of major | | | | -.249 | .086 | .779 |

Table 48 (continued)

*Logistic Regression Analysis for On-Time Graduation (Within in Four Years)*

| | Model 1 | | | Model 2 | | |
|---|---|---|---|---|---|---|
| *n* = 3624 | B | Sig. | Exp. (B) | B | Sig. | Exp. (B) |
| **Cox & Snell $R^2$** | **.118** | | | **.149** | | |
| **Nagelkerke $R^2$** | **.158** | | | **.200** | | |

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

For block two, containing the environmental variables, the regression model was again statistically significant $\chi^2(30) = 586.297$, $p < .001$. The Nagelkerke $R^2$ statistic explained 20% of the variance and classified correctly 66.1% of the cases. The Hosmer and Lemeshow Test statistic was again not significant $\chi^2(8) = 4.758$, $p = .783$, which resulted in goodness of fit for this regression model.

In terms of the race/ethnicity variables, African American/Black students had a decreased likelihood of graduating. African American/Black students had an odds ratio less than one (*Exp. (B)* = .593) with a negative coefficient (*B* = -.522). As mentioned before, an odds ratio below one translates to the variable as associated with lower odds of the outcome being tested to occur (Szumilas, 2010). After inverting the odds ratio, the result is that White students were 1.686 ($p < .05$) times more likely to graduate on-time than African American/Black students. Again, Latino/Chicano students also had decreased odds of graduating on-time, with an odds ratio less than one (*Exp. (B)* = .717) with a negative coefficient (*B* = -.322). White students were 1.395 ($p < .01$) times more likely to graduate on-time.

Female students having a greater likelihood of graduating on-time than male students. Females were 1.548 ($p < .001$) times more likely than males of graduating within four years. Low-income no longer appeared statistically significant once the environmental variables were introduced. There was again no statistically significant difference in the likelihood of undeclared and declared students graduating on-time.

In terms of the pre-college academic performance variables, higher high school GPAs ($p < .001$) and SAT composite scores ($p < .001$) were again associated with a higher likelihood of graduating. For every one unit increase in high school GPA, the odds of graduating within four years increased by 2.576 times at the $p < .001$ level. For every one unit increase in SAT

composite scores, the odds of graduating within four years increased by 1.001 times at the $p <$ .001 level. Students who passed AP exams were 1.285 ($p < .05$) times more likely to graduate on-time than students who had not. The dual credits earned and the number of dual enrollment courses variables were also not significant in block two.

With the environmental variables, the number of developmental education/workload courses taken by a student was significant. The *Exp. (B)*, or odds ratio, for the number of developmental education/workload courses was .811 ($p < .001$) with a negative coefficient (B) of -.209. Inverting the odds ratio provides some clarity by changing the *Exp. (B)* to a number greater than one (Laerd Statistics, 2018) With *Exp. (B)* calculated by inverting the odds ratio (1/.811 = 1.233, $p < .001$). The result was that as the number of developmental education/workload courses decreases by one unit, the odds of graduating on-time increase by 1.233 times.

Students who participated in undergraduate research were again more likely to graduate on-time. More specifically, students who participated were 1.593 ($p < .001$) times more likely to graduate in four years than those students who did not engage in undergraduate research. Though the number of changes of major was not statistically significant, those students who changed their major were 1.535 ($p < .05$) times more likely to graduate on-time than those students who did not change their major.

Students who first enrolled in the College of Agricultural and Environmental Sciences (*Exp. (B)* = 1.612, $p < .05$ level), the College of Biological Sciences (*Exp. (B)* = 1.404, $p < .01$ level), or the College Letters and Science (*Exp. (B)* = 2.416, $p < .001$ level) were found to be associated with higher likelihood of on-time graduation in reference to students who started in College of Engineering (dummy variable). Students who first enrolled in the academic discipline

area of math and physical science, however, which falls within the College of Letters and Science, had a lower likelihood of graduating on-time. The *Exp. (B)*, or odds ratio, for the math and physical science are was .483 ($p < .001$) with a negative coefficient of -.727. Inverting the odds ratio provides some clarity by changing the *Exp. (B)* to a number greater than one (Laerd Statistics, 2018) With *Exp. (B)* calculated by inverting the odds ratio (1/.483 = 2.070, $p < .001$). The result is that students in the academic discipline area of AES-Collegewide were 2.070 ($p < .001$) times more likely to graduate in four years than students classified in math and physical science.

**On-time graduation (within four years) for undeclared students.** The findings for this regression model are depicted in Table 49. For undeclared students, block one of the regression model was statistically significant $\chi^2(14) = 87.539$, $p < .001$. This model explained 16.2% (Nagelkerke $R^2$) of the variance in on-time graduation and classified correctly 64.7% of the cases. The Hosmer and Lemeshow test was not statistically significant $\chi^2(8) = 5.284$, $p = .727$, resulting in a goodness of fit for the model.

In terms of the demographic input variables, African American/Black undeclared students had an odds ratio less than one (*Exp. (B)* = .305) with a negative coefficient (*B* = -1.188). This translates to the variable as associated with lower odds of the outcome being tested to occur (Szumilas, 2010). White undeclared students would be associated with higher odds of the outcome of on-time graduation, with *Exp. (B)* calculated by inverting the odds ratio (1/.305 = 3.279, $p < .05$). White undeclared students, therefore, were 3.279 ($p < .05$) times more likely to graduate on-time than African American/Black undeclared students. Latino/Chicano undeclared students also had an odds ratio less than one (*Exp. (B)* = .490) with a negative coefficient (*B* = -.714). White undeclared students, therefore, were 2.041 ($p < .05$) times more likely to graduate

on-time than Latino/Chicano undeclared students. With gender, female undeclared students were 1.524 ($p < .05$) times more likely to graduate within four years than male undeclared students.

For the pre-college academic performance variables, high school GPA, SAT composite scores, and AP exams were all significantly associated with higher likelihood of graduating on-time. For every one unit increase in high school GPA, the odds of graduating increased by 1.913 times at the $p < .05$ level. For every one unit increase in SAT composite score, the odds of graduating increased by 1.001 times at the $p < .05$ level. Undeclared students who passed AP exams were 1.751 ($p < .05$) times more likely to graduate within four years than undeclared students who did not pass AP exams.

For block two of the regression model, the result was again statistically significant $\chi^2(22) = 108.344$, $p < .001$. This model explained 19.7% (Nagelkerke $R^2$) of the variance in on-time graduation and classified correctly 68.5% of the cases. The Hosmer and Lemeshow test was not statistically significant $\chi^2(8) = 7.798$, $p = .453$, resulting in a goodness of fit for the model.

In terms of the demographic input variables, African American/Black undeclared students had an odds ratio less than one (*Exp. (B)* = .305) with a negative coefficient (*B* = -1.186). Again, this translates to the variable as associated with lower odds of the outcome being tested to occur (Szumilas, 2010). White undeclared students would be associated with higher odds of the outcome of on-time graduation, with *Exp. (B)* calculated by inverting the odds ratio (1/.305 = 3.279, $p < .05$). White undeclared students, therefore, were 3.279 ($p < .05$) times more likely to graduate within four years than African American/Black undeclared students. Latino/Chicano undeclared students also had an odds ratio less than one (*Exp. (B)* = .544) with a negative coefficient (*B* = -.608). White undeclared students, therefore, were 1.838 ($p < .05$) times more likely to graduate within four years than Latino/Chicano undeclared students.

