COURSE WITHDRAWAL AS A STUDENT ATTRITION FACTOR

A Dissertation Presented to the
Faculty of the College of Education
University of Houston

In Partial Fulfillment
of the Requirements for the Degree of

Doctor of Education

By

Lillian Wanjagi

December 2015

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An Abstract
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Abstract

Student attrition has serious implications for society as a whole and for students who do not complete postsecondary education (Yorke, 1999). Graduation rate and degrees awarded are the ultimate goals, but there are intermediate achievements as students move toward degree completion that should be tracked and studied. Examples of intermediate measure well-studied are term-to-term retention and year-to-year retention (Moore & Shulock, 2009). Failure to focus on course completion, however, shortchanges possible interventions to increase degree completion (Adelman, 2006).

The Texas legislature passed Senate Bill 1231 in 2006 to address student course completion. The bill limits undergraduate students enrolling as first-time freshmen at a public institution of higher education in fall 2007 or later to a total of six dropped courses (Ws) during their entire undergraduate careers. When these six Ws have been used, the student would have to complete all subsequent courses without an option to drop the class. The purpose of this study was to examine whether the goal of reduced withdrawals had actually been realized at Big Town University, a large major research university in Texas post implementation of the new withdrawal policy that limits how many courses undergraduate students could drop controlling for student gender, student ethnicity, student ACT or SAT score, student major, change of student major, and semester GPA. Two cohorts were examined – 2,128 students who enrolled as FTIC pre-implementation the revised withdrawal policy in fall 2005 and a second cohort of 2,067 students who enrolled as FTIC in fall 2007 post-implementation of the revised withdrawal policy. A

generalized linear mixed-effects model via use of generalized estimating equations was used to statistically model the variables of the study over time.

Results indicated that students did drop fewer classes after the withdrawal policy was implemented. The independent variable of Cohort = 2007 Withdrawal Policy Implementation was statistically significant ($p = .042$), indicating that students who attended UH after implementation of the withdrawal policy were 23% less likely to withdraw from a class when compared to students who attended school before implementation of the withdrawal policy. Two variables were found to impact the chance of dropping a class - college semester GPA and ethnicity. The variable of GPA was a significant for the dependent variable of Number of Dropped Classes (OR = 0.46, SE OR = 0.03; $p < .0005$). The magnitude of the odds ratio indicates that for each one unit increase in a student's GPA, the student is 54% less likely to drop a class. Student ethnicity was tested as a control variable and students who were classified as Asian, Pacific Islander were 62% more likely to drop a class than White students (OR = 1.62, SE OR = 0.46, $p < .0005$).

Results of this study can be used to improve advising practices for students who are considered at risk of dropping classes. Course attrition is the result of many complex variables for example goal change or attainment, uncertainty of educational/career plan, adjustment/transition difficulties, academic difficulty, and personal reasons over which the institution has little control (e.g. health and finances). Recommendations from this study focus on the academic support that institutions could provide to help mitigate the chances of dropping courses due to poor academic performance. The university should track persistence and completion rates of courses by program of study and persistence and completion rates for students in retention-related initiatives to measure the effectiveness of existing programs. Semesterly reviews of students' attempted hours versus completed hours could provide early flags for

students that may require additional support to complete their courses. Based on the finding of this study, monitoring the students GPA and the changes to the GPA for each semester may also be helpful to identify students at risk of dropping classes. This significant relationship of academic performance as measured by GPA to student persistence has been validated by many other studies (Adelman, 2004, 2006; A. W. Astin, 1997; Bennett, 2003; Pascarella & Terenzini, 2005) Academic advisors should target students with lower GPAs to provide them with extra assistance to support timely and efficient course completion. Students who are found to have an excessive number of course repeats, failures, and withdrawals should be monitored and required to have mandatory advisement prior to future enrollments. Mid-semester grades and early alert reports for these students should be monitored for potential problems. Effort should be exerted to identify signals along the way of students for students who may be on or off track for completing a degree. Academic Advisors should consider tracking individual student progress metrics like success in first-year math or English or any required core curriculum, credit accumulation, course completion, course drops, and time and credits to degree. This study also suggests that there is need for specialized academic support programs for Asian, Pacific Islander students. Suzuki (2002) suggests increase outreach to underrepresented APA in admissions recruitment as well as when advertising programs and services on campus.

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CHAPTER 1

Introduction

Social mobility is strongly tied to economic status, which, in turn, is strongly correlated with postsecondary achievement (Casse & Manno, 1998; Jenkins, 2003; Zucker & Dawson, 2001). An individual's level of economic success is strongly related to educational attainment level. Numerous studies have demonstrated the strong relationship between educational attainment and earnings (Bureau of Labor Statistics, 2015; Carnevale, Jayasundara, & Hanson, 2012; Day & Newburger, 2002; Kantrowitz, 2007; Kominski & Julian, 2010; Newburger & Curry, 2000). It is estimated that every person with a baccalaureate degree makes an average of $5,900 more per year in federal, state, and local tax revenue compared to a person with only a high school diploma. Over a lifetime, this can add up to an additional $177,000 in tax contributions. In some states, an increase in percentage of college graduates by five percent could generate over $100 million dollars each year in new taxes (U.S. Department of Education, 2011). In addition to the economic concerns, the United States is facing a need for a more educated workforce amidst an increasingly diverse population. The association between educational attainment and economic and social benefits underscores the importance of improving college completion (graduation) rates for all members of society.

However, the statistics on college completion are alarming and effective strategies and solutions to boost college completion rates remain elusive. Nationally, about 60 percent of students graduate from four-year colleges and universities within six years. According to a study by the American Institutes for Research (AIR), more than $9 billion was spent by state and federal governments to support students at four-year colleges and universities who left school

before their sophomore year during a five-year period. AIR researchers analyzed 2003-2008 data from the federal Integrated Postsecondary Education Data System (IPEDS) and found that 30 percent of first-year college students who failed to return to campus for a second year accounted for $6.2 billion in state appropriations for colleges and universities and more than $1.4 billion in student grants from the states (Schneider, 2010). Additionally, the federal government provided $1.5 billion in grants to these students. The study did not examine community colleges, where first-year dropout rates are even higher (Schneider, 2010). Consequently, college attrition has been characterized as a national concern because it creates major impediments to upward social mobility and economic success (Horn, Berger, Carroll, & National Center for Education Statistics, 2004; Yorke, 2000). Unless post-secondary educational attainment is maintained as the U.S. population diversifies ethnically, annual worker income will decline over the next 15 years (Kelly, 2005).

Access and participation in higher education has been the focus of higher education policy for over a century beginning with the passage of the Second Morrill Act in 1890 which expanded the 1862 system of land-grant universities to include historically African-American institutions. The act provided the then-named Office of Education responsibility for administering support for the original system of land-grant colleges and universities. World War II led to continued federal support for education and in 1944, the Servicemen's Readjustment Act of 1944 (commonly known as the "GI Bill") authorized postsecondary education assistance that ultimately sent nearly eight million World War II veterans to college. Other efforts to increase access for women and minorities followed. Fueled by the belief that college would lead to economic opportunity, the federal government and the states developed substantial aid programs to assist the financially less fortunate (U.S. Department of Education, 1997). The efforts to

improve access have shown increased participation rates. The nation currently sends 56 percent of its recent high school graduates directly to college with 75 percent enrolling within two years after high school graduation (U.S. Department of Education, 1997). While colleges and universities have successfully improved access and enrolled more students than ever, they have not made any significant increases in degree completion. In Texas, a study commissioned by the Texas Higher Education Coordinating Board (THECB) found that postsecondary enrollment has increased ten-fold since the mid-1900s to approximately 14 million students each year, but the institutional graduation rate has held steady at 50 percent during the same time (2004). Nationally, 67 percent of students at four-year institutions complete a bachelor's degree within six years of enrolling and only 28 percent of associate degree-seeking students graduate within three years (Lee & Rawls, 2010). According to Moore and Shulock (2009), the United States is near the top of the 29 Organization for Economic Cooperation and Development (OECD) countries in terms of college participation rates but near the bottom in terms of college completion rates. There are numerous national and regional initiatives focused on improving degree completion rates by measuring and reporting completion rates of first semester retention, graduation rates, and transfer rates (Moore & Shulock, 2009). The federal government requires colleges and universities to report only on fulltime students though we know that four of every ten public college students are only able to attend part-time and that college attendance patterns have changed and more students are attending college part-time and are enrolling in multiple institutions along the path to a degree (Adelman, 2006). Current graduation rates are tracked and measured only for students who complete their four year degree within six years of their start date and only report graduation rates for students who graduated from the school at which they matriculated (Moore & Shulock, 2009).

Over the last 20 years, more than 31 million students have gone off to college but never earned a degree (Shapiro, Dundar, Yuan, Harrell, Wild, Ziskin (2014). Far too many college students get lost in the process, slowed down by unclear expectations with no clear pathway to graduation day. College completion cannot be realized if students depart from the higher education pipeline therefore it is important to understand the phenomenon of student departure. There are several types of departures from higher education. Most colleges and universities are concerned with "institutional departure" (Tinto, 1993), which is when students leave the school where they are enrolled and transfer to another institution. Students who leave the institution for another school are not considered dropouts, but the college still sees this departure as a loss of students who did not complete their education at the school where they began (Tinto, 1993). Those students who withdraw and do not transfer to another institution are considered "system departures" and are described as college dropouts (Tinto, 1993). The studies on system departures question the students' initial motivation for attending school and evaluate whether or not the students should have been admitted in the first place (Bandura & Adams, 1977; Bandura & Locke, 2003; Hsieh, Sullivan, & Guerra, 2007). Another form of student departure is known as "stopouts" (Tinto, 1993). Stopouts are students who withdraw from higher education for a period of time, only to reenroll at a later date. Dropouts and stopouts are different: dropouts are those who depart from the system and do not return while stopouts are those who temporarily withdraw but do return at some time in the future. Many who are stopouts typically return as a part-time student, while working full-time. Students who stopout, have a lower incidence than full-time students of completing a four year degree (Educational Policy Institute [EPI], 2004). The dialogue on college completion also requires an understanding of these three terms commonly used in the discourse - attrition, persistence, and retention. Attrition refers to a

decrease in the number of students participating in a degree program. It is generally referred to by theorists (Spady, 1970; Tinto, 1975, 1987,1993; Bean, 1980, 1985) as the college dropout rate. Persistence refers to the act of continuing toward an educational goal such as earning a degree or certificate (Martinez, 2003). Retention refers to the persistence of undergraduate students in pursuit of their bachelor's degree and is most frequently measured by the number of students that progress through completion of the bachelor's degree program (Center for the Study of College Student Retention [CSCSR], 2015.). Retention is often one key benchmark by which colleges measure their success. This term is often interchangeable with the term "persistence"

Recent higher education policy has been focused on degree completion. In a joint session of Congress on February 24, 2009, President Obama set forth a goal that "by 2020, America will once again have the highest proportion of college graduates in the world" (Field, 2009). Stating that three-quarters of the fastest-growing occupations now require more than a high school diploma, the then newly inaugurated president outlined this goal as part of his agenda to revive the nation's economy and "to build a new foundation for lasting prosperity" (Field, 2009). In response, many college completion initiatives have been developed by non-profit organizations, business leaders, and state legislators, among others focusing solely on college completion (Adult College Completion Network (2010), American Council on Education (ACE), College Completion Challenge (2010), Complete College America (2010), and Midwestern Higher Education Compact, 2010; among many others). President Obama's higher education agenda provides financial incentives for states to maintain their commitments to higher education (Russell, 2011). In March 2011, the administration released the *College Completion Tool Kit*, presenting seven "low-cost" action strategies for governors to consider. The Obama

administration called on each governor to host a state college completion summit, and announced a $20 million grant program under the Fund for the Improvement of Postsecondary Education (FIPSE) Comprehensive Program to increase college success and improve productivity (Complete College America, 2010a). In his 2015 budget, President Obama proposed a new $1 billion investment that funds programs like "Race to the Top: College Affordability and Completion Program," which aim to increase the number of college graduates and contain the cost of tuition by rewarding states that are willing to change their higher education policies and practices systematically to enable more students to complete their degree plans (whitehouse.gov/issues/education/higher-education). Complete College America was established in 2009 as a national nonprofit organization aimed at increasing the nation's college completion rates and consists of 23 "alliance states." The program is unique in that it focuses on increasing completion solely through state policy change by coordinating dialogue among state leaders, higher education leaders, and the national education policy community. The alliance operates under the premise that within the U.S. college enrollment has significantly grown while, at the same time, completion rates have been stagnant. In hopes of increasing college completion across the U.S., Complete College America requires that all member states, in partnership with their colleges and universities, pledge to make college completion a top priority and commit to the following three actions: 1) set completion goals; 2) develop action plans and move key policy levers; and 3) collect and report common measures of progress (Complete College America, 2010b). In 2010, Governor Rick Perry pledged Texas to fulfill the commitments required for membership in the Complete College America Alliance of States. The Texas legislature has been active in making changes in an effort to address low within-term retention, increased time to

degree, and low persistence and low degree completion rates for public higher education institutions (Complete College Texas, 2010c).