Table 46

*Logistic Regression Analysis for On-Time Graduation (Within Four Years) for Undeclared Students*

| | Model 1 | | | Model 2 | | |
|---|---|---|---|---|---|---|
| *n* = 679 | B | Sig. | Exp. (B) | B | Sig. | Exp. (B) |
| Block 1: Input Variables | | | | | | |
| *Ethnicity* | | | | | | |
| African American/Black | -1.188 | .038* | .305 | -1.186 | .041* | .305 |
| American Indian/Alaskan Native | -.068 | .958 | .934 | -.253 | .847 | .776 |
| Asian/Asian American | -.334 | .103 | .716 | -.346 | .102 | .708 |
| Latino/Chicano | -.714 | .009** | .490 | -.608 | .032* | .544 |
| Pacific Islander | -.220 | .881 | .802 | .115 | .940 | 1.121 |
| *Other demographic variables* | | | | | | |
| Female | .422 | .014* | 1.524 | .339 | .055 | 1.403 |
| Non-lower socioeconomic status | -.094 | .665 | .911 | -.180 | .419 | .836 |
| First-generation status | -.139 | .525 | .870 | -.170 | .447 | .844 |
| In-state resident | -.444 | .362 | .641 | -.367 | .453 | .693 |
| *Pre-college academic performance* | | | | | | |
| High school GPA | .649 | .031* | 1.913 | .703 | .022* | 2.020 |
| AP exams | .560 | .017* | 1.751 | .533 | .027* | 1.703 |
| SAT composite | .001 | .043* | 1.001 | .001 | .221 | 1.001 |
| Dual enrollment credit | -.115 | .639 | .891 | -.102 | .687 | .903 |
| Number of dual enrollment courses | .083 | .058 | 1.086 | .084 | .059 | 1.088 |
| Block 2: Environmental Variables | | | | | | |
| *College* | | | | | | |
| Agricultural and Environmental Science | | | | -.265 | .314 | .767 |
| Biological Sciences | | | | -.307 | .284 | .736 |

Table 49 (continued)

*Logistic Regression Analysis for On-Time Graduation (Within Four Years) for Undeclared Students*

| | Model 1 | | | Model 2 | | |
|---|---|---|---|---|---|---|
| *n* = 679 | B | Sig. | Exp. (B) | B | Sig. | Exp. (B) |
| Block 2: Environmental Variables (continued) | | | | | | |
| *Academic Discipline Area* | | | | | | |
| Humanities, Arts | | | | .041 | .900 | 1.042 |
| Math and Physical Sciences | | | | -1.015 | .004** | .362 |
| *Developmental education/workload courses* | | | | | | |
| Enrolled in developmental education/workload | | | | .299 | .298 | 1.348 |
| Total number of developmental education/ workload courses | | | | -.304 | .033* | .738 |
| *High-impact educational practices* | | | | | | |
| Undergraduate research | | | | .199 | .361 | 1.220 |
| First-year seminars | | | | -.102 | .552 | .903 |
| **Cox & Snell $R^2$** | **.121** | | | **.147** | | |
| **Nagelkerke $R^2$** | **.162** | | | **.197** | | |

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

For the pre-college academic performance variables, high school GPA and AP exams were significantly associated with higher likelihood of graduating on-time. For every one unit increase in high school GPA, the odds of graduating increased by 2.020 times at the $p < .05$ level. Undeclared students who passed AP exams were 1.703 ($p < .05$) times more likely to graduate within four years than undeclared students who did not pass AP exams.

In terms of environmental variables, undergraduate research participation no longer indicated any statistical significance for undeclared students and on-time graduation in block two. The number of developmental education/workload courses completed was associated with a decreased likelihood of graduating within four years. The results for the number of developmental education/workload courses had an odds ratio less than one (*Exp. (B)* = .738) with a negative coefficient (*B* = -.304). As a result, for each reduction in units of developmental education/workload courses taken, the likelihood of graduating on-time increased 3.289 times at the $p < .05$ level. Undeclared students who first enrolled in the academic discipline area of math and physical science had an odds ratio less than one (*Exp. (B)* = .362) with a negative coefficient (*B* = -1.015). This translates to undeclared students who started in academic discipline area of AES-Collegewide 2.762 ($p < .01$) times more likely to graduate than undeclared math and physical sciences students.

**On-time graduation (within four years) for declared students.** The findings for this regression are depicted in Table 50. For block one of this model for declared students, the regression model was statistically significant $\chi^2(14) = 381.854$, $p < .001$. The model explained 16.2% (Nagelkerke $R^2$) of the variance in on-time graduation and classified correctly 64.1% of the cases. The Hosmer and Lemeshow test was not statistically significant $\chi^2(8) = 8.757$, $p = .363$, resulting in a goodness of fit for the model.

In terms of the demographic input variables, African American/Black declared students had an odds ratio less than one (*Exp. (B)* = .575) with a negative coefficient (*B* = -.553). Again, this translates to the variable as associated with lower odds of the outcome being tested to occur (Szumilas, 2010). White declared students would be associated with higher odds of the outcome of on-time graduation, with *Exp. (B)* calculated by inverting the odds ratio (1/.575 = 1.739, $p <$ .05). White declared students, therefore, were 1.739 ($p < .05$) times more likely to graduate within four years than African American/Black declared students. Latino/Chicano declared students also had an odds ratio less than one (*Exp. (B)* = .669) with a negative coefficient (*B* = -.402). White undeclared students, therefore, were 1.495 ($p < .05$) times more likely to graduate within four years than Latino/Chicano declared students. Female declared students were 1.849 ($p < .001$) times more likely than male declared students to graduate on-time. Declared students from low-income areas were less likely to graduate within four years. Non-low-income declared students were 1.439 ($p < .001$) times more likely to graduate on-time than low-income declared students.

In terms of pre-college academic performance, high school GPA, SAT composite scores, AP exams, and dual enrollment credit were associated with higher likelihood of degree completion within four years. For every one unit increase in high school GPA, the odds of on-time graduation increased by 2.426 times at the $p < .001$ level. For every one unit increase in SAT composite score, the odds of on-time graduation increased by 1.001 times at the $p < .001$ level. Declared students who passed AP exams were 1.268 ($p < .05$) times more likely to graduate than declared students who did not. Declared students who earned dual enrollment credit prior to matriculation were 1.308 ($p < .05$) times more likely to graduate than declared students who had not earned dual enrollment credit.

Table 50

*Logistic Regression Analysis for On-Time Graduation (Within Four Years) for Declared Students*

| | Model 1 | | | Model 2 | | |
|---|---|---|---|---|---|---|
| *n* = 2945 | B | Sig. | Exp. (B) | B | Sig. | Exp. (B) |
| Block 1: Input Variables | | | | | | |
| *Ethnicity* | | | | | | |
| African American/Black | -.553 | .024* | .575 | -.428 | .091 | .652 |
| American Indian/Alaskan Native | -.050 | .889 | .951 | -.008 | .983 | .992 |
| Asian/Asian American | .157 | .107 | 1.170 | .181 | .069 | 1.198 |
| Latino/Chicano | -.402 | .001** | .669 | -.284 | .028* | .753 |
| Pacific Islander | -.766 | .237 | .465 | -.597 | .374 | .550 |
| *Other demographic variables* | | | | | | |
| Female | .615 | .000*** | 1.849 | .449 | .000*** | 1.567 |
| Non-lower socioeconomic status | .364 | .000*** | 1.439 | .311 | .002** | 1.365 |
| First-generation | .067 | .506 | 1.069 | .085 | .410 | 1.088 |
| In-state resident | .088 | .712 | 1.092 | .043 | .858 | 1.044 |
| *Pre-college academic performance* | | | | | | |
| High school GPA | .886 | .000*** | 2.426 | 1.008 | .000*** | 2.741 |
| AP exams | .238 | .035* | 1.268 | .187 | .108 | 1.205 |
| SAT composite | .001 | .000*** | 1.001 | .001 | .001** | 1.001 |
| Dual enrollment credit | .268 | .022* | 1.308 | .240 | .045* | 1.271 |
| Number of dual enrollment courses | .023 | .171 | 1.023 | .020 | .233 | 1.021 |
| Block 2: Environmental Variables | | | | | | |
| *College* | | | | | | |
| Agricultural and Environmental Science | | | | .004 | .995 | 1.004 |
| Biological Sciences | | | | .316 | .008** | 1.372 |
| Letters and Science | | | | .895 | .000*** | 2.448 |