The Lumina Foundation and the Melinda and Bill Gates Foundation have adopted the "college completion agenda" undertaking diverse activities aimed at increasing the number of adults in the United States who have earned a postsecondary credential. Along with many governors, private businesses, think tanks, and higher education systems and institutions, they are part of a growing national movement focused on increasing student success and educational attainment. The current focus on college completion of undergraduate students continues to make retention and persistence the most dominant focus of study and consideration in American higher education (Astin, 1975; Moxley, Najor-Durack, & Dumbrigue, 2001; Seidman, 2005).

In order for students to complete their degrees programs, they must complete the courses required for their degree program. Traditional measures of student success (graduation rates and degrees attained) ignore the intermediate outcomes that students must achieve on the path to degree completion, including finishing any needed remediation and completing particular courses or sets of courses (i.e., general education requirements or coursework needed for transfer from a community college to a university). By ignoring these intermediate outcomes, traditional measures fail to provide intermediate interventions to increase degree completion. Legislators in Texas have acknowledged the relationship between course completion and college completion and consequently, they passed Senate Bill 1231 into law in 2007 during the 80th legislative session. It amended TEC51.907 which now states that undergraduate students who enrolled for the first time in a Texas public institution of higher education in fall 2007 or after will be limited to a total of six dropped courses during their entire undergraduate career. This statute applies to courses dropped at public institutions of higher education in Texas including community and

technical colleges, health science centers that offer undergraduate programs, and universities. Courses dropped at independent or private institutions or at colleges and universities outside of Texas, do not count against the student's six drop limit ("UH registrar information, (2014, para 1).

Statement of the Problem

There is extensive literature on the reasons why students do not complete their degree programs. There is very scarce literature, however, on course completion and what impacts a student's decision to withdraw from courses, despite the fact that course withdrawals come with a very significant cost to the student, the institution, and taxpayers (Yorke, 1999). With the pressure to increase retention and degree completion, institutions seek research to examine program effectiveness and their outcomes (Voorhees, 2001); therefore understanding what factors impacts a students' decision to withdraw their courses could be helpful to these institutions. Graduation rates and degrees awarded are the ultimate goals, but there are intermediate achievements, such as term-to-term retention and year-to-year retention (Moore & Shulock, 2009) that should be tracked and studied. Failure to focus on factors that impact course completions shortchanges possible interventions to increase degree completion (Adelman, 2006)

Purpose of the Study

This study will investigate whether the 2007 Texas policy that limits the number of course withdrawals has actually resulted in reduced withdrawals at an urban major research university in Texas. The dependent variable will be the number of classes dropped for each student. The independent variable of interest will be withdrawal policy with two cohorts of students: (a) students who matriculated into the university prior to implementation of the

withdrawal policy and (b) students who matriculated into the university after implementation of the withdrawal policy. The study will also include independent control variables for (a) student gender, (b) student ethnicity, (c) student ACT or converted SAT score, (d) student major, (e) change of student major, and (f) semester GPA.

The relationship between measured variables will be explored using a generalized estimating equation (GEE) to predict which factors are most significant in influencing a student's course withdrawal. The key to college completion is credit accumulation or credit production as described by McCormick and Carroll (1999). Since student degree completion could be improved by not withdrawing from courses, there are benefits to the student and the institution to understand the possible factors that impact course withdrawals and subsequently reduce or prevent the withdrawals.

Research Questions

The research questions and associated statistical hypotheses guiding this inquiry are as follows:

RQ1: Did first-time-in- college (FTIC) students who entered the university following the implementation of the 2007 Texas revised course withdrawal policy drop fewer courses than FTIC students who entered the university prior to implementation of the Texas 2007 withdrawal policy?

H01: There is not a statistically significant relationship between the withdrawal policy (pre vs. post-implementation) and the criterion of the number of courses dropped, after controlling for (a) student gender, (b) student ethnicity, (c) student ACT or

converted SAT score, (d) student major, (e) change of student major, and (f) semester GPA.

HA1: There is a statistically significant positive relationship between the withdrawal policy (pre vs. post-implementation) and the criterion of the number of courses dropped, after controlling for (a) student gender, (b) student ethnicity, (c) student ACT or converted SAT score, (d) student major, (e) change of student major, and (f) semester GPA.

H01a: The independent variable control of student gender is not a significant predictor of the criterion of the number of classes dropped

HA1a: The independent variable control of student gender is a significant predictor of the criterion of the number of classes dropped.

H01b: The independent variable control of student ethnicity is not a significant predictor of the criterion of the number of classes dropped.

HA1b: The independent variable control of student ethnicity is a significant predictor of the criterion of the number of classes dropped.

H01c: The independent variable control of student ACT or converted SAT score is not a significant predictor of the criterion of the number of classes dropped.

HA1c: The independent variable control of student ACT or converted SAT score is a significant predictor of the criterion of the number of classes dropped.

H01d: The independent variable control of student major is not significant predictor of the criterion of the number of classes dropped.

HA1d: The independent variable control of student major is a significant predictor of the criterion of the number of classes dropped.

H01e: The independent variable control of change of student major is not a significant predictor of the criterion of the number of classes dropped.

HA1e: The independent variable control of change of student major is a significant predictor of the criterion of the number of classes dropped.

H01f: The independent variable control of semester GPA is not a significant predictor of the criterion of the number of classes dropped.

HA1f: The independent variable control of semester GPA is a significant predictor of the criterion of the number of classes dropped.

Significance of the Study

The information provided by this research effort may lend insight into the factors that impact attrition as reflected by course withdrawals. Additionally, the results of the study will be used to determine the extent to which academic factors (GPA), demographic factors (gender and race/ethnicity), and enrollment factors (change in major) can account for a student's withdrawing from a course. The study will also examine whether the revised withdrawal policy resulted in fewer withdrawals. Student withdrawals have a significant effect on the fiscal stability of an institution of higher education. The results of this study will, therefore, be of interest to administrators and researchers, in particular, by providing insight into the profiles of students who withdraw from courses. Understanding course attrition trends can benefit decision-makers by improving institutional effectiveness through policy and/or adjustments in areas such as course scheduling, and student support services to increase academic performance and within-term course retention rates (Wyman, 1997). Strategic management of attrition results in

decreased enrollment volatility, decreased recruiting costs, increased graduation rates, decreased financial aid expenditures on non-completers, and increased academic performance of students.

Limitations of the Study

This study will seek to explore the degree, if any, to which various factors (independent variables) influence students' withdrawals from courses (dependent variable) at one major research university in Texas. The results are not causal; rather they will measure the degree and direction of any possible relationship between the dependent variable and any single combination of the predictor variables. Since data for this research was collected from a single major research university with a diverse student body in Texas, the generalizability of the findings of this study may be limited. The study only looked at a very small subset of course withdrawals - students who dropped classes but remained enrolled in all four semesters. Students who drop out completely may be impacted by completely different factors.

Definitions of Terms

The following terms are used throughout this study:

Credit hour: Credit hours are a measurement used by colleges and universities to determine progress towards degree. A one credit hour class roughly equates to spending three hours (in and out of the classroom) devoted to class work per week or 45 hours during a semester.

Cohort: A specific group of students established for tracking purposes (National Center for Education Statistics, 2009).

Drop: Dropping a class is when students leave a class before completion and is sometimes used interchangeably with "withdraw" (Hagedorn, 2007).

FTIC: This is a first-time-in-college student who has no prior postsecondary experience attending any institution at the undergraduate level

Full-time status: Typically, full-time status for undergraduate students is defined as being enrolled in at least 12 credit hours during the fall and spring semesters and/or at least nine credit hours during the summer semester.

Grade Point Average (GPA): Grade Point Average is a measure of scholastic achievement on a 4-point scale. It is computed by dividing the total number of grade points by the number of credits.

Major(s): The major is the primary area of academic study.

Part-time status: Part-time status for undergraduate students is defined as being enrolled in fewer than 12 credit hours during the fall and spring semesters and/or fewer than nine credit hours during the summer semester.

Within-term retention: This is the percentage of courses in which students earn a grade versus the courses that students withdraw from or drop over the course of a term. By this definition, if a student takes four classes and withdraws from one, he or she was retained in 75 percent of her courses. (Manning & Bostian, 2006).

W grade: The grade of W is assigned to a course after the last day to drop or withdraw without receiving a grade (four weeks after the first day of classes in a fall or spring semester) and before the final day to drop or withdraw (generally four weeks prior to the last day of classes in a fall or spring semester). Students are responsible for initiating action to drop or withdraw from classes ("UH Registrar Withdrawal Information," 2014, para. 1).

Organization of the Study

This study is organized into a number of sections. Chapter 1 provided an introduction, identified the importance of this study, and defined the scope of the study. Chapter 2 reviews the literature on student attrition and related attrition factors that could possibly have an impact on course withdrawal. Chapter 3 discusses the research methodology, including the research questions and hypothesis and methods of data analysis. Chapter 4 discusses the study results. Chapter 5 analyzes the study results, study limitations, implications, and conclusions.

CHAPTER 2

Literature Review

A review of attrition literature will help frame this study. The review will focus on a body of studies regarding student persistence. It is important to consider that a decision to withdraw from college may begin with a decision to drop a class. Any barriers identified at the course level are critical in understanding and curbing student attrition. Anticipating course completion barriers can inform us how they affect students and how intervention strategies may reduce or prevent course withdrawal. Additionally, identifying and understanding specific drivers that impact course withdrawal or course completion are equally important. Since no single theory is all-encompassing with regard to course withdrawal and student attrition, it is necessary for this study to examine several possible explanations. Specifically, the following five areas will be reviewed: theoretical foundations of student attrition, legislative and policy mandates that impact course withdrawals, withdrawal and registration policies, student characteristics, and course characteristics.

Theoretical Foundations

While the proportion of individuals enrolling in college has grown since the 1970's, the proportion completing college has not. Almost 54% of students who start a four-year bachelor's program and attend full-time finish in 6 years (Schenider, 2010). Completion rates for bachelor's degree vary by institution type. Students at private not-for-profit four year institutions have the highest six year graduation rate at 65%, compared to 56% at public four-year institutions, and 28% at private for-profit institutions. Graduation rates at community colleges

are even lower. At community colleges, only 30% of full-time students who start at community colleges graduate with an associate degree in three years (Aud, Hussar, Johnson, Kena, & Roth, 2012; Knapp, Kelly-Reid, & Ginder, 2010). Tinto (1993) admits that even though "student departure has been a much studied phenomenon, there is still much we do not know" (p. 35). There are several theoretical models that describe or predict student dropout (Cabrera, Nora, & Casaneda, 1992; Spady, 1970; Tinto, 1975, 1987, 1988, 1993), along with studies that look at the types of institutional environments required for students to persist (Astin,1984; Pascarella & Terenzini, 1991). Other factors that influence a student's decision to leave or stay at higher education institutions include a variety of personal reasons, such as lack of financial resources (Singell, 2001), few support services (Harter, 2000), low grades (Sandiford & Jackson, 2003), and/ or a lack of a sense of belonging (Hurtado & Carter, 1997).

Numerous studies conducted to explain college student attrition, have generally focused on four categories which are: background characteristics of the student such as parents educational attainment; institutional-related factors such as academic programs, faculty, tutoring services, extracurricular-activities, and social involvement; environmental factors such as financial aid and how much a student works while attending school; and cognitive abilities such as high school rank, ACT/SAT scores, and college GPA (Nora, Cabrera, Hagedorn, & Pascarella, 1996). Many terms have been used to describe the act of students leaving college including *student mortality, college dropout, student attrition, college retention, and student persistence* (Morrison & Silverman, 2012). These studies have resulted in many theories to explain student withdrawal from college. The following section will discuss the major retention theories

Astin (1975, 1984) examined factors that support persistence in college. He concluded that the major factors that improve retention are living on campus, involvement with faculty, and interaction with peers. He found that institution size was a significant factor and that as institutional size increased, retention and student satisfaction decreased. Bean's (1985) research focused specifically on reasons for attrition as opposed to strategies to improve persistence. He contended that student peers are the most critical component to the socialization process. Bean (1985) Bean and Metzner (1985) studied persistence factors for nontraditional students and they outlined three forms of socialization that impact student retention: academic socialization, institutional fit, and institutional commitment. Academic socialization pertains to whether or not a student can meet the expectations of the faculty and academic rigor of the institution. Institutional fit relates to how well the values, norms, and goals of the student match those of the institution while institutional commitment reflects both initial level of commitment and the integration process. Bean and Metzner (1985) study concluded that the chief difference between the attrition process of traditional and nontraditional students is that "nontraditional students are more affected by the external environment than by the social integration variables affecting traditional student attrition" (p. 485). Their research suggests that external factors outside of the university like finances, encouragement, and family responsibilities are the key to student persistence. Tinto (1975, 1993) developed a person-environment model of college student attrition. His model recognized that student pre-entry characteristics influence the student's experiences within the college environment and suggested that pre-entry variables such as academic preparedness (GPA and SAT scores).impact students' levels of commitment and motivation. Tinto (1993) proposed that attrition was situational in essence. In order to understand why students depart from higher education, we must first look to the manner in which

students enter higher education institutions. The attributes of individuals and institutions must be viewed in concert because isolated broad characteristics do not portray an accurate portrait of persistence patterns. Pascarella and Terenzini's (1991) study revealed significant associations between student-faculty relationships and persistence, which is consistent with Tinto's research that supports significant associations between college persistence and informal contacts between students and faculty.

Course attrition has a significant impact on persistence and consequently on time to degree completion. In general, the decision to remain in college up to degree completion is the product of a number of different influences, including a student's personal characteristics, academic goals and performance, and integration into the institution. However, many students are at a high risk of leaving college without a degree. According to a 2011 longitudinal study by the National Center for Education Statistics (NCES), the median time it took for 2008 bachelor's degree recipients to earn their degree was 52 months. Forty-four percent of 2007–08 first-time bachelor's degree recipients completed a bachelor's degree within 48 months of their initial postsecondary enrollment, another 23 percent within 49–60 months, and an additional 9 percent within 61–72 months. By institutional type, the median time to earn a degree was 55 months for 2008 bachelor's degree recipients graduating from public institutions, 45 months for graduates of private nonprofit institutions, and 103 months for graduates of private for-profit institutions. Graduates who started at a 2-year public institution and subsequently obtained a bachelor's degree had a median time to degree of 63 months. Bachelor's degree recipients who delayed entry into postsecondary education had a median time of 80 months (U.S. Department of Education, National Center for Education Statistics, 2011).

Efforts to measure student success have generally been limited to retention, graduation, and transfer rates, but these measures are inadequate to fully understand student progress and degree completion. They are inadequate in providing guidance as to how to improve intermediate student progress and ultimately degree completion. Research shows the importance of early accumulation of college credits to provide momentum toward degree completion. Adelman's (1999) analysis of national data for students intending to complete a bachelor's degree indicates that earning fewer than 20 credits in the first year of enrollment is negatively related to degree completion. Other research supports this finding, with one study (McCormick & Carroll, 1999) demonstrating that, among students beginning their enrollment in a 4-year institution, only 45 percent of those completing fewer than 20 units in the first year went on to complete a degree compared to 91 percent completion among students with 30 credits in the first year. Another study (Chen & Carroll, 2005) focused on first generation college students found that they earn fewer credits in the first year than other students. Completing 30 credits in the first year was positively related to degree completion among these students. Among other factors, Adelman (2006) found that excessive no-penalty withdrawals and no-credit repeats made a big difference in a student's persistence to completion of a four-year degree. He (2006) also found that bachelor's degree attainment was 15 percent lower for students who earned fewer than 20 credits in the first calendar year of enrollment compared to students who earned 20 or more credits.

Legislative and Policy Mandates

National Mandates

Boosting college completion rates has led to a national productivity agenda for higher education. Higher education is facing increasing demands for quality assurance from the public, from state legislatures, and from other governing bodies (Bailey, Jenkins, & Leinbach, 2005,

Boswell, 2002; State Higher Education Executive Officers, 2005). Performance-based funding is increasingly popular among both state and federal policy makers, who want public institutions to graduate more students, more efficiently. These external stakeholders call for accountability and evidence that the resources provided to higher education have been used effectively. They want to know that academic institutions can provide measurable proof of institutional effectiveness and provide evidence of their accountability (American Council on Education, 2004; Shulock & Moore, 2002, 2004).

The Higher Education Reauthorization Act of 1992 provided new guidelines for states to evaluate public institutions of higher education using a broad variety of measures (Higher Education Reauthorization Act, 1992). The retention rate is among the most widely referenced metric in higher education, which is the percentage of entering students persisting in their academic program at an educational institution until graduation (Wyman, 1997). Higher education institutions continue to face demands for more accountability from the general public and from various governing bodies (State Higher Education Executive Officers, 2005). The pressure for universities to maintain or increase enrollments and increase degree production despite significant funding reductions makes it important for higher education institutions to focus on increasing student retention and reducing student attrition (American Council on Education, 2004). As funding in higher education becomes scarce, more states are beginning to view course completion and college completion (within-term retention and graduation) as measurable funding objectives.

According to a review by the National Conference of State Legislators (NCSL) in 2010, most states' higher education institutions receive funding based on how many full-time equivalent students are enrolled at the beginning of the semester. This funding model provides

an incentive for institutions to enroll students into the classroom—but not necessarily to complete the class. Several states are reconsidering that funding model and instead are allocating money to colleges based on the number of students who complete courses and degrees (NCSL, 2010). The Midwest Higher Education Compact (2010) findings were similar for Midwestern institutions that have been historically funded on the basis of course enrollments rather than course completions (Giegerich, 2010). However, in light of state financial deficits, funding higher education based on course or degree completion rates or other indicators of student success is being given serious consideration nationally as reported by the Midwest Higher Education Compact (2009). Florida began performance funding for community colleges in 1994 and has experienced positive results from tying six to eight percent of state higher education funding to student success. Between 1996 and 2007, enrollment in Florida grew by 18 percent, and the number of certificates and degrees awarded increased by 43 percent (Midwest Higher Education Compact, 2009). In Pennsylvania, four-year institutions have received performance-based funding for the last decade. Their policy makers attribute the change to performance funding with the increase in graduation rates by about 10 percentage points in total and an increase of fifteen percent for Hispanic students (Midwest Higher Education Compact, 2009). Indiana, Ohio and Tennessee are the first states attempting to completely shift their funding formula to performance outcome based funding (Midwest Higher Education Compact, 2009). During the next few years, performance-based funding will grow incrementally, and eventually 100 percent of base funding will be tied to course completion and other performance indicators instead of course enrollment. This is the first instance of large-scale performance funding implementation and the results are still unknown (National Conference of State Legislators, 2010).

Texas Mandates

In Texas in 1999 during the 76th legislature, House Bill 1678 [Texas Education Code (TEC) 61.086] also called "Closing the Gaps by 2015" was passed. The goal of the law was to create a statewide plan to identify, attract, enroll and retain students that reflect the diverse population of Texas. The law directed the THECB to "develop and annually update a uniform recruitment and retention strategy to identify, attract, enroll and retain diverse students." This bill empowered THECB to carry out the state's Uniform Recruitment and Retention Strategy and other efforts aimed at increasing both access and completion at higher education institutions in Texas.

Other laws passed in Texas to address low graduation rates include one that was implemented in 2003 by Texas State Senator Judith Zaffirini (D-Laredo, Texas) called the "B-On-Time" (BOT) Loan Program. The BOT program is a unique state aid program intended to increase access to higher education in Texas and encourage on-time graduation. The objective was to increase the return on college investment by motivating students to graduate on-time and therefore spend less money on their education (Shook, 2014). A secondary goal of this program was to help prevent overcrowding at public universities in Texas by creating vacancies since more students would graduate in less time (Hearns & Holdsworth, 2004). The law provides for a state student loan to be completely forgiven if the eligible borrower completes his or her degree on time. The goal of increased on-time graduation rates seems to have been realized by students who participate in the program. The THECB reported in 2011 that 44 percent of public university students with BOT loans graduated in 4 years, more than twice the 4-year graduation rate for those who received aid but not BOT loans (20 percent). BOT recipients' 6-year graduation rates were significantly higher than the rate for non-BOT students. Seventy-one

percent of BOT recipients at public universities graduated within 6 years compared to 49 percent for aid recipients without BOT (Texas Higher Education Coordinating Board, 2011).

The THECB accountability system also uses graduation and retention rates as performance indicators for public institutions in its report card published annually (Texas Higher Education Coordinating Board website). The Texas legislature also passed Senate Bill 1231 in 2006 that limited undergraduate students enrolling as first-time freshmen at a public institution of higher education in Fall 2007 or later to a total of six dropped courses during their entire undergraduate careers ("SB 1231" 2006, para. 2). When six Ws have been accumulated, the student would be required to complete all subsequent courses without an option to drop the class with the goal that this additional requirement would make a student reconsider the decision to withdraw. The policy is expected to result in a reduction in individual course withdrawals for all institutions, which would lead to more credit accumulation and ultimately increased degree completion. This specific policy is the basis of this study.

In 2009 during the 81st legislative session, the THECB proposed changes in the funding recommendations to the Texas legislature in an effort to resolve low completion course and graduation rates. In an effort to hold institutions accountable for reducing the course withdrawals after the official class reporting day, the THECB formula funding recommendations for the 2010-2011 biennium proposed a change from the current funding methodology where funding is based on attempted semester credit hours or contact hours (inputs) to a funding methodology based on completed semester credit hours or contact hours (outcomes) (Formula Funding Recommendations for the 2010-11 Biennium, 2009). The THECBs' recommendation was made on the premise that the new policy would provide higher education institutions increased motivation to work at reducing the withdrawals because the institution would not

receive funding for any courses not completed by a student at the end of each semester. This recommendation will be phased in by the legislature (Funding Recommendations for the 2012-13 Biennium, 2010). The THECB states that the recommendation for this change is driven by the recognition that the state of Texas needs to change its focus on meeting the student participation goals of the state's higher education plan, "Closing the Gaps by 2015," in order to be more effective at meeting the state's student success goals which includes degree completion for Texas students. THECB is committed to eliminating the attempted hours funding because it believes that this model provides incentive for institutions to enroll students, but no incentive to retain students through to the end of the semester. Funding institutions based on course completion will shift the institutions' focus from enrollment to retention. Institutions can increase student retention and success by implementing and strengthening practices that support students (Formula Funding Recommendations for the 2012-13 Biennium, 2010).

In 2011 during the 82nd Legislative session, the Texas Legislature passed House Bill 9 which established the Higher Education Outcomes-Based Funding Act. The law requires the THECB to establish base formula funding recommendations for public institutions of higher education in Texas. The bill requires a funding policy to be developed based on the evaluation of student achievement-based measures such as degree completion rates and the alignment of the same student outcomes to the state's educational goals. The success measures the THECB would consider include:

- the total number of bachelor's degrees awarded by the institution;
- the total number of bachelor's degrees in critical fields awarded by the institution;
- the total number of bachelor's degrees awarded by the institution to at-risk students; and

- the six-year graduation rate of students of the institution who initially enrolled in the fall semester immediately following their graduation from public high school in Texas as compared to the six-year graduation rate predicted for those students based on the composition of the institution's student body.

The continued emphasis on measurable student outcomes makes it even more critical for institutions to understand the factors that impact course completion.

In 2013, the 83rd Texas Legislature approved critical legislation that will change the way higher education does business by distributing some funding based on student outcomes. It passed several bills intended to improve student outcomes and increase institutional productivity: Senate Bill 1 implemented outcomes-based funding for community colleges (Student Success Points) and technical colleges (Returned Value Funding Model), and Senate Bill 215 implemented a cap for the number of hours required for an associate's degree to no more than the number required by licensure or accrediting requirements in an effort to improve time-to-degree (Texas Higher Education Coordinating Board website).

Institutions of higher education operate within a policy environment established primarily at the state level therefore the continued scrutiny on higher education outcomes will continue to impact how institutions operate. Institutions need to grow enrollments while reducing dropouts and while this can't be directly legislated, improvements in policy can support institutions achieve their goals by the environment created by the mandates.