Table 50 (continued)

*Logistic Regression Analysis for On-Time Graduation (Within Four Years) for Declared Students*

| *n* = 2945 | Model 1 B | Model 1 Sig. | Model 1 Exp. (B) | Model 2 B | Model 2 Sig. | Model 2 Exp. (B) |
|---|---|---|---|---|---|---|
| Block 2: Environmental Variables (continued) | | | | | | |
| *Academic Discipline Area* | | | | | | |
| AES – Agricultural Sciences | | | | .291 | .670 | 1.338 |
| AES – Environmental Sciences | | | | .449 | .521 | 1.567 |
| AES – Human Sciences | | | | .828 | .229 | 2.288 |
| Humanities, Arts | | | | -.261 | .190 | .770 |
| Math and Physical Sciences | | | | -.627 | .000*** | .534 |
| *Developmental education/workload courses* | | | | | | |
| Enrolled in developmental education/workload | | | | .001 | .992 | 1.001 |
| Total number of developmental education/ workload courses | | | | -.197 | .000*** | .821 |
| *High-impact educational practices* | | | | | | |
| Undergraduate research | | | | .512 | .000*** | 1.668 |
| First-year seminars | | | | -.045 | .587 | .587 |
| **Cox & Snell $R^2$** | **.122** | | | **.153** | | |
| **Nagelkerke $R^2$** | **.162** | | | **.205** | | |

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

For block two of the regression model, the result was again statistically significant $\chi^2(26) = 489.998$, $p < .001$. This model explained 20.5% (Nagelkerke $R^2$) of the variance in on-time graduation and classified correctly 66.2% of the cases. The Hosmer and Lemeshow test was not statistically significant $\chi^2(8) = 5.926$, $p = .656$, resulting in a goodness of fit for the model.

In terms of the demographic input variables, Latino/Chicano declared students again had an odds ratio less than one (*Exp. (B)* = .753) with a negative coefficient (*B* = -.284). White undeclared students, therefore, were 1.328 ($p < .05$) times more likely to graduate within four years than Latino/Chicano declared students. Female declared students were 1.567 ($p < .001$) times more likely than male declared students to graduate on-time. Declared students from low-income areas were less likely to graduate within four years. Non-low-income declared students were 1.365 ($p < .001$) times more likely to graduate on-time than low-income declared students.

In terms of pre-college academic performance, high school GPA, SAT composite scores, and dual enrollment credit were associated with higher likelihood of degree completion within four years. For every one unit increase in high school GPA, the odds of on-time graduation increased by 2.741 times at the $p < .001$ level. For every one unit increase in SAT composite score, the odds of on-time graduation increased by 1.001 times at the $p < .001$ level. Declared students who earned dual enrollment credit prior to matriculation were 1.271 ($p < .05$) times more likely to graduate in four years than declared students who had not earned dual enrollment credit.

Declared students who first enrolled in the College of Biological Sciences (*Exp. (B)* = 1.372, $p < .01$ level) or the College Letters and Science (*Exp. (B)* = 2.448, $p < .001$ level) were found to be associated with higher likelihood of on-time graduation in reference to declared students who started in College of Engineering (dummy variable). Students who first enrolled in

the academic discipline area of math and physical science, however, which falls within the College of Letters and Science, had a lower likelihood of graduating on-time. Math and physical sciences declared students had an odds ratio less than one (*Exp. (B)* = .534) with a negative coefficient (*B* = -.627). This translates to social sciences (dummy variable) students 1.873 ($p < .001$) times more likely to graduate on-time than math and physical sciences students.

In terms of other environmental variables, undergraduate research participation again resulted in significant findings. Declared students who engaged in undergraduate research were 1.668 ($p < .001$) times more likely to graduate within four years than those who did not participate. Declared students, in contrast, that required more remediation through developmental an increased number of education/workload courses were less likely to graduate on-time. Declared students needing remediation in math, English, and/or chemistry had an odds ratio for the number of total developmental education/workload courses taken less than one (*Exp. (B)* = .821) with a negative coefficient (*B* = -.197). This translates that for every decrease in the number of developmental education/workload courses taken, there is an increase of 1.218 times the likelihood of on-time graduation.

## Summary

This chapter reviewed the findings of the statistical analyses conducted for each of the six research questions. Included were descriptive, inferential, and multivariate statistics aimed at determining if differences existed between the students who matriculated to the institution under one of the undeclared, or non-degree granting academic programs, or one of the declared, or degree-granting programs. All of the analyses will be discussed further in chapter five.

# CHAPTER V:

# DISCUSSION, CONCLUSIONS, AND IMPLICATIONS

The purpose of this study was to examine the relationship between matriculating with or without a declared major and college student persistence. The research about undeclared and declared students, as it related to college student persistence, was conflicting and dated, leaving a gap in the literature on the subject, as discussed in chapter two. As expressed in chapter one, perception of undeclared students as at-risk is prevalent among parents, administrators, faculty, and staff (Mangan, 2011; Simon, 2012). This study sought to answer whether those perceptions were supported or not by examining student records for one entering cohort of first-time in college, full-time college students. Additionally, this study aimed to update the dated research on undeclared students and to add to the literature on college student persistence.

The study was conducted through the conceptual frame provided by Astin's (1993) I-E-O model, with the aim of determining if matriculating in an undeclared versus declared academic program was predictive of college student persistence and degree completion, taking into consideration student demographics, pre-college academic performance, institutional sub-environments, high-impact educational practice participation, and within-college academic performance.

This chapter includes discussion of the findings from the six research questions posed for this study. It then provides overall conclusions that address the purpose of the study and that can be drawn from the findings. Next, the chapter reviews the potential implications and

recommendations that can be made from these findings and used to consider changes in research, policy, and practice. This chapter ends with concluding thoughts based on the study, overall.

## Discussion of Findings

The research questions were ordered to build understanding from the first questions establishing the distribution of undeclared and declared students across a variety of demographic and pre-college academic performance to the last questions examining what variables may be predictive of higher likelihood to persist and graduate. The discussion of the specific findings for each of the research questions follows in the next section.

### Research Question One

*What are the demographic characteristics of first-time in college freshmen who matriculated to the institution in the fall 2010 quarter as undeclared and declared?*

It was important to understand who the students were in the fall 2010 cohort before examining whether any of the variables were significantly predictive of the outcomes of persistence and/or degree completion. If there were characteristics that differed greatly, such as if all undeclared students were first-generation, for example, then that would provide some understanding if later research questions resulted in first-generation status as a significant predictor of persistence. The findings from the descriptive statistics calculated indicated some similarities and differences across the demographic variables of each of the groups of undeclared and declared students.