Empirical Studies of Withdrawal and Registration Policies

It is important to study the impact of policies. A good example of why it is critical to study the impact of unintended consequences is a study of a retention policy in the State of Georgia. A merit scholarship called the HOPE (Helping Outstanding Pupils Educationally) program had unintended consequences that were undesirable (Cornwell, Lee, &Mustard, 2005). HOPE is a scholarship and grant program that rewards eligible students with financial assistance in degree, diploma, and certificate programs. To get the scholarship a student must have graduated from a Georgia high school with at least a B average regardless of income. To maintain the eligibility for the scholarship, a student must maintain a cumulative GPA of 3.0 at regular credit hour check points. The study found that the GPA requirement caused students to enroll in fewer classes to stall the first checkpoint. The study also noted that there was an increase in the withdrawal of classes for students who were performing poorly because withdrawn classes are not considered in the GPA calculation. A third observation was that students chose classes where the expected grade was higher. Consequently, the HOPE retention rules resulted in increased course withdrawals, and reduced course completions. Students in the HOPE program had decreased full-course load enrollment, increased course withdrawals among freshmen, and substantially increased summer credits (Cornwell, Lee, &Mustard, 2005). The study concluded that the program's grade-based retention requirements led to student behaviors that partially undermined the program's objective to promote academic achievement (Cornwell, et al., 2005). This is an example of a policy meant to increase access and participation rates for students in Georgia but had an unintended consequences that were contradictory to the stated goals of the program. With that in mind, the next section will summarize several studies on the impact of registration and withdrawal policies on course taking behavior

A study by Hagedorn, Maxwell, Cypers, Moon, and Lester (2007) examined course adding and dropping behavior of 5,000 community college students from nine Los Angeles Community College (LACCD) campuses using rational choice theory as the framework to understand why students drop and add classes. For example, a student may drop a class after first test results because the student may not want to take a chance on not passing a class. The researchers in this study found that some students use the drop-add policies to their detriment by not completing their intended degree programs. Lenient drop-add policies allow for course withdrawal for extended durations of time into the semester, and they allow for no contact or review by an academic advisor prior to the withdrawal. Students may overuse and manipulate the policies such that they end up not being beneficial. Excessive dropping and adding of courses unnecessarily tax administrative and staff resources that are already strained due to current budget restrictions so the researchers in this study recommend assisting students to make wise course choices the first time.

Hagedorn, Maxwell, Cypers, Moon, and Lester (2007) suggest solutions like posting on the internet all course syllabi which would give students the opportunity to preview the class requirements prior to enrollment. The visibility would have the added benefit of allowing faculty to "compare and contrast" their requirements with that of their colleagues. This study (Hagedorn et al., 2007) also found that enrolling and dropping of courses occurred without the consultation of an experienced and knowledgeable individual. The researchers found that add-and-drop policies with minimal barriers (like requiring prior approval from an advisor) implemented in colleges and universities could be good for students. When add and drop policies are appropriately applied, they can help students to achieve success. The researchers recommend additional staffing if resources are available or use the instructors to contact students

who drop their courses. Their final recommendation is that colleges should investigate more overt types of procedures to stem course shopping. A "three strikes" rule where more than three drop/add activities raise a red flag or a limit on the number of drops and adds after the first day of class could be established. Such a system could either eliminate excessive shopping or could single out students who may need to be advised (Hagedorn et al., 2007).

Florida's higher education commission examined all state higher education institutions withdrawal policies (Florida State Postsecondary Education Planning Commission, 1996) and acknowledged the contribution of liberal withdrawal policies to increased course withdrawals which in turn contributed to increased student attrition. The commission found many variations on the deadline date for withdrawals with no consequences among the Florida higher education institutions. The withdrawal dates ranged from the 9-10th week to as late as 12th -13th week. Additionally, two community colleges in the Florida system had no withdrawal deadlines at all. Four out of the nine state universities allowed course withdrawal past the ninth week. The study highlights the importance of the policy component of managing course withdrawals. A review of student transcripts at Florida State University found that there was a relationship between the number of times a student had withdrawn from courses and the student's performance during the first two semesters. The researchers in this study concluded that even though there was evidence to suggest that students used liberal drop-add policies to manipulate the system and improve grade point averages, the study was unable to identify why students repeat courses. The Commission noted wide variations in drop-add policies with some institutions limiting the number of courses that a student could drop. Some Florida institutions allowed a grade of C to be forgiven while other institutions only allowed a D or F to be given. As a result of the study, the commission recommended a limit on the state funding of courses that students repeat as a

result of withdrawals, incomplete, or failing grades. The Florida legislature did not act on the recommendation.

In 1993, College of the Canyons changed its withdrawal policy from allowing students to drop courses in the 11th – 12th week of a 17 or 18 week semester to the 8th week of classes (College of the Canyons, 1994). After the policy was implemented, the institution compared the withdrawals from four previous years prior to policy implementation and found that for fall 1993, withdrawals were reduced by 32 percent from fall 1993. The data indicated a direct relationship with liberal withdrawal policies to increased course withdrawal. The study showed that more students passed their courses in fall 1993 compared to fall 1992. This may be attributed to the policy that required students to complete their course and earn a grade past a pre-defined date.

Central Piedmont Community College (CPCC) found that 14 percent of all their students withdrew from the university while 22 percent of all course registrations ended in withdrawals (Manning & Bostian, 2006). Manning and Bostian called the students who exited all their courses and left the college "walk-aways" and they found that these students have different characteristics than others, even the ones who enrolled and dropped one or more course. The "walk-aways" were more likely to have had a major life event and had repeatedly withdrawn from their courses prior to the exit. The study identified several policies at CPCC that facilitated a higher than average course withdrawal rate. First, CPCC had a liberal withdrawal policy that allowed students to drop courses without penalty until the twelfth week of a sixteen week semester. In comparison, many four-year institutions do not allow withdrawals without penalty after the first few weeks of the term. Second, low tuition rates at CPCC were also a factor because the cost of retaking the dropped class was not high. Third, the grading policy was

another contributing factor. A 1990 grading policy allowed for only A's, B's, and C's (there were no D's and F's) and as a result, if students were not doing at least C-level work, they were forced to withdraw. As a result of the study, policy changes on grading and earlier withdrawal deadlines were considered and implemented (Manning & Bostian, 2006).

Several studies have concluded that excessive course withdrawals have a negative impact on degree completion (Adelman, 2004, 2006; Swail, Cabrera, Lee & Williams, 2005; Chen & Carroll, 2005; Sumners, 2000), making a student's ability to complete courses an important indicator of likely success. Adelman (2006) found that withdrawing from or repeating 20 percent or more of courses decreased the probability of bachelor's degree completion by nearly half. In a study of community college students, he found that the same level of course withdrawal reduced the probability of transfer by 39 percent (Adelman, 2004). In examining the success of first generation students, Chen and Carroll (2005) found that students who withdrew from or repeated less than 10 percent of their courses were more likely to earn a bachelor's degree.

Most of the studies that look at withdrawals from an institutional perspective have been at the community college level. While the student body of a community college is not necessarily comparable to a typical four-year university, understanding student behaviors at the community colleges may be helpful and have implications for universities and particularly four-year universities that have large commuter or part-time enrollments like the institution that is the focus of this study. These studies show that it is critical to have policies that support course completion and, by extension, student success.

Student Characteristics

Studies of college students suggest the important role that student characteristics and behaviors, including expectations and student effort, play in student persistence (Pascarella, Pierson, Wolniak, Terenzini, 2004; Pike and Kuh, 2005). Academic factors such as high school preparation, course grades, academic progress, enrollment level, and educational goals have been found to be significant variables in student persistence research (Astin 1975; Bean 1985; and Pascarella & Terenzini, 1991). These studies examine student variables as predictors of attrition, including (a) demographic characteristics (gender, race/ethnicity, socioeconomic status, and marital status); (b) external factors related to students' lives outside the institution (financial status, work and family responsibilities, physical or emotional challenges, motivational characteristics); and (c) internal factors associated with student engagement in curricular and extra-curricular experiences (interactions with faculty and staff, participation in campus organizations and activities, residence on campus versus off-campus, relationships with other students). For example, in a community college study, Conklin (1997) found that at Johnson County Community College (JCCC) the top five reasons that the students gave for withdrawing from courses and/or college were work schedule conflicts, inconvenient class times, personal problems, hard courses, and disliking the instructor. Conklin's (1997) study showed that three to four percent of the courses offered at JCCC had a 40 percent or greater attrition rate whereas withdrawal from the college was 15-20 percent.

In their 2008 study at a higher education institution in Jerusalem, Badad and associates investigated antecedents and correlates of course dropping during a drop-add period in 109 elective courses (Badad, Icekson, & Yelinek, 2008). Student ratings of the teachers (SRT) and characteristics of the syllabi distributed in the first class session were found to be significant

predictors of course dropping. Lower quality teachers (SRT-based) and more difficult courses (syllabus-based) were dropped more frequently.

Age

A review of literature indicates different results regarding the contribution of student age in relation to college attrition. Students who stop out for one term or more have increased academic difficulties and are much less likely to complete a degree (Adelman, 1999). Adelman's study noted that continuous enrollment is the single most important predictor of attainment of a baccalaureate degree. DesJardins, Ahlburg, McCall, and Moye (2002) also found that the longer students took to complete the degree, the less likely to complete a degree they were. Several studies of undergraduate persistence (Choy, 2002; Horn, 1996, 1998) identify being older as a predictor of stopping out or dropping out of college.

Gender

Differences in gender have been found to contribute to individual commitment to completion of a college degree. Buchmann & DiPrete (2006) argue that women have reached parity with men and in some cases have by-passed men in college graduation rates. The percentage of bachelor's degrees awarded to women has continued to increase and female participation exceeds male in all racial groups, with African-American women earning 67 percent of bachelor's degrees, Hispanic women earning 61 percent, Native American women earning 61 percent, Asian women earning 54 percent, and Whites earning 57 percent (Buchmann & Diprete). A study by Leppel (2001) revealed an interaction between major and gender. It is important to note that the number of undergraduate women enrolled in institutions of higher education has exceeded the number of men since 1978, and female academic attainment rates have increased faster than those of males at all levels (National Center for Education Statistics,

2001). Between 1959 and 2002, the college participation rate of women increased from 39 percent to 68 percent, a jump of 29 percentage points, while the proportion of men going on to college increased only by about 8 percentage points, from 54 percent to 62 percent (Mortenson, 2005). According to Leppel (2001), women are more likely to succeed in education, health, humanities, or liberal arts majors, whereas men are more successful in business majors. In terms of degree completion, in 1970 men received a majority of bachelor's degrees in all 50 states, a trend that changed in 2001 when women earned a majority of such degrees (Mortenson, 2005). Aragon and Johnson (2008) conducted a study to determine the factors that influenced the completion and non-completion of community college online courses. They found that demographically, female students had higher completion rates compared to male students.

Ethnicity

Many researchers have focused on the social and academic challenges faced by students of color and the relationship to attrition (Benton, 2006; Flowers, 2004; Watson & Kuh, 1996). Bachelor's degree completion rates for students who sought a bachelor's degree at 4-year institutions and enrolled in fall 2002 varied by race/ethnicity (National Center for Education Statistics, 2011). Asian/Pacific Islander students had the highest 6-year graduation rate, followed by White, Hispanic, African American, and American Indian/Alaska Native students. Approximately 67 percent of Asians/Pacific Islanders graduated with a bachelor's degree or its equivalent within 6 years compared with 60 percent of Whites, 49 percent of Hispanics, 40 percent of African Americans, and 38 percent of American Indians/Alaska Natives (National Center for Education Statistics, 2011). Minority students have been found to have higher attrition rates than nonminority students (Pascarella & Terenzini, 1991, 2005; Tinto, 1975). Not only are minority students more likely to drop out, they traditionally enroll in higher education at

rates lower than white students (Horn, Nevill, & Griffith, 2006). Davis (2004) suggested that African American students at predominantly white institutions had lower graduation rates than their white peers, but Crawford (1999) found that race/ethnicity did not have a significant impact on first year persistence.

Seidman (2005) reports that African-American students tend to persist to their second year of college, nationally, at a rate of 75 percent compared to 80 percent for White students. Similarly, while the six-year graduation rate for White students approaches 57 percent, the rate for African-American and Hispanic students is only 41.7 percent and drops to 35.8 percent for Native American students.

Financial Factors

Financial factors in terms of socioeconomic status (SES) do, in fact, contribute to students' decisions to stay or withdraw from an institution. Research on student persistence and attrition shows that students from low SES backgrounds have lower educational aspirations, persistence, and achievement than students from high SES backgrounds (Astin, 1993; Conley, 2001; Pascarella & Terenzini, 1991; Tinto, 1993). Tinto points out that finances affect a student's decision to persist or leave an institution (Tinto, 1993).

The gender, race, and ethnicity differences in college participation and completion are more pronounced when examined by socioeconomic status. King (2000), for example, found that white upper and middle class men achieved similar academic attainment as women of similar race and SES. Hurd (2000) reported that the most common reasons students gave for leaving the institutions are lack of financial assistance and being academically unprepared. Students with low SES were more likely to engage in behaviors that hinder academic success such as living off campus, working, and attending class part-time (Paulsen & St. John, 2002).

Titus's (2006) findings were that low-SES students have the highest levels of unmet financial need and are also likely to work more hours while enrolled which in turn impacts the student's ability to persist.

Student GPA

Educational achievements as measured by grade point averages are a central factor in retention. Researchers have sought to understand the influence of academic achievement, specifically college grades, on persistence by conducting both national and institutional studies from the first to the second year and beyond (Cabrera, Nora, & Castañeda, 1993; Cabrera, Stampen, & Hansen, 1999). Astin (1975) found that a student's undergraduate grade point average (GPA) was more closely related to persistence than any other single variable. Additionally, Bean's (1985) study found that low GPAs during the freshmen and sophomore years were more influential in a student's decision to drop out than in the junior and senior years. Other research suggests that academic achievement could be the strongest predictor for completion of a baccalaureate degree (Pascarella &Terenzini, 1991). Studies (Voorhees, 1985; Bean, 1985; Nora, 1990; Pascarella &Terenzini, 2005) show that college grades are one of the most consistent predictors of student persistence and degree completion.

Enrollment Level

Among the academic variables most frequently noted in literature on attrition in higher education is the part-time versus full-time enrollment level of the student. Attending college part-time is found to be a risk factor for stopping or dropping out of college (Choy, 2002; Cuccaro, 1997; Horn, 1998; Horn, Nevill, & Griffith, 2006; Horn & Premo, 1995). Researchers also point out that part-time college enrollment is closely associated with other risk factors such as financial independence, family responsibilities, and full-time employment. Part-time students

are currently among the fastest growing student segment in higher education and represent almost two-thirds of the credit-seeking students in two- year colleges (Phillippe, 2000). Complete College America collected data from 329 institutions in 30 states, covering 158 public two-year colleges, and 171 public four-year institutions. Some of their key findings included the fact that most college students (69%) were not enrolled in a schedule that would lead to on-time graduation, even if they never changed majors, failed a course, or took a class they didn't need (Complete College America, 2010). They also found that even among "full-time" students, most (52%) were actually taking fewer than 15 hours, the standard course load that could lead to on-time graduation (Complete College America, 2010). Horn and Premo (1995) found that part-time attendance increases the risk of attrition, particularly for first year students, who are more than twice as likely to leave school in their first year compared to full-time students. According to the National Center for Education Statistics (2011), in fall 2009, 36 percent of the post-secondary student population attended college part-time.

Course Characteristics

The ere are several studies that specifically look at course characteristics like subject, mode of delivery, core curriculum, barrier courses, discipline, and other course attributes. In Giguere's (2007) study of students enrolled in upper level classes in the arts, sciences, and business academic areas and who had completed an off-line independent study distance education course had higher completion rates regardless of the discipline or academic areas. However, the completion rates were highest for business courses and lowest for math and science courses.

There are also some subject specific studies that focus on withdrawal from specific types of courses like nursing (Bello, Norwalk Community Coll, & et al., 1977; Catalano & Eddy, 1993; Glossop, 2002) and mathematics (Cuesta College, 1999; Waycaster, 2004). In a study on course shopping by Hagedorn, Maxwell, Cypers, Moon, and Lester (2007), math courses were more likely than English courses to be dropped by both cyclic and bulk shoppers. Enrollments in remedial courses were considerably less likely to be dropped than were college-level English and math courses in general. In the study, frequent cyclic shoppers were found to be less likely to have strong grade point averages and also less likely to have a successful rate of course completions. Additionally, the study found that students who were likely to drop and add courses early in the semester were more likely to withdraw from or fail their other courses later in the semester.

Literature Review Summary

It is essential to address the barriers to student success if we are going to increase college completion. Course withdrawal is a costly problem, and universities need to focus more on strategies to assist students to complete their courses in order to increase their likelihood of completing a degree. Course withdrawal is not merely an administrative issue involving enrollment trends; it also represents complex decision making processes taken by students (Badad, Icekson, & Yelinek, 2008) that affect their future. Thus, it is critical to understand the drivers for course withdrawal.

There is a general research gap on course-dropping at four year universities and institutional withdrawal policies. This study will fill that gap by examining the impact of the

legislative mandate limiting the number of withdrawals of undergraduate students at a major research university in Texas.

CHAPTER 3

Methodology

This study investigated whether the intended consequence of reduced withdrawals had actually been realized at an urban major research university in Texas as a result of a new withdrawal policy that limited how many courses undergraduate students could drop. The dependent variable was the number of classes dropped for each student. The primary independent variable of interest was withdrawal policy with two levels of (a) students who matriculated into the university prior to implementation of the withdrawal policy and (b) students who matriculated into the university after implementation of the withdrawal policy. The study also included independent control variables to identify whether there was a relationship between number of withdrawals and (a) student gender, (b) student ethnicity, (c) the differences student ACT or SAT score, (d) , student major, (e) change of student major, and (f) semester GPA.

The use of a quantitative design model was appropriate given that the research questions explained how one variable(s) affects another (Creswell, 2003). The data were statistically analyzed to test the hypotheses and determine whether a relationship existed between the independent variable (withdrawal policy implementation) and the dependent variable (number of withdrawn courses).

The researcher examined whether there was a correlation between the implementation of the revised withdrawal policy (independent variable) and the number of courses from which FTIC students had withdrawn (dependent variable). Creswell (2003) argued it is important to determine the direction and magnitude of the association of variables. The study was a panel study such that each of the FTIC students was followed from his or her first semester through his

or her fourth semester of study at the university. Since this study had a time series element due to the panel data, a generalized estimating equation (GEE) model was used so as to incorporate the time series element into the statistical model. GEEs are an extension of the generalized linear model used to accommodate correlated data (Nelder & Wedderburn, 1972). Additionally, student demographic and school performance variables were used as independent controls. To estimate the impact of the withdrawal policy on course completion, the researcher used an indicator variable, Withdrawal Policy, as a predictor in the GEE model. Each student was given one of two values on the variable: 0 was assigned if the student belonged to the fall 2005 FTIC cohort and 1 if the student was a member of the fall 2007 FTIC cohort.

Setting

The setting of the study was a major research university in a large urban city in the southwest hereby referred to as Big Town University. Big Town University had an enrollment of 35,344 students in fall 2005 in twelve academic colleges. Of these students, 9.7 percent of them were first-time degree-seeking freshmen. Of the students enrolled in fall 2005, 79.7 percent (28,186) were undergraduate students and of those students, 56.2 percent (19,866) students were full-time. The university had an enrollment of 34,663 students in fall 2007 of whom 10.1 percent were first-time degree-seeking freshmen. Approximately 80 percent (27,572) of the students enrolled in Fall 2007 were undergraduate students and of those students, 56.7 percent (19,656) of students were full time. The university is considered very diverse in that the undergraduate student ethnicity for fall 2005 was made of 36.1 percent Caucasian, 20.8 percent Hispanic, 20.5 percent Asian or Pacific Islander, and 15.7 percent African American students. Ninety-three percent of the undergraduate students lived off-campus. The average age

of Fall 2005 undergraduate students was 23. The 6-year graduation rate was 39 percent. The breakdown was similar for the Fall 2007 undergraduate student population which consisted of 35.4 percent Caucasian, 22.2 percent Hispanic, 21.4 percent Asian or Pacific Islander, and 14.8 percent African American students. Ninety-two percent of the undergraduate students lived off-campus. The average age of Fall 2007 undergraduate students was 22. The 6-year graduation rate was 40 percent.

Participants

Study data were derived from existing institutional data sources (Office of Institutional Research (OIR). The OIR provided enrollment data for 2 cohorts of students. The first cohort consisted of Fall 2005 FTIC students and their courses over two years (four semesters of; two years (a) Fall 2005, (b) Spring 2006, (c) Fall 2006, and (d) Spring 2007). The second cohort was made up of Fall 2007 FTIC students and their courses enrolled for two years (four semesters of; a) Fall 2007, (b) Spring 2008, (c) Fall 2008, and (d) Spring 2009). Table 1 shows the total number of available students for the study and the numbers of students that met the inclusion criteria.

Table 1

Frequencies and Percentages of Study Participants

	Fall 2005 FTIC – Pre policy		Fall 2007 FTIC – Post Policy		Total	
Students	*N*	%	*N*	%	*N*	%
Available Students	3,565	50.3	3,517	49.6	7,082	100.0
Study Participants	2,067	49.3	2,128	50.7	4,195	100.0

The actual number of student records in each cohort was determined after the dataset were cleaned and coded according to the inclusion criteria of the study. The inclusion criteria was that each student must have completed all four semesters in their respective cohort, and each student must have ACT or SAT scores that could be used as control variables to account for pre-enrollment achievement/standing.

Before the review of the data began, the researcher obtained permission from Human Subjects Committee to begin this study. With assistance from the OIR office, a data query was used to gather existing institutional data regarding the student demographic information. The OIR office had online data but it was not consistent with this study's purpose, therefore, the researcher believed that a customized query would contribute to a better understanding of the undergraduate students. The researcher used SPSS to sort and identify all FTIC students enrolled in Fall 2005 and Fall 2007 and their associated two-year course enrollments. In accordance with the University's Human Subjects Committee expectations, the records generated were re-ordered to protect names, student IDs and any other identifiable information which could link a student to a particular record. To further ensure confidentiality, in place of names, an assignment of randomized numbers was used to link an individual semester record to all their courses over the tracking semesters of the study.

Research Design

The purpose of the study was to examine whether the goal of reduced withdrawals had actually been met at Big Town University in Texas post implementation of the new withdrawal policy that limits how many courses undergraduate students could drop. The dependent variable was the number of classes dropped for each student. The independent variable was withdrawal

policy with two levels: (a) students who matriculated into the university prior to implementation of the withdrawal policy and (b) students who matriculated into the university after implementation of the withdrawal policy. The study also included independent control variables: (a) student gender, (b) student ethnicity, (c) student ACT or SAT score, (d) student major, (e) change of student major, and (f) semester GPA. A generalized linear mixed-effects model using generalized estimating equations (GEEs) was used to statistically model the variables of the study over time. GEEs are an extension of the generalized linear model used to accommodate correlated data (Nelder & Wedderburn, 1972).

Repeated measures on the same individuals are correlated, so the model must consider this correlation. Many types of covariance and correlational structures are available in modeling dependence of variables across time or repeated measurements (Peretz, Goren, & Kromhout, 2002). A model making use of the GEE conventions allowed for diverse covariance structures and allowed for the estimation of both main effects of the independent variables in the model as well as the estimation of the correlation and variance among individual variables. The GEE design does not require the data to be balanced, i.e. each group or subject does not need to have the same number of observations. Also, the number of repeated measures or actual intervals of the repeated measures are not required to be identical. Hence, the design accommodates missing data (Peretz, Goren & Kromhout, 2002). The inclusion of an indicator variable allowed for observation and comparison of two cohorts. The research question and associated statistical hypotheses of the study were as follows:

RQ1: Did FTIC students who entered the university following the implementation of the 2007 Texas revised course withdrawal policy and course completion drop fewer courses than

FTIC students who entered the university prior to implementation of the Texas revised course 2007 withdrawal policy?

H01: There is not a statistically significant positive relationship, or a statistically significant negative relationship, between the predictor of withdrawal policy (pre vs. post-implementation) and the criterion of the number of courses dropped, after controlling for (a) student gender, (b) student ethnicity, (c) student ACT or converted SAT score, (d) student major, (e) change of student major, (f) the number of enrolled semester hours, and (g) semester GPA.

HA1: There is a statistically significant positive relationship between the predictor of withdrawal policy (pre vs. post-implementation) and the criterion of the number of courses dropped, after controlling for (a) student gender, (b) student ethnicity, (c) student ACT or converted SAT score, (d) student major, (e) change of student major, and (f) semester GPA.

H01a: The independent variable control of student gender is not significant predictor of the criterion of the number of classes dropped.

HA1a: The independent variable control of student gender is a significant predictor of the criterion of the number of classes dropped.

H01b: The independent variable control of student ethnicity is not a significant predictor of the criterion of the number of classes dropped.

HA1b: The independent variable control of student ethnicity is a significant predictor of the criterion of the number of classes dropped.

H01c: The independent variable control of student ACT or converted SAT score is not a significant predictor of the criterion of the number of classes dropped.

HA1c: The independent variable control of student ACT or converted SAT score is a significant predictor of the criterion of the number of classes dropped.

H01d: The independent variable control of student major is not a significant predictor of the criterion of the number of classes dropped.

HA1d: The independent variable control of student major is a significant predictor of the criterion of the number of classes dropped.

H01e: The independent variable control of change of student major is not a significant predictor of the criterion of the number of classes dropped.

HA1e: The independent variable control of change in student major is not a significant predictor of the criterion of the number of classes dropped.

H01f: The independent variable control of semester GPA is not a significant predictor of the criterion of the number of classes dropped.