The overall cohort distribution was about 20% of students matriculating as undeclared and 80% as declared. Earlier research reported that between 22% and 50% of students enroll at institutions as undeclared (Gordon, 2007; Kramer, Higley, & Olsen, 1994). The findings at this

institution, though near the low end of the range, appear to be consistent with those earlier findings.

More specifically with regards to the various demographic variables, and surprisingly consistent with the overall distribution of students, undeclared students represented roughly one out of every five students in most of demographic characteristic categories. Though at first glance, it appears that the largest groups of undeclared students were Asian/Asian-American or White, the percentages are consistent with the overall distribution of students in the fall 2010 cohort. The institutional site for this study has consistently enrolled higher numbers of Asian/Asian-American students than other race/ethnic groups. With gender, one out of every five female students and one out of every five male students were undeclared. The same distribution of undeclared versus declared students was found in the reported categories for low-income, first-generation and non-first generation, and residency statuses.

Undeclared and declared students appear to be more similar than different. The two groups are similar in that both undeclared and declared students can be found in every race/ethnic group, gender, socioeconomic status, first-generation status, and residency. There was no one characteristic that stood out as only having undeclared or declared students.

**Research Question Two**

*What are the pre-college academic performance, developmental/workload course enrollment, and high-impact educational practice participation characteristics of first-time in college freshmen who matriculated to the institution in the fall 2010 quarter as undeclared and declared?*

Although the findings from question one indicated that undeclared and declared students may be quite alike, in terms of demographic backgrounds, there were some differences that

resulted when examining the pre-college academic performance variables. With high school GPAs, declared students were found to have earned higher high school GPAs. This is not to suggest that students who entered as undeclared did not earn high GPAs in high school. The findings, however, resulted in a significant difference, with declared students as a population earning higher mean high school GPAs than undeclared students.

With advanced placement (AP) exams, declared students entered the institution having passed, on average, more exams than undeclared students. This was not surprising given that declared students earned higher high school GPAs and as such would be more likely to take and pass a higher number of AP exams. Being undeclared about a major does not mean that students would be less likely to pass a high number of AP exams, but on average, as a population, declared students arrived at the institution having passed more AP exams. Similarly, declared students, on average, enter having completed more dual enrollment credits at an institution of higher education, while in high school, than their peers who matriculate as undeclared students.

Overall, it would appear that declared students achieve higher levels of academic performance while in high school. When examining the variables utilized in institutional admissions processes that are designed to assess student academic readiness for college, there was, however, a different outcome that resulted. With both the ACT and SAT exams, there was no statistically significant difference in composite scores for undeclared versus declared students. Although performance in high school, as measured by GPA, AP exams passed, and dual enrollment credits earned, suggests that declared students are better performers, undeclared students appear to test as college ready as declared students.

Once students enroll at the institution, as mentioned above, some students needed remediation in mathematics, English, and/or chemistry and were required to complete

developmental education/workload courses. Roughly one in five students who required remediation were undeclared. Similarly, for those students who did not need to complete developmental education/workload courses, one in five students were undeclared. There was no significant difference found when comparing undeclared and declared students by enrollment in developmental education/workload courses. As a result, undeclared and declared students appear to be college ready, upon matriculation, at similar levels as measured by the need to remediate in mathematics, English, and/or chemistry. This is consistent with the findings regarding ACT and SAT composite scores, undeclared and declared students are college ready at similar levels.

With high-impact educational practices, only first-year seminar enrollment appeared to indicate any difference between undeclared and declared students. Undeclared students, on average, as a population, enrolled more often in first-year seminars than declared students. With the exception of first-year seminar enrollment, undeclared and declared students appear to seek out opportunities to participate in high-impact educational practices at similar rates.

**Research Question Three**

*Are there statistically significant differences in the within-college academic performance (earned college GPA) of first-time in college freshmen who matriculated to the institution as undeclared and declared?*

Earlier research studies had conflicting findings regarding the within-college academic performance of declared students and undeclared students (Gordon, 2007). This study utilized an operationalized definition of undeclared which included those students who had not chosen a major field of study upon matriculation to the institution (Anderson, Creamer, & Cross, 1989). In their study, Anderson, Creamer, and Cross (1989) found that declared students were more

academically successful, having earned higher grades in college, when compared to undeclared students.

Although this study utilized a similar definition of undeclared as Anderson, Creamer, and Cross, the findings from this study supported those earlier studies that found undeclared students performed academically better than declared students (Lewallen, 1995). In this study, undeclared students earned higher college GPAs than their declared peers. More specifically, undeclared students on average, earned a college GPA above a 3.0, while declared students earned a college GPA just below 3.0. This finding is counter to the those regarding high school GPAs, but is consistent with earlier research which suggested that even students who earned lower GPAs while in high school may still find academic success once they enter college (DeBerard, Spielmans, & Julka, 2004).

**Research Question Four**

*To what extent, if any, do first-time in college freshmen who matriculated to the institution as undeclared and declared change their major?*

Often, the perception of administrators, faculty, staff, and parents is that when a student declares a choice of major, that decision was a fully-crystalized and well-informed decision (Cuseo, 2005; Gordon, 2007; Titley & Titley, 1980). The findings from this study, however, indicate that the major within which a student finishes is not likely to be the major they first declared upon matriculation to the institution as declared students were more likely to change major at least once when compared to undeclared students. This finding reinforces earlier literature that suggested major choices are often made with a lack of information or a lack of experience with decision-making (Gordon, 2007).

Additionally, undeclared and declared students also differed in terms of the number of changes of major made by either population. Declared students not only were more likely to change majors, they also changed majors more frequently than undeclared students. These findings are consistent with the only study to have compared undeclared and declared students in terms of change of major behavior (Kramer, Higley, & Olsen, 1994). More often than with declared students, undeclared students, after making their choice of academic program, end up graduating with that major. And, if they do change their initial choice of degree-granting major subsequent to that initial choice, they make these changes less frequently than do declared students.

**Research Question Five**

*To what extent do the variables included in this study predict college student persistence of first-time in college freshmen?*

Measures of college student persistence have proved to be challenging for scholars to define (Hagedorn, 2012). For this reason, this study considered two types of measures of persistence: persistence by number of quarters enrolled and persistence by year. Persistence by year was measured from first-year to second-year enrollment, second-year to third-year enrollment, and third-year to fourth-year enrollment. The findings for this question are described in this section by the input and environmental variables, consistent with the frame of the conceptual model of Astin's (1993) I-E-O utilized for this study.

**Inputs: demographics.** Two of the demographic input variables consistently resulted in significant findings for each of the measures of persistence by year when the input variables were considered in isolation of the environmental variables. Those two demographic variables were gender and residency. Female students and in-state resident students were predicted to have

a higher likelihood of persisting from year to year in college. Once environmental variables were introduced into the regression models, however, gender was no longer a predictor of persistence by year. This is consistent with earlier studies that found gender did not predict likelihood of student persistence (Laskey & Hetzel, 2011). This suggests that environmental factors play a role in changing the possible effects of gender on persistence. It could be that the campus environment provides more support, whether implicit or explicit, to male students. Or conversely, the environment may be, whether intentionally or unintentionally, negating some of the persistence effects of being a female student on the campus.

In terms of race/ethnicity, none of the groups of students were more likely to persist to the second year. But, Asian/Asian-American students were consistently more likely to persist from the second year to the third and from the third year to the fourth year, when compared to White students.