HA1f: The independent variable control of semester GPA is a significant predictor of the criterion of the number of classes dropped.

Table 2 represents the variables for this study

Table 2

Description of Study Variables

Name of Variable	Description of Variable	Variable type	Coding	Coded Variable
Number of courses withdrawn	This is a count variable that indicates the number of courses a student withdraws from in a particular semester	Dependent Variable (count)	0 -10	
Withdrawal Policy implementation	This is an indicator variable which classifies whether a student enrolled as a FTIC pre or post the withdrawal policy	Independent Variable (dichotomous)	0 1	Fall 2005 FTIC cohort pre-withdrawal policy Fall 2007 FTIC cohort post-withdrawal policy
Student Major – STEM	This is one of six degree classifications which are derived from 152 undergraduate majors available to the student.	Control (dichotomous) Time-Varying	0 1	Not a STEM major STEM major
Student Major – Business	This is one of six degree classifications which are derived from 152 undergraduate majors available to the student.	Control (dichotomous) Time-Varying	0 1	Not a Business major Business major
Student Major – Liberal Arts, Social Sciences, and Education	This is one of six degree classifications which are derived from 152 undergraduate majors available to the student.	Control (dichotomous) Time-Varying	0 1	Not a Liberal Arts, Social Sciences, and Education major Liberal Arts, Social Sciences, and Education major
Student Major – Professional (Law, Architecture)	This is one of six degree classifications which are derived from 152 undergraduate majors available to the student.	Control (dichotomous) Time-Varying	0 1	Not a Professional major Professional

Student Major – Other	This is one of six degree classifications which are derived from 152 undergraduate majors available to the student.	Control (dichotomous) Time-Varying	0 1	Not an Other major Other major
Student Major - Undeclared	This is one of six degree classifications which are derived from 152 undergraduate majors available to the student.	Control (dichotomous) Time-Varying	0 1	Not an Undeclared major Undeclared major
Change in student major from previous semester	This is an indicator variable which indicates if the student changed his or her major from the previous semester	Control (dichotomous) Time-Varying	0 1	Student did not change major from previous semester Student changed major from previous semester
Gender	This is the declared gender of the student.	Control Dichotomous	0 1	Male Female
Student Ethnicity – Hispanic	This is one of six ethnicity classifications	Control (dichotomous)	0 1	Not Hispanic Hispanic
Student Ethnicity – Black/AA	This is one of six ethnicity classifications	Control (dichotomous)	0 1	Not Black/AA Black/AA
Student Ethnicity – White	This is one of six ethnicity classifications	Control (dichotomous)	0 1	Not White White
Student Ethnicity – Asian or Pacific Islander	This is one of six ethnicity classifications	Control (dichotomous)	0 1	Not Asian or Pacific Islander
Student Ethnicity - Unknown	This is one of six ethnicity classifications	Control (dichotomous)	0 1	Not classified as unknown Classified as unknown
Student Ethnicity – Other	This is one of six ethnicity classifications	Control (dichotomous)	0 1	Classified into one of the other Ethnicity Classifications Not classified into one of the other Ethnicity Classifications
Semester GPA	This is the semester GPA for the student for the current semester.	Continuous Time-Varying	0-4.0	
Student ACT or converted SAT score	This is the ACT score or converted SAT score for each student	Control (continuous)	11-36	The SAT scores will be converted into ACT composite scores according the concordance chart located on the ACT website: http://www.act.org/aap/concordance/estimate.html

Variables Definitions

Dependent Variable –Number of Withdrawals

The dependent variable was the total number of courses from which a student withdrew. The variable is a count variable.

Independent Variable - Withdrawal Policy Implementation

The primary independent variable was a dichotomous variable that identified whether the FTIC student was enrolled at the university pre-withdrawal policy, i.e. Fall 2005 or post-withdrawal policy, i.e. Fall 2007. The value of 0 represented a FTIC student who enrolled at the university during the Fall 2005 pre-withdrawal policy and was not subject to the 6-class withdrawal limit for undergraduate students. A value of 1 represented a student enrolled at the university in Fall 2007 who was subject to the 6-class withdrawal limit for undergraduate students.

Control Predictor Variables

Semester Grade Point Average

Semester GPA was measured by dividing the total number of grade points earned by the total number of credit hours attempted. This output was provided by the Institutional Research Office. The traditional zero-to-four GPA range was used. The researcher sought to understand the influence of academic achievement as measured by the GPA (Cabrera, Nora, & Castañeda, 1993; Swail, Cabrera, Lee, & Williams, 2005). Studies (Bean, 1985; Pascarella & Terenzini, 2005) show that college grades are one of the most consistent predictors of student persistence and degree completion. Other researchers (Nora, 1990; Voorhees, 1985) have reported a significant direct effect between college academic performance and persistence.

Student Gender

Student gender was a dichotomous variable specifying the declared gender of the student. The variable was coded as 0 = male, 1 = female.

Student Ethnicity

Student ethnicity was collected for each student. A total of six ethnicity indicator variables were used to represent the six distinct ethnicities. Each of the indicator variables had a value of 0 or 1, with 1 indicating a person is a specific ethnicity as indicated by the variable. The reference group for ethnicity was White. Aggregation of the "Other" and "Unknown" ethnicity classifications was performed for some of the GEE models, due to non-convergence or high coefficients and or standard errors of the models. Aggregation was performed at the time of data analysis. However, descriptive findings (frequency counts and percentages) will be presented for each of the six ethnicity variables.

Student ACT or converted SAT score

Each student's ACT or converted SAT score was used as a variable control in the GEE model. Use of the scores allowed for inclusion of each student's high prior academic standing (high school) in the GEE model. The score was used as a control/covariate. Student ACT or converted SAT score is a continuous variable with a range of 11-36. The SAT to ACT concordance chart for conversion is located on the ACT website at http://www.act.org/aap/concordance/estimate.html.

Student Major

Each student was classified into one of six degree classifications. Each of the degree classifications was represented by an indicator variable. Each of the indicator variables had a value of 0 or 1, with 1 indicating a person was a major of a specific program as indicated by the variable. The reference group for student major was Student Major - Undeclared.

Change in student major from previous semester

This variable was a dichotomous indicator variable, coded as 1 = the student changed their major from the previous semester and 0 = the student did not change their major from the previous semester.

Data Analysis

Analysis tools included the use of the GEE techniques and techniques of time series analysis. Each research question was answered with a general estimating equation - generalized linear mixed-effects models for cross-sectional panel data (GEE). STATA v.12 statistical software (www.stata.com) was used to perform the analyses of this study. STATA has a program for longitudinal analysis on panel data, which uses the "xtgee" command.

The GEE model generalizes the ordinary least squares (OLS) regression model and can be used when data are not normally distributed. In the case of this study, the dependent variable was a count variable. As well as allowing for other than normally distributed data, the GEE model also differs from the OLS or multiple regression models because it allows for the use of data from more than one source of variation (Peretz,

Goren, & Kromhout, 2002). The GEE model, like the OLS model, includes only one dependent variable and allows for one or several independent variables.

The independent variables can be continuous or nominal in scale. However, the differences between the GEE and OLS models are in the inclusion of both fixed and random factors for the GEE models. Fixed model effects provide estimates of the averages for a given factor, similar to an OLS or multiple regression model. The inclusion of random effects allows the model to estimate parameters for different individuals or groups of an independent factor. In the case of this study, the subjects were two sets of students, those who were FTIC in Fall of 2005, and those who were FTIC in Fall of 2007.

The design specifications of this study were as follows, assuming the ethnicity reference group = White, Major =Undeclared, and Gender = Male:

Number of courses withdrawnij = B0 + B1Xij1(Withdrawal policy implementation) + B2Xij2 (Student's gender) + B3Xij3 (Student Ethnicity = Hispanic) + B4Xij4 (Student Ethnicity = Black/AA) + B5Xij5 (Student Ethnicity = Asian or Pacific) + B6Xij6 (Student Ethnicity = Other) + B7Xij7 (Student Ethnicity = Unknown + B8Xij8 (Student ACT or converted SAT score) + b1z1 (Student major for semester = STEM) + b2z2 (Student major for semester = Business) + b3z3(Student major for semester = Liberal Arts, Social Sciences, and Education) + b4z4 (Student major for semester = Professional, Law, Architecture) + b5z5(Student major = Other) + b6z6 (Student major = Undeclared) + b7z7(Change in student major from previous semester) + b7z7 (Semester GPA) + εij

Let i = 1,…,k = students

Let j = 1,…,ni = repetitions (semesters) of the i^{th} student

Yij = number of dropped courses for the ith students and the j^{th} semester

B0 = the overall intercept that corresponds the mean value of the number of dropped classes for the students when all independent variables and controls equal zero.

B1,…,Bp = fixed effects

Xij1,…,xijp = the values of the variables for the i^{th} student on the j^{th} semester.

b1,…bk = students' random effect.

bi = the ith individual random effect, which relates to the differences between a student's intercept and the group intercept (B0).

z1,…,zk = dummy variables that correspond to students' indicators.

Further assumptions were that the bi's were independent and normally distributed with mean zero and variance σ^2_b (the variance between students). Also, it was assumed that the errors were independent and εij were independent and normally distributed with mean zero and variance σ^2_w (the variance within individuals). The bi's and the εij's were all independent of each other.

A large number of records were collected for analysis ((*N* = 4,195 students, *N* = 16,780 records). Inferential tests with very large datasets can be overpowered but statistical power calculations can be undertaken to assess the likelihood of a study having discovered effects. Such calculations need to be undertaken prior to a study to avoid under-powering or overpowering in which sample sizes are excessively large, leading to very high power (Tabachnick & Fidell, 2007). Therefore the dataset was randomly split into three separate representative subsets, Training, Validation, and Test sets, for analysis. The records of half of the students of the study (*N* = 2.097 student's, *N* = 8,388 records) were randomly chosen without replacement from the full dataset (*N* = 4,195

students, *N* = 16,780 records) to build the training models. The records of one-quarter of the students of the study (*N* = 1,049 student's, *N* = 4,196 records) were randomly chosen from the remaining dataset (*N* = 2098 students, *N* = 8,392 records) to build the validation set. The final 25% of records were used as the test set (*N* = 1,048 students; *N* = 4,192 records).

CHAPTER 4

Results

The results of Chapter 4 are divided into three sections (a) population and descriptive findings, (b) investigation of assumptions as relates to inferential analysis, and (c) tests of hypotheses. The chapter concludes with a summary of the results. SPSS v22.0 was used for all descriptive analyses and STATA v12.0 was used for all of the inferential analyses. All inferential analyses were set at a 95% level of significance (α=.05).

The purpose of this study was to investigate whether the intended consequence of reduced withdrawals has actually been realized at Big Town University as a result of a new withdrawal policy in Texas that limits how many courses undergraduate students can drop. The research questions and associated statistical hypotheses of this study were as follows:

RQ1: Did FTIC students who entered the university following the implementation of the 2007 Texas revised course withdrawal policy and course completion drop fewer courses than FTIC students who entered the university prior to implementation of the Texas revised course 2007 withdrawal policy?

RQ1. To what extent do academic factors (such as semester GPA), demographic factors (such as gender, race/ethnicity), pre-college attributes (SAT, ACT) and enrollment factors (such as student's major) predict student success or non-success as defined by course completion for Big Town University FTIC undergraduate students?

Population and Descriptive Findings

The population of this study was made up of students from Big Town University in Texas. The data were collected from an existing institutional data source known as the Office of Institutional Research (OIR). Data were provided for two cohorts of students: (a) Cohort 1 consisted of Fall 2005 first time in college (FTIC) students enrolled pre-implementation of the revised withdrawal policy and (b) Cohort 2 consisted of Fall 2007 FTIC students enrolled post implementation of the revised withdrawal policy. Table 2 presents descriptive information of withdrawn classes according to course subject. The types of courses withdrawn were split almost evenly between the two cohorts. With the exception of Liberal Arts and Social Sciences, the majority of students who withdrew from the different types of courses were in Cohort 2, after implementation of the withdrawal policy.

Table 3

Frequencies and Percentages of Withdrawn Classes According to Course Type

	Pre-Policy-Fall 2005 Cohort Classes		Post-Policy-Fall 2007 Cohort Classes		Total	
Course Type	*N*	%	*N*	%	*N*	%
Business	105	46.05	123	53.95	228	100.00
Liberal Arts and Social Sciences	671	51.62	629	48.38	1,300	100.00
Other	47	41.23	67	58.77	114	100.00
Professional	8	40.00	12	60.00	20	100.00
STEM	1,027	47.28	1,145	52.72	2,172	100.00

TOTAL	1,858	48.50	1,976	51.50	3,834	100.00

The core curriculum represents foundational education that students must fulfill as part of any undergraduate degree program. The University in the study has a forty-two hour core curriculum made up of basic intellectual competencies in reading, writing, speaking, listening, critical thinking, and computer literacy that are considered essential to the learning process. These courses can make the bulk of the courses that FTIC students attend in their first two years therefore tracking their completion rates can provide helpful information. Tables 4 and 5 indicate the Core curriculum credit hour requirements for both cohorts.

Table 4

Summary of Required Core Courses by Category for the Fall 2005 Pre-policy Cohort

Course Category	*Credit Hours*
Communication	6
Mathematics	3
Mathematics/Reasoning	3
U.S. History	6
American Government	6
Humanities	3
Visual/Performing Arts	3
Natural Sciences	6
Social Behavioral Sciences	6

TOTAL	42

Table 5

Summary of Required Core Courses by Category for the Fall 2007 Post-policy Cohort

Course Category	*Credit Hours*
Communication	6
Mathematics	3
Institutionally Designated Option: Math/Reasoning	3
American History	6
Government	6
Humanities	3
Visual & Performing Arts	3
Natural Sciences	6
Social & Behavioral Sciences	3
Writing in the Disciplines	3
TOTAL	42

Note. Beginning Fall 2007 a separate writing intensive category was included in the Core Curriculum, and the Social and Behavioral Sciences category no longer require writing intensive courses.

Table 6 presents descriptive information regarding whether the courses dropped were a part of the core curriculum for each cohort. The majority of total courses withdrawn were part of the core curriculum (60.35%).

Table 6

Frequencies and Percentages of Type of Withdrawn Classes by Curriculum Type

	Cohort 1: *N* = 2128 (pre policy implementation)		Cohort 2: *N* = 2067 (post policy implementation)		Total (*N* = 4195)	
Curriculum Type	*N*	%	*N*	%	*N*	%
Core Curriculum	1226	65.98	1088	55.06	2314	60.35
Non-Core Curriculum	632	34.02	888	44.94	1520	39.65
Total	1858	100.00	1976	100.00	3834	100.00

Table 7 is a frequency table of withdrawn classes based upon the semester they were dropped. Overall, the majority of classes were withdrawn during the Spring Semester (56.05%).

Table 7

Frequencies and Percentages of Withdrawn Classes by Semester of Withdrawal

	Cohort 1: *N* = 2128 (pre policy implementation)		Cohort 2: *N* = 2067 (post policy implementation)		Total (*N* = 4195)	
Semester of Withdrawal	*N*	%	*N*	%	*N*	%
Fall Semester	818	44.03	867	43.88	1685	43.95
Spring Semester	1040	55.97	1109	56.12	2149	56.05
Total	1858	100.00	1976	100.00	3834	100.00

Table 8 presents the frequencies and percentages of demographic variables for all study participants.

Table 8

Frequencies and Percentages of Demographic and Freshman Major Variables for All Students Included in Study (N = 4195)

Variable	Frequency	%
Cohort		
Fall 2005	2128	50.7
Fall 2007	2067	49.3
Ethnicity		
White	1142	27.2
Black, non-Hispanic	705	16.8
Hispanic	897	21.4
Asian or Pacific Islander	1298	30.9
Other	127	3.0
Unknown	26	0.6
Gender		
Male	1957	46.7
Female	2238	53.3
Major		
STEM	1356	32.3
Liberal Arts, Social Sciences, and Education	740	17.6
Professional (Law, Architecture)	96	2.3
Business	396	9.4
Other	216	5.1
Undeclared	1391	33.2

Table 9 presents the frequencies and percentages of demographic variables for all study participants grouped by cohort.

Table 9

Frequencies and Percentages of Demographic and Freshman Major Variables for All Students Included in Study According to Cohort (N = 4195)

	Cohort 1: *N* = 2128 (pre policy implementation)		Cohort 2: *N* = 2067 (post policy implementation)	
Variable	Frequency	%	Frequency	%
Ethnicity				
White	615	28.9	527	25.5
Black, non-Hispanic	362	17.0	343	16.6
Hispanic	442	20.8	455	22.0
Asian or Pacific Islander	616	28.9	682	33.0
Other	80	3.8	47	2.3
Unknown	13	0.6	13	0.6
Gender				
Male	979	46.0	978	47.3
Female	1149	54.0	1089	52.7
Major				
STEM	616	28.9	740	35.8
Liberal Arts, Social Sciences, and Education	418	19.6	322	15.6
Professional (Law, Architecture)	47	2.2	49	2.4
Business	205	9.6	191	9.2
Other	95	4.5	121	5.9
Undeclared	747	35.1	644	31.2

Table 10 presents the measures of central tendency for ACT Scores at enrollment into college for all Students Included in the Study.

Table 10

Measures of Central Tendency for ACT Scores at Enrollment into College for All Students Included in the Study

Variable	*N*	*M*	*SD*	*Mdn*	Sample Range
ACT Score	4180	17.02	4.11	16.00	11-35

Note. ACT = American College Testing scores; *N* = Sample Size; *M* = Mean; *SD* = Standard Deviation; *Mdn* = Median.

Table 11 presents the measures of central tendency for ACT Scores at enrollment into college for all Students Included in the Study grouped by cohort.

Table 11

Measures of Central Tendency of ACT Scores at Enrollment into College for All Students Included in the Study According to Cohort (N = 4195)

Cohort/Variable	*N*	*M*	*SD*	*Mdn*	Sample Range
Cohort 1					
ACT Score	2128	17.29	4.19	16.00	11-35
Cohort 2					
ACT Score	2052	16.73	4.01	16.00	11-34

Note. ACT = American College Testing scores; *N* = Sample Size; *M* = Mean; *SD* = Standard Deviation; *Mdn* = Median.

Tables 12 through 16 present frequency counts and percentages of the number of withdrawn classes for all students according to ethnicity, gender, and major, respectively. The four largest ethnicity groups were White (27.2%), Black, non-Hispanic (16.8%), Hispanic (21.4%), and Asian/Pacific Islander (30.9%). There were slightly more females (53.3%) than males (46.7%). The dominant major group was "Undeclared" (33.2%), while the second largest portion of participants majored in the STEM category (32.3%). Furthermore, the majority of participants had not dropped any classes. As a result, there was an excessive amount of zeroes for the dependent variable of Number of Withdrawals as presented in table 12. A histogram of the Number of Courses Withdrawn variable for the entire dataset (N = 16,780 records) indicated a large number of records with a value of zero (n = 15, 018 records, 89.5% of all records). .

Table 12

Frequencies and Percentages of Number of Withdrawals for All Students Included in Study According to Cohort (N = 4195)

	Cohort 1: *N* = 2128 (pre policy implementation)		Cohort 2: *N* = 2067 (post policy implementation)		Total (*N* = 4195)	
Semester/ Number of Withdrawals	Frequency	%	Frequency	%	Frequency	%
Semester 1						
0	1916	90.0	1798	87.0	3714	88.5
1	185	8.7	245	11.9	430	10.3
2	22	1.0	20	1.0	42	1.0
3	2	0.1	1	<0.05	3	0.1
4	3	0.1	2	0.1	5	0.1
5	---	0.0	1	<0.05	1	<0.05
Semester 2						
0	1784	83.8	1649	79.8	3433	81.8
1	291	13.7	357	17.3	648	15.4
2	39	1.8	52	2.5	91	2.2
3	11	0.5	4	0.2	15	0.4
4	1	<0.05	4	0.2	5	0.1
5	2	0.1	1	<0.05	3	0.1
Semester 3						
0	1677	78.8	1605	77.6	3282	78.2
1	365	17.2	396	19.2	761	18.1
2	63	3.0	46	2.2	109	2.6
3	16	0.8	8	0.4	24	0.6
4	3	0.1	6	0.3	9	0.2
5	4	0.2	6	0.3	10	0.2
Semester 4						
0	1660	78.0	1581	76.5	3241	77.3
1	376	17.7	391	18.9	767	18.3
2	58	2.7	71	3.4	129	3.1
3	16	0.8	16	0.8	32	0.8
4	11	0.5	6	0.3	17	0.4
5	4	0.2	2	0.1	6	0.1

6		1	<0.05	---	0.0	1	<0.05
7		2	0.1	---	0.0	2	<0.05

Table 13

Measures of Central Tendency for the Number of Course Withdrawals According to Descriptive Variables and Semester

	Semester 1			Semester 2			Semester 3			Semester 4		
Variable	*M*	*SD*	Range	*M*	*SD*	Range	*M*	*SD*	Range	*M*	*SD*	Range
Cohort												
Fall 2005 (*N* = 2128)	0.12	0.38	0-4	0.20	0.50	0-5	0.27	0.60	0-5	0.29	0.68	0-7
Fall 2007 (*N* = 2067)	0.15	0.41	0-5	0.24	0.53	0-5	0.27	0.60	0-5	0.30	0.62	0-5
Ethnicity												
White	0.11	0.35	0-3	0.20	0.51	0-5	0.22	0.58	0-5	0.28	0.65	0-7
Black, non-Hispanic	0.15	0.44	0-5	0.26	0.57	0-5	0.31	0.65	0-5	0.35	0.70	0-5
Hispanic	0.11	0.38	0-4	0.21	0.49	0-5	0.29	0.56	0-4	0.30	0.65	0-6
Asian or Pacific Islander	0.16	0.43	0-4	0.23	0.52	0-4	0.28	0.62	0-5	0.29	0.63	0-7
Other	0.06	0.28	0-2	0.17	0.48	0-3	0.24	0.51	0-3	0.16	0.44	0-2
Unknown	0.08	0.27	0-1	0.08	0.28	0-1	0.33	0.57	0-2	0.20	0.52	0-2
Gender												
Male	0.14	0.41	0-4	0.24	0.53	0-5	0.30	0.62	0-5	0.32	0.67	0-7
Female	0.12	0.39	0-5	0.20	0.49	0-5	0.25	0.58	0-5	0.27	0.63	0-7
Major												
STEM	0.16	0.45	0-5	0.22	0.50	0-4	0.31	0.65	0-5	0.31	0.68	0-7
Liberal Arts, Social Sciences, and Education	0.07	0.26	0-2	0.20	0.51	0-4	0.20	0.53	0-5	0.27	0.65	0-6
Professional (Law, Architecture)	0.14	0.40	0-2	0.13	0.45	0-3	0.16	0.39	0-2	0.12	0.38	0-2
Business	0.09	0.33	0-4	0.17	0.42	0-2	0.22	0.50	0-4	0.23	0.55	0-5
Other	0.10	0.31	0-2	0.22	0.45	0-2	0.20	0.50	0-5	0.25	0.57	0-4
Undeclared	0.15	0.42	0-4	0.24	0.57	0-5	0.33	0.65	0-5	0.36	0.69	0-5
Overall (*N* = 4195)	0.13	0.40	0-5	0.22	0.51	0-5	0.27	0.60	0-5	0.30	0.65	0-7

Note. *M* = Mean; *SD* = Standard Deviation.