In-state resident students continued to be more likely to persist than out-of-state/international students in each of the persistence by year models. Some of this could be attributed to the cultural environment of the campus. Out-of-state and international students may find difficulty fitting into the new environment. The reasons for this difference may be something to consider in future research, though the institutional site for this study admits a significantly larger number of in-state students than out-of-state/international students which may also account for the difference.

**Inputs: pre-college academic performance.** High school GPA was the only variable that resulted in significant findings consistently across each of the measures of persistence by year. The higher the high school GPA a student earned, the higher the likelihood of persistence from one year to the next in college. SAT composite scores was also significant, though not as

significant as high school GPA, for persistence from year one to two and year two to three. The effects of SAT composite scores, however, were no longer significant in terms of persistence from year three to year four.

The number of advanced placement (AP) exams that students passed was not a factor in persistence from year one to two, but appeared as significant in the later years. The higher number of AP exams passed, the higher the likelihood of persistence from year two to three and year three to four. The number of AP exams passed, however, was not as significant of a factor as high school GPA. These effects were found in the regression models when inputs were examined in isolation and when environmental variables were added to the models. It is surprising that AP exams passed was not a significant variable in terms of persistence from year one to two, suggesting that AP exams may provide students with advantages in terms of progression toward a degree, but they do not appear to be an important predictor of success in the first-year of college.

**Inputs: academic program.** With only one study in the past thirty years that examined whether undecided or decided students were more likely to persist (Leppel, 2001), this study sought to determine if the academic program a student first enrolls in can predict persistence in college. To accomplish this, it was important to account for other possible variables that may or may not impact student success.

The findings from the comparison of undeclared and declared students, in terms of persistence by number of quarters enrolled, indicated a significant difference between the two populations. Undeclared students persist, on average, more quarters of enrollment at the institutional site than declared students. This does not, however, suggest that undeclared students are more likely to persist through to degree completion. It is possible, given that some students in

both the undeclared and declared populations completed degrees within three years (twelve quarters) while other students who persisted for a higher number of quarters may not have graduated. For that reason, student persistence was also measured by year.

The logistic regression models for persistence by year resulted in no significant differences in likelihood of persisting when first enrolling as undeclared versus declared. This indicates that the academic program a student selects, whether a degree-granting or non-degree-granting program, does not change the likelihood of persistence from one year of college to the next. This would appear to be incongruent with earlier research findings that indicated that one of the predictors of persistence to degree completion, within six years, was educational aspirations (Belcher, 2006). Undeclared students are often viewed as having a lack of educational goals. But, the findings from this study indicate that undeclared students are not necessarily lacking goals and supports the assertions by Graunke, Woosley, and Helms (2006) that undeclared students are not without educational aspirations. Undeclared students often have a more general goal of completing a degree. Declared students often start with a narrow, specific goal of a particular major or career path and sometimes those initial choices are not the best fit. Some declared students, faced with uncertainty as the result of no longer having their initial major, may be more likely to be the students Blecher (2006) found as no longer having educational aspirations. Nonetheless, the findings from the measures on persistence from year to year in college do not include academic program, matriculating as undeclared or declared, as predictive of persistence.

**Environment: high-impact educational practices (HIPs).** Two of the HIPs examined in this study were determined to have a significance in terms of persistence. Not surprising, first-year seminar enrollment was predictive of first year persistence and subsequent enrollment at the

start of the second year. The effects of first-year seminars, however, were not significant in measures of persistence to the third year or persistence to the fourth year. First-year seminars can contribute to students remaining at the institution into the second year. But, other environmental factors may be necessary for students to persist past the second year.

One such factor may be participation in undergraduate research opportunities. Throughout each of the regression models for persistence, undergraduate research participation was significant. Students who engaged in research experiences were more likely to persist from year to year in college. This is consistent with the literature on high-impact educational practices that provide students an opportunity to apply the knowledge being learned in the classroom in an experience outside of the classroom (Kuh, 2008; O'Neill, 2010; Tukibayeva & Gonyea, 2014).

**Environment: college of initial enrollment.** Students who first matriculate into any of the colleges other than the College of Engineering were more likely to persist from year two to three, and year three to four, when compared to students in the College of Engineering. There is not, however, any significant relationship to starting in those colleges and an increased likelihood of persisting from the first year to the second year. The college of initial entry for a student does not predict first-year persistence, but there may be other factors that explain why the students who started in the other colleges were more likely to persist in the years that follow that first year. When drilling down into the more specific academic discipline areas within the four undergraduate colleges, there were no significant findings for any of the persistence from year to year measures.

**Persistence: undeclared students.** When examining only undeclared students, the findings for persistence resulted in highly mixed results from one year to the next as to the factors that might predict persistence. For persistence from the first year to the second, only AP

exams passed was significant. Undeclared students who passed AP exams were more likely to persist. But, passing AP exams was not predictive of persistence in later years. High school GPA and participation in undergraduate research were not factors in the first-year persistence models, but were significant in both of the later years. Additionally, undeclared arts and humanities students were the more likely to persist from the second year to the third year, and subsequently to the fourth year when compared to undeclared students in the AES-Collegewide programs area.

**Persistence: declared students.** When examining only the declared students, in-state residency, high school GPA, and participation in undergraduate research were consistently factors in predicting persistence from year to year. SAT composite scores were significant for declared students from matriculation through the second year, but not significant from the third year to the fourth year. Consistent with the findings for the regressions that included both undeclared and declared, the college of initial enrollment was not predictive of first-year persistence, but was a factor in later years.

**Research Question Six**

*To what extent do the variables included in this study predict graduation of first-time in college freshmen?*

In this study, there were two output measures to address this question. The first was graduation (degree completion, also referred to as within six years) and the second was on-time graduation (within four years). As expected, many of the variables that were significant factors with the persistence measures were again significant for the graduation measures. The findings are discussed, again within the I-E-O conceptual frame below.

**Input: demographics.** Whether for the measure of graduation or on-time graduation, gender was a significant factor. Though gender was not significant with the persistence measures when environmental variables were introduced, it remained significant as a factor in the graduation measures. Female students continued to be more likely to graduate and to graduate within four years than male students. This finding is consistent with Ewert's (2012) earlier research that women graduate at higher rates than men.

Socioeconomic status, in contrast to gender, was not significant once environmental variables were introduced. In isolation with the input variables only, lower income students have a lower chance of completing a degree, or completing a degree on-time. When the environmental factors are added to the model, then that status as lower income no longer results in any statistical significance. This could be reflective of resources and programs on the campus that are intended to assist students who are from low-income communities. This also indicates that the campus environment may have a positive effect on students from low socioeconomic backgrounds and communities as low income alone does not appear to be a significant predictor of not graduating.

In terms of residency status, the findings were mixed. In-state resident students were more likely to graduate than out-of-state or international students. But, there was no significant difference in the likelihood of graduating on-time. Residency, as a result, may be a factor that predicts likelihood of degree completion, but does not predict if that completion would be likely to happen within four years. As in-state students were more likely to persist from year to year, it could be interpreted from the graduation model findings that in-state students have a greater ability to persist and remain enrolled longer than four-years. This could be related to the

differences in tuition costs for in-state students versus out-of-state or international students, but further study would be necessary to confirm this possibility.

In terms of race/ethnicity, there were differences associated with on-time graduation. African American/Black students and Latino/Chicano students were less likely to graduate within four years when compared to White students. When examining graduation within six years, however, there were no differences between African American/Black or Latino/Chicano students and White students. Asian/Asian-American students were more likely to graduate on-time than White students, but not more likely to graduate within six years.

**Input: pre-college academic achievement.** As mentioned in chapter two, Astin (2005-2006) determined that high school GPA and SAT composite scores were the strongest predictors of degree completion. Astin found that high school GPA was a much stronger predictor than SAT scores. The findings from this study confirm both of these conclusions. The higher the high school GPA the higher the likelihood of graduating and of graduating on-time. SAT composite scores were only significant for graduating within six years and not for graduating on-time. Similar to Astin's findings, high school GPA was a stronger predictor than SAT composite scores. Interestingly, however, dual enrollment credits earned did not result in any predictability of degree completion, whether in four or six years.

**Input: academic program.** As mentioned in chapter one, the prevalent belief is that the sooner students declare a major, the higher the likelihood that they will persist in college through to graduation (Kim & Rzonca, 2003; Mangan, 2011). The findings from the persistence measures indicated that this belief is not well-founded. The findings from the graduation measures in this study also confirm that this belief may be mistaken. Academic program, whether undeclared or

declared, did not result in any significant difference in likelihood of on-time graduation. As a result, academic program was not a predictor of on-time graduation.

In terms of degree completion within six years, however, there was a difference between undeclared and declared students. Undeclared students were more likely to graduate in six years than declared students. This again supports Graunke, Woosley, and Helms' (2006) finding that undeclared students are not without educational aspirations and are not necessarily at greater risk of attrition than declared students.

**Environment: developmental education/workload coursework.** This environmental variable only appeared to be a factor in terms of on-time graduation. The more students needed to remediate in mathematics, English, and/or chemistry, the less likely there were to graduate within four years. Needing remediate, again, was not a predictor of degree completion within six years. Students with developmental education/workload coursework completed degrees within six years with the same likelihood as those students who did not require remediation.

**Environment: high-impact educational practices (HIPs).** Undergraduate research, stood out as the only high-impact educational practice that was significant as a predictor of student progress to the completion of a degree. This was also true for on-time graduation. It confirms that students who participate in educational activities in which they have the opportunity to apply the knowledge being learned in the classroom, outside of the classroom, have a much greater likelihood of graduating and graduating on-time (Kuh, 2008; O'Neill, 2010).

**Environment: college of initial enrollment.** The college of initial enrollment is a factor in the likelihood of degree completion. Students who started in the College of Letters and Science were more likely to graduate and graduate within four years when compared to students

who started in the College of Engineering. As the College of Letters and Science contains a large number of degree programs where the curriculum is less linear and restrictive, it is not surprising that more students would progress to a degree and do so on-time. There is less of a likelihood of being delayed by courses that are unavailable. Students in many of the majors in Letters and Science are not required to complete a sequence of courses that must be taken in a specific order, and as a result, are not as likely to be set back by poor performance in one or more of the courses in those sequences.

The exception in Letters and Science includes the majors that are included in the academic discipline area of mathematics and physical sciences. Majors such as physics, mathematics, and chemistry contain a number of courses that must be taken in sequence. Poor performance in a course in one or more of those sequences may delay students with completing their degree on-time. The differences in the advising services in mathematics and physical science and the non-enforcement of prerequisites by the departments in that academic discipline area also may account for some of the findings. As students are not required to meet with an advisor in the physics major, for example, they may not receive the educational planning assistance and support that would help them to make and achieve a graduation plan within four years. As a result, a predictor of not graduating within four years would be matriculating into one of the majors in the academic discipline area of mathematics and physical sciences.

Students who first matriculated into any of the colleges other than engineering were more likely to graduate within four years when compared to students who started in the College of Engineering. There was, however, only students in the College of Letters and Sciences were more likely to graduate within six years when compared to students who started in the College of Engineering.

**Graduation: undeclared students.** When examining only undeclared students, the findings for on-time graduation again indicated that undeclared students who passed AP exams were more likely to graduate within four years. But, passing AP exams was not predictive of graduation within six years. High school GPA was also significant in terms of on-time graduation but not six-year degree completion. SAT composite scores, in contrast, were significant predictors for both graduation and on-time graduation. African American/Black undeclared students and Latino/Chicano undeclared students were less likely to complete their degree within four years than White undeclared students. Undeclared students in the academic discipline area of math and physical sciences were less likely to graduate on-time, but not less likely to graduate within six years.

**Graduation: declared students.** When examining only the declared students, high school GPA and participation in undergraduate research were consistently factors in predicting degree completion, whether in four years or six years. Female declared students were more likely than male declared students to graduate and to graduate on-time. Declared students from low-socioeconomic areas were less likely to complete a degree than declared students not from low-socioeconomic areas. In-state resident declared students, though not more likely to graduate on-time, were more likely to graduate than out-of-state/international declared students. Latino-Chicano declared students were less likely to graduate on-time than White declared students. Asian/Asian-American declared students, in contrast, were more likely to graduate in six years than White declared students. Declared students in the math and physical sciences academic discipline area, in the College of Letters and Science, were less likely to graduate on-time that declared students in the social sciences academic discipline area. Additionally, declared students who needed remediation were also less likely to complete a degree within four years. In contrast,

declared students who completed dual enrollment credits prior to matriculation were more likely to graduate on-time.

## Conclusions from the Findings

The purpose of this study was to examine the relationship between matriculating with or without a declared major and college student persistence. From the findings, a couple of conclusions can be made regarding college student persistence and degree completion for undeclared and declared students that directly address the purpose of this study. Additional conclusions not pertaining to the academic program variable could be drawn from the findings and are included below.

### Conclusion One

*Undeclared and declared students are really more similar than they are different.*

Though there were some differences in terms of pre-college academic performance, the level of college readiness of both undeclared and declared students was the same. Though undeclared students earned higher GPAs in college, they were no different than declared students in terms of likelihood of persistence in college and timely degree completion. Additionally, undeclared and declared students were found in each of the race/ethnic groups, genders, income statuses, first-generation statuses, and residency categories. Undeclared students earned higher and lower high school GPAs, and higher and lower ACT and SAT composite scores. Declared students earned higher and lower high school GPAs, and higher and lower ACT and SAT composite scores. Undeclared and declared students earned AP credit and dual enrollment credit. Some undeclared and declared students had to remediate in mathematics, English, and/or chemistry. Other undeclared and declared did not have to remediate. As Gordon (2007) determined, undeclared students are not a homogenous group, easily defined by particular

characteristics, much the same as declared students. Initial academic program upon matriculation, whether undeclared versus declared, was not a predictor of student persistence or of degree completion. Contrary to perception, undeclared students are not at greater risk of departure from college than declared students.

**Conclusion Two**

*Declared students are not decided students.*

The perception that declared students make a crystallized, well-informed choice does not appear to be a valid one. Declared students are more likely to change their initial choice of major and more likely to change their major more frequently than students who start as undeclared. The pressures to declare, from external and internal sources, push students to select a major too early rather than face the anxiety that comes from having to answer the question "what are you majoring in?" (Grites, 1981). Many "declared" students have made decisions based on a lack of information, pressures to decide, and other external factors (Lewallen, 1995). Many declared students and are not truly decided about their initial choice of major. Nor is the decision that a declared student makes a fully crystalized and/or well-informed one. This may be the reason behind why undeclared students are more likely to graduate in six years than declared students.

**Conclusion Three**

*Race/ethnicity is a factor in on-time degree completion.*

The findings from this study associated with race/ethnicity as it relates to first-year persistence in college is consistent with the previous research that examined persistence and race/ethnicity (Laskey & Hetzel, 2011; Rigali-Oiler & Kurpius, 2013; Wolfle, 2012). When examining the relationship between race/ethnicity and on-time degree completion, however, the findings suggest that African American/Black and Latino/Chicano students are less likely to

graduate on-time. Race/ethnicity is not a factor in terms of degree completion more generally within six years. Students from these ethnic groups are just as likely to earn a college degree, but they are less likely to do so in four years.

**Conclusion Four**

*First-generation status is not a factor in persistence or graduation rates.*

The literature on first-generation status and college student persistence, described in chapter two, indicated a lack of agreement between scholars. Some researchers found that first-generation students were less likely to persist (Isitani, 2003, 2006; Somers, Woodhouse, & Cofer, 2004; Soria & Stebleton, 2012), while other researchers determined there was no difference in likelihood of persisting (Wright, Jenkins-Guarnieri, & Murdock, 2013). The findings from this study indicate that there was no difference in persistence or degree completion for first-generation students versus non-first-generation students. As a result, a student's status as non-first-generation, is not a predictor of college student persistence or degree completion. Conversely, a student's status as first-generation is not a predictor of student attrition from college.

## Recommendations for Future Research

Based on the conclusions and the findings, a number of recommendations for future research can be drawn from this study. Some of the recommendations are extensions or replications of the current study, while other considerations for future research suggest examining other questions that arose from conducting this study.

*Different kinds of data should be examined within the same research question.*

A study including quantitative and qualitative methods, including for example, survey and interview responses from the students, faculty, staff, and administrators, in combination with

student records from institutional databases, would provide a more comprehensive understanding of college student persistence and would inform institutional retention efforts, communication with students and their families, and policies.

Examining additional variables would enable an institution to more accurately and appropriately address those factors that are, in fact, predictors of student attrition. This study, for example, considered three types of high-impact educational practices (HIPs). There are, however, ten different HIPs that Kuh (2008) described. A study that examines all ten of the HIPs would make the findings richer and more comprehensive. It would equip institutions with information designed to improve the effects of participation in HIPs, as well as more appropriately focus resources to those HIPs that prove to be of most significance.

Examples of other additional variables could include frequency and type of contact with staff and faculty associated with various campus and community resources designed to support students in their progress toward degree completion. As an example, if students interact with an academic advisor once a year versus multiple times a year, are there any significant differences in the likelihood that the student would persist and/or graduate? The addition of other environmental factors, like frequency and type of contact with faculty and staff may play an integral role in student success.

Castillo, Conoley, Choi-Pearson, Archuleta, Phoummarath, and Van Landingham (2006) found that student perception of the campus environment was a factor in the likelihood of persisting in college. Connecting the data from institutional databases, with inclusion of data from other sources such as survey instruments designed to examine student perceptions of their experiences and environments may provide a more comprehensive picture of persistence and/or degree completion.

*A future study should be conducted that is an expanded and longitudinal replication of this study at additional research institutions as well as at different institutional types.*

It is important to know whether the results at this four-year research university would yield the same findings at other four-year research universities. The institutional site at this study has a quarter-based academic calendar. It seems likely that students attending a semester-based research university would be affected differently by the environment of campus because of the distribution of academic work across additional weeks of instruction. This could lead to different interactions with staff and faculty. At the same time, the greater frequency of changing courses within the quarter system may have an impact on the speed at which students ultimately select a major when undecided, or the frequency with which they change majors when they are decided.

In this study, a definition of undeclared was used that arguably could be operationalized at any institutional type, as long as students are able to select undeclared or undecided upon initial enrollment. As degree completion is a priority for institutions of all types, replicating this study at other institutional types, with the same definition, would help to clarify whether initial academic program choice is actually a predictor of persistence or degree completion. Additionally, as the institution included in this study is a research university that admits a large number of high achieving students, examining the research questions at other institutional types, with less selectivity in admissions, may or may not yield different findings. Further examination of this study's research questions would help to answer if there is a difference due to the selectivity of admissions.

Given the criticisms of some of the theories related to student departure and student persistence as being limited to students enrolling at four-year institutions, knowing the findings of similar studies conducted at two-year institutions, for example, would provide a more

complete picture of college student persistence. It is possible that at a two-year institution not starting with a major may have a very different effect of a student's persistence in college than might occur at a four-year institution. This more complete picture would help to revise or replace existing theories and improve institutional efforts to move students from admission and orientation to enrollment and degree completion.

*A future study should be conducted that examines the extent to which various variables predict persistence and degree completion for non-first time in college, full-time students.*

As this study only examined first-time in college students who enrolled full-time, the findings may not be as transferrable to transfer students or part-time enrolled students. Given the ever-changing enrollment patterns of students (Renn & Reason, 2013), it would be important to examine the extent to which many of the variables in this study predict persistence and/or degree completion for these other populations of students.

*A future study should examine the question of why a significant number of students earned dual enrollment credit and/or AP credit but also required remediation to be college ready in mathematics, English, and/or chemistry.*

The student records examined in this study depicted that 70.1% of the cohort had earned dual enrollment credit at an institution of higher education while enrolled in high school. Additionally, only 22% of the cohort did not earn credit from AP exams. Meanwhile, 41.4% needed remediation as measured by enrollment in developmental education/workload courses. As a result, at least 10% of the students who earned dual enrollment credit were also required to complete remedial coursework in order to be college ready in mathematics, English, and/or chemistry. For the 78% of students having passed an AP exam, at least 18% still required remediation. This suggests that having completed dual enrollment credit and/or passing an AP

exam for credit might not necessarily translate into a student arriving on campus as college ready. Further examination into why would be an important question to consider that could help to correct assumptions about the level of preparation of students admitted to institutions of higher education.

*A future study should be conducted that examines why African American/Black and Latino/Chicano students are less likely to graduate on-time.*

Although much of the literature on race/ethnicity and persistence indicated that race/ethnicity was not a factor with persistence (Laskey & Hetzel, 2011; Rigali-Oiler and Kurpius, 2013; (St. John, Hu, Simmons, Carter, & Weber, 2004; Wolfle, 2012), it was a significant predictor of on-time graduation. African American/Black and Latino/Chicano students were less likely to graduate on-time than White students. African American/Black and Latino/Chicano students are still just as likely to graduate within six years, but there would be implications for the services and programs provided to these students based on what such a study's findings might conclude as to the reasons why they are not finishing in four.

*A future study should be conducted that moves beyond the "undeclared" question*

If, as this study's findings indicate, being undeclared is not a significant factor in student persistence, it opens up the space to explore which factors are truly significant. Instead of directing further attention to the question of whether starting undeclared puts one at a graduation disadvantage relative to declared peers, researchers could direct attention to other factors that may indeed have significant impacts on improving persistence and degree completion rates. As found by this study, there are some perceived "truths" that can create or perpetuate inequity or misperceptions of student populations in higher education. If the realization is that being undeclared is not a "truth" of deficiency or risk of attrition, then the focus can shift to those

variables, in combination, that do contribute to either persistence or departure. More simply, with these conclusions, scholars interested in better understanding persistence or student departure can decide which of the many variables should be explored next, without the misperception that being undeclared is a factor in attrition.

## Implications for Policy and Practice

The findings of this study provide useful information for administrators, faculty, staff, and students. The potential implications for policy and practice in higher education, as well as implications for students, are discussed in this section.

### Policy

The findings and conclusions from this study have implications for college and university leadership that relate to institutional policies associated with admissions, declaration of major, and/or change of major. As academic program is not a predictor of persistence or on-time degree completion, there is no need for policies that require students select a major upon initial entry into an institution. College and universities without the option to select undeclared at the time of the admission application may want to consider adding such an option since many declared students change their major. It is possible the decision about a major was not a well-informed one and it is likely that all students have some level of uncertainty about a major (Lewallen, 1995).

The argument could be made that institutions could address the issue of major declaration, conversely, by requiring all students declare a specific program of study given that the likelihood of persistence and on-time degree completion is no different for undeclared versus declared students. Such a policy would not provide relief for students from the pressures to decide (Grites, 1981, 1983) and would not provide students with a sense that the institution is

committed to the welfare of students (Braxton, Hirschy, & McClendon, 2004). As a result, institutional policies related to admissions should be designed to allow, or even encourage, students who are have some level of uncertainty about a choice of major to matriculate as undeclared and explore possible majors with the assistance of the faculty and staff on the campus.

Related, some institutions, the University of Texas at Austin for example, have moved in recent years to policies that limit a student's ability to change their major, under the perception that not allowing students to change majors will lead to more students completing their degree. The findings from this study, as mentioned earlier, do not support the conclusion that changing majors is a problem. Declared students, though more likely to change their major and change it more frequently, were no less likely to persist or graduate. Changing one's major, therefore, should not necessarily be viewed as a negative factor in the student's pursuit of a degree.

Some institutions have also interpreted federal financial aid policies such that students may not receive financial aid if they are undeclared (e.g. Kent State University). The findings from this study reveal that this interpretation is poor policy. Many institutions already allow students to be undeclared without violating federal financial aid rules. Again, if undeclared and declared students are no different in their progress through an institution to the completion of a degree, then students who wish to take the time to decide upon a major should not be penalized.

**Practice**

The process of admitting students into specific majors seems unnecessary if many students are predicted to change their major, and as a result, are likely to graduate in a different major than their major at the time of admission. Given that undeclared students are just as likely to persist and graduate on-time as declared students, and that many declared students change

majors, institutional decision processes should not place emphasis on academic major as a criterion for admission when that major is likely to change.

Once students are admitted, institutional practice should not restrict students' ability to change majors, or more importantly, discourage the exploration of possible majors. Students may not have chosen an initial major that fits with their interests. Therefore, allowing them to explore and change majors may contribute to a higher likelihood of degree completion. If students end up in a major that has a higher level of congruence with their interests, they are more likely to maintain that choice of major (Allen & Robbins, 2008; Leuwerke, Robbins, Sawyer, & Hovland, 2004).

This study also has implications for new student orientation programs. Orientation programs should be designed to provide parents and family with information and reassurance their student's decision to enroll as an undecided student, if this is what they have chosen, is mature and appropriate. Having orientation sessions aimed at parents and family members that communicate that there is, in fact, no difference in likelihood of persisting and graduating for undeclared students, can work toward dispelling the misperceptions of undeclared students as less than declared students and alleviate some of the pressures to declare early.

Another practice where there are implications drawn from this study's findings is academic advising. Academic advisors, whether assigned to students who are declared or not, should engage in major and career exploration with all of their students from the first interaction. Undeclared students need assistance with exploring and choosing an initial choice of major. Declared students, in contrast, need advising that helps them either reject, revise, or confirm their initial choice of major.

There are also implications for practice in terms of the initiatives, programs, and services provided for students from specific populations, such as first-generation students. Being first-generation, coming to campus without the same level of cultural capital regarding higher education, does not translate into a decreased likelihood of persisting in college. However, it is possible that being first-generation, low-income, male, and lower achieving in high school, in combination, contribute to an increased chance of attrition for a student. It is possible that retention programs targeting students based on one variable, whether that variable be that first-generation status, etc., may not be appropriately targeting the students at most risk of leaving college.

### Students

The findings also have implications for students and their families. Students and their families no longer need to emphasize having a specific major declared at the time of initial entry into college. This increased understanding that starting undeclared is not a disadvantage for students in terms of college completion, including on-time completion, will help students to feel less pressure to decide early. Students, many of whom have uncertainty about a major as evidenced in the likelihood of changing majors, could approach college with the intention of taking time to explore their educational options. The steps toward successful degree completion do not have to include a declaration of major prior to matriculation.

## Concluding Thoughts

This study adds to the limited recent scholarly literature on undecided students and their likelihood of persisting through a college or university to graduation. It begins to fill the gap in the literature with regards to undeclared students and college student persistence. The study was designed around Astin's (1993) I-E-O conceptual model and accounted for other possible

variables to determine if there was a difference. The study confirms that Astin's model provides a valuable framework for operationalizing questions associated with student persistence in college, institutional retention efforts, as well as student departure. The change in significance for some of the input variables once the environmental factors were added to the regression models reinforces that institutional leaders must consider who the student is prior to matriculation, the institutional environment, and the interaction between the student and the environment as contributing factors to the outcomes being measured.

This study was approached, in the context of a degree completion agenda in higher education, with the intention of answering if being undecided about a major translated to a decreased likelihood of persisting in college, from the point of matriculation to the point of degree completion. The logistic regression models conducted for this study resulted in the findings that there are no differences in persistence or on-time graduation for declared and undeclared students. There are other factors, however, that are more likely to predict persistence or degree completion.

Perceptions of administrators, faculty, staff, and parents were that undecided students were at greater risk of dropping out. As mentioned before, higher education administrators and students' families have tended to agree that students should persist to degree completion and that part of doing so is declaring a major as early as possible (Allen & Robbins, 2008; Mangan, 2011; Onink, 2010; Simon, 2012). One study from the past 30 years by Leppel (2001) supported those ideas. The findings from this study, however, do not support those perceptions of undecided students, ideas about early major declaration, or Leppel's earlier findings.

If, as this study's findings indicate, declared and undeclared students are quite alike, especially when one considers college student persistence, then it is possible that the best

approach for colleges and universities is to permit and even encourage students to explore their options for majors as opposed to making a premature, uninformed decision at the point of entry and sticking with it. Institutional policy and practice should be adjusted to consider all students as students in need of major exploration. Additionally, the findings from this study illustrate that there are some perceived ideas that can create or perpetuate inequity or misperceptions of students and/or college student persistence. If being undeclared is not a deficiency or risk of attrition, then it is important to remember that some of the other perceived "truths" are also based on untested perceptions and may actually be contrary to the actual truth.

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# APPENDICES

APPENDIX A

IRB Approval

THE UNIVERSITY OF ALABAMA | Office of the Vice President for Research & Economic Development
Office for Research Compliance

September 12, 2017

David B. Spight
Department of ELPTS
College of Education
The University of Alabama
Box 870302

Re: IRB # EX-17-CM-056 "Early Declaration of a College Major and its Relationship to College Student Persistence"

Dear Mr. Spight:

The University of Alabama Institutional Review Board has granted approval for your proposed research. Your protocol has been given exempt approval according to 45 CFR part 46.101(b)(4) as outlined below:

*(4) Research involving the collection or study of existing data, documents, records, pathological specimens, or diagnostic specimens, if these sources are publicly available or if the information is recorded by the investigator in such a manner that subjects cannot be identified, directly or through identifiers linked to the subjects.*

Your application will expire on September 11, 2018. If your research will continue beyond this date, complete the relevant portions of Continuing Review and Closure From. If you wish to modify the application, complete the Modification of an Approved Protocol Form. When the study closes, complete the appropriate portions of FORM: Continuing Review and Closure.

Should you need to submit any further correspondence regarding this proposal, please include the assigned IRB application number.

Good luck with your research.

Sincerely,

358 Rose Administration Building | Box 870127 | Tuscaloosa, AL 35487-0127
205-348-8461 | Fax 205-348-7189 | Toll Free 1-877-820-3066