Table 14

Frequencies and Percentages of Number of Withdrawals for All Students Included in Study According to Ethnicity (N = 4195)

	White		Black, non-Hispanic		Hispanic		Asian/Pacific Islander		Other		Unknown		Total	
Semester/ Number of Withdrawals	Freq.	%	Freq.	%	Freq.	%	Freq.	%	Freq.	%	Freq.	%	Freq.	%
Semester 1														
0	1029	90.1	613	87.0	810	90.3	1118	86.1	120	94.5	24	92.3	3714	88.5
1	102	8.9	84	11.9	77	8.6	159	12.2	6	4.7	2	7.7	430	10.3
2	10	0.9	6	0.9	8	0.9	17	1.3	1	0.8	0.0	0	42	1.0
3	1	0.1	0	0.0	0	0.0	2	0.2	0	0.0	0.0	0	3	0.1
4	0	0.0	1	0.1	2	0.2	2	0.2	0	0.0	0.0	0	5	0.1
5	0	0.0	1	0.1	0	0.0	0	0.0	0	0.0	0.0	0	1	<0.05
6	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0.0	0	0	0.0
Semester 2														
0	957	83.7	553	78.6	743	81.9	1061	81.3	97	86.6	22	91.7	3433	81.8
1	158	13.8	130	18.5	145	16.0	201	15.4	12	10.7	2	8.3	648	15.4
2	21	1.8	14	2.0	16	1.8	38	2.9	2	1.8	0.0	0	91	2.2
3	4	0.3	5	0.7	2	0.2	3	0.2	1	0.9	0.0	0	15	0.4
4	2	0.2	1	0.1	0	0.0	2	0.2	0	0.0	0.0	0	5	0.1
5	1	0.1	1	0.1	1	0.1	0	0.0	0	0.0	0.0	0	3	0.1
6	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0.0	0	0	0.0
Semester 3														
0	945	82.6	535	75.9	695	76.0	1010	77.2	80	79.2	17	70.8	3282	78.2
1	167	14.6	137	19.4	184	20.1	248	19.0	19	18.8	6	25.0	761	18.1
2	20	1.7	23	3.3	31	3.4	33	2.5	1	1.0	1	4.2	109	2.6
3	7	0.6	5	0.7	4	0.4	7	0.5	1	1.0	0.0	0	24	0.6
4	0	0.0	4	0.6	1	0.1	4	0.3	0	0.0	0.0	0	9	0.2
5	5	0.4	1	0.1	0	0.0	4	0.3	0	0.0	0.0	0	10	0.2
6	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0.0	0	0	0.0

Table 14 (cont'd)

Semester/ Number of Withdrawals	White		Black, non-Hispanic		Hispanic		Asian/Pacific Islander		Other		Unknown		Total	
	Freq.	%	Freq.	%	Freq.	%	Freq.	%	Freq.	%	Freq.	%	Freq.	%
Semester 4														
0	899	78.5	522	73.8	705	77.0	1008	77.2	90	87.4	17	85.0	3241	77.3
1	199	17.4	148	20.9	161	17.6	247	18.9	10	9.7	2	10.0	767	18.3
2	32	2.8	25	3.5	38	4.2	30	2.3	3	2.9	1	5.0	129	3.1
3	7	0.6	5	0.7	7	0.8	13	1.0	0	0.0	0.0	0	32	0.8
4	5	0.4	4	0.6	2	0.2	6	0.5	0	0.0	0.0	0	17	0.4
5	2	0.2	3	0.4	1	0.1	0	0.0	0	0.0	0.0	0	6	0.1
6	0	0.0	0	0.0	1	0.1	0	0.0	0	0.0	0.0	0	1	<0.05
7	1	0.1	0	0.0	0	0.0	1	0.1	0	0.0	0.0	0	2	<0.05

Table 15

Frequencies and Percentages of Number of Withdrawals for All Students Included in Study According to Gender (N = 4195)

Semester/ Number of Withdrawals	Male		Female		Total	
	Frequency	%	Frequency	%	Frequency	%
Semester 1						
0	1715	87.6	1999	89.3	3714	88.5
1	214	10.9	216	9.7	430	10.3
2	24	1.2	18	0.8	42	1.0
3	2	0.1	1	<0.05	3	0.1
4	2	0.1	3	0.1	5	0.1
5	0	0.0	1	<0.05	1	<0.05
Semester 2						
0	1568	80.2	1865	83.3	3433	81.8
1	328	16.8	320	14.3	648	15.4
2	49	2.5	42	1.9	91	2.2
3	6	0.3	9	0.4	15	0.4
4	4	0.2	1	<0.05	5	0.1
5	1	0.1	2	0.1	3	0.1
Semester 3						
0	1490	76.2	1792	80.0	3282	78.2
1	383	19.6	378	16.9	761	18.1
2	60	3.1	49	2.2	109	2.6
3	14	0.7	10	0.4	24	0.6
4	5	0.3	4	0.2	9	0.2
5	4	0.2	6	0.3	10	0.2
Semester 4						
0	1481	75.7	1760	78.6	3241	77.3
1	371	19.0	396	17.7	767	18.3
2	73	3.7	56	2.5	129	3.1
3	18	0.9	14	0.6	32	0.8
4	11	0.6	6	0.3	17	0.4
5	1	0.1	5	0.2	6	0.1
6	0	0.0	1	<0.05	1	<0.05
7	1	0.1	1	<0.05	2	<0.05

Table 16

Frequencies and Percentages of Number of Withdrawals for All Students Included in Study According to Major (N = 4195)

	STEM		Liberal Arts, Social Sciences, and Education		Professional (Law, Architecture)		Business		Other		Undeclared		Total	
Semester/ Number of Withdrawals	Freq.	%	Freq.	%	Freq.	%	Freq.	%	Freq.	%	Freq.	%	Freq.	%
Semester 1														
0	1169	86.2	698	93.0	85	88.5	364	91.9	196	90.7	1212	87.1	3714	88.5
1	165	12.2	51	6.9	9	9.4	31	7.8	19	8.8	155	11.1	430	10.3
2	17	1.3	1	0.1	2	2.1	0	0.0	1	0.5	21	1.5	42	1.0
3	1	0.1	0	0.0	0	0.0	0	0.0	0	0.0	2	0.1	3	0.1
4	3	0.2	0	0.0	0	0.0	1	0.3	0	0.0	1	0.1	5	0.1
5	1	0.1	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	1	<0.05
Semester 2														
0	1082	81.4	648	83.9	88	89.8	338	84.1	192	79.7	1085	80.2	3433	81.8
1	209	15.7	103	13.3	8	8.2	58	14.4	45	18.7	225	16.6	648	15.4
2	34	2.6	14	1.8	1	1.0	6	1.5	4	1.7	32	2.4	91	2.2
3	2	0.2	6	0.8	1	1.0	0	0.0	0	0.0	6	0.4	15	0.4
4	2	0.2	1	0.1	0	0.0	0	0.0	0	0.0	2	0.1	5	0.1
5	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	3	0.2	3	0.1
Semester 3														
0	962	75.7	698	84.1	99	85.3	415	80.6	243	83.2	865	73.9	3282	78.2
1	254	20.0	112	13.5	16	13.8	90	17.5	44	15.1	245	20.9	761	18.1
2	41	3.2	13	1.6	1	0.9	7	1.4	4	1.4	43	3.7	109	2.6
3	6	0.5	4	0.5	0	0.0	2	0.4	0	0.0	12	1.0	24	0.6
4	2	0.2	1	0.1	0	0.0	1	0.2	0	0.0	5	0.4	9	0.2
5	6	0.5	2	0.2	0	0.0	0	0.0	1	0.3	1	0.1	10	0.2

Table 16 (cont'd)

Semester/ Number of Withdrawals	STEM		Liberal Arts, Social Sciences, and Education		Professional (Law, Architecture)		Business		Other		Undeclared		Total	
	Freq.	%	Freq.	%	Freq.	%	Freq.	%	Freq.	%	Freq.	%	Freq.	%
Semester 4														
0	979	76.4	704	80.0	98	89.9	454	81.4	253	79.8	753	71.8	3241	77.3
1	242	18.9	134	15.2	9	8.3	90	16.1	52	16.4	240	22.9	767	18.3
2	41	3.2	30	3.4	2	1.8	9	1.6	9	2.8	38	3.6	129	3.1
3	13	1.0	5	0.6	0	0.0	3	0.5	2	0.6	9	0.9	32	0.8
4	4	0.3	5	0.6	0	0.0	1	0.2	1	0.3	6	0.6	17	0.4
5	1	0.1	1	0.1	0	0.0	1	0.2	0	0.0	3	0.3	6	0.1
6	0	0.0	1	0.1	0	0.0	0	0.0	0	0.0	0	0.0	1	<0.05
7	2	0.2	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	2	<0.05

Inferential Analysis

Assumptions. Hypothesis testing involved regression via generalized estimating equations (GEE). The GEE is similar to standard regression. But unlike standard regression GEE allows for dependence within clusters, such as in the longitudinal data of this study. GEE models make no distributional assumptions for missing data and outliers in data, but require three specifications; (1) a mean function, (2) a variance function, and (3) a "working" correlation matrix for the clusters, which models the dependence of each observation with other observations in the same cluster. The appeal of a GEE model is that it gives consistent estimates of the parameters, and consistent estimates of the standard errors can be obtained using a robust "sandwich" estimator even if the working correlation matrix is incorrectly specified (Zorn, 2011). This estimator is consistent as the number of case clusters becomes large. GEE models a known function of the marginal expectation of the dependent variable as a linear function of the explanatory variables. The parameters estimated are derived as population-averaged.

GEE in STATA requires a fitting distribution, the default being a Gaussian or Normal distribution. Normal distributions are often assumed for models with continuous outcomes. However not all outcomes are continuous. The models in this study included the dependent variable of "Number of Courses Withdrawn" which was a count variable. A histogram of the Number of Courses Withdrawn variable for the entire dataset (N = 16,780 records) indicated a large number of records with a value of zero (n = 15, 018 records, 89.5% of all records). The data were count data, and the distribution appeared Poisson. However, the mean (M = 0.23) and median (Mdn = 0) of the dependent variable were not very different, indicating that the large amount of zeroes were not seriously adversely affecting normality of the distribution. Due to the

nature of the dependent variable as a count, it was determined that ordinary least squares (OLS) type of regression may not be the best fit for the model, and that a Poisson or negative binomial model may fit better with the dependent variable. Therefore, the three types of models were tested in the training phase with a random sample of 50% of the data to investigate the best model fit and parameters. Checks to the model fit were then performed with a validation set using a random sample of half of the remaining 50% of the data. And the final chosen model was tested in a hold-out test dataset consisting of the last 25% of the data.

Training sets. Half of the students in the study (N = 2.097 students, N = 8,388 records) records were randomly chosen without replacement from the full dataset (N = 4,195 students, N = 16,780 records) to build the training models. The first model utilized the OLS regression approach. Table 17 presents the OLS model coefficients with associated standard errors, test-statistics, and p-values. Although many of the coefficients were significant ($p < .05$), the coefficients were very small and not easy to interpret in the context of the number of courses withdrawn. For instance, the size and magnitude of the coefficient for the independent variable of Cohort, which was an indicator variable for classifying a student into the 2005 cohort (Cohort = 0) or the 2007 cohort (Cohort = 1) was negative and very small (B = -0.04, *SE* B = 0.02; p = .007). The size and direction of the coefficient suggested that the number of courses withdrawn by students in the 2007 cohort, who attended school after the withdrawal policy implementation, decreased by about 0.05 when compared to students in the 2005 student cohort.

Table 17

OLS Regression Coefficient Table for the Dependent Variable of Number of Courses Withdrawn Regressed on the Independent Variables of Study, using the Training Set (N = 2,097 Students)

Variable	B	*SE* B	*z*	*P*
Cohort	-0.04	0.02	-2.72	.007
Major = STEM	0.04	0.02	2.14	.032
Major = Liberal Arts, Social Sciences, and Education	-0.05	0.02	-2.67	.008
Major = Professional (Law, Architecture)	-0.05	0.05	-1.08	.281
Major = Business	-0.01	0.02	-0.27	.789
Major = Other	-0.04	0.03	-1.17	.243
Change in Major	0.04	0.03	1.67	.095
Gender	0.03	0.01	2.50	.013
Ethnicity = Black	0.02	0.02	1.04	.299
Ethnicity = Hispanic	-0.02	0.02	-0.93	.353
Ethnicity = Asian, Pacific Islander	0.01	0.02	0.70	.482
Ethnicity = Other	-0.02	0.04	-0.49	.621
Ethnicity = Unknown	-0.14	0.07	-1.95	.051
GPA	-0.14	0.01	-15.34	<.0005
SAT/ACT Score	<-0.005	<0.005	-1.24	.214
Constant	0.65	0.04	14.89	<.0005

Note. B = Unstandardized Model Coefficients; *SE* B = Standard Error of the Model Coefficients; *z* = z Statistic; *p* = Significance.
Reference Group for Cohort = 2005 pre-withdrawal policy implementation
Reference Group for Major = Undeclared
Reference Group for Gender = Male
Reference Group for Ethnicity = White

Next, a Poisson regression was performed with the training set and the same dependent and independent variables. Table 18 presents the coefficients, odds ratios, test statistics and p-values for the Poisson model.

Table 18

Poisson Regression Coefficient Table for the Dependent Variable of Number of Courses Withdrawn Regressed on the Independent Variables of Study, using the Training Set (N = 2,097 Students)

Variable	B	*SE* B	OR	*SE* OR	*z*	*P*
Cohort	-0.25	0.09	0.78	0.27	-2.83	.005
Major = STEM	0.21	0.08	1.23	0.50	2.47	.014
Major = Liberal Arts, Social Sciences, and Education	-0.33	0.11	0.72	0.24	-3.03	.002
Major = Professional (Law, Architecture)	-0.24	0.29	0.78	0.93	-0.84	.400
Major = Business	-0.05	0.13	0.95	2.32	-0.41	.683
Major = Other	-0.21	0.17	0.81	0.68	-1.20	.232
Change in Major	0.20	0.12	1.23	0.71	1.73	.084
Gender	0.19	0.07	1.21	0.46	2.65	.008
Ethnicity = Black	0.11	0.11	1.12	1.07	1.04	.297
Ethnicity = Hispanic	-0.09	0.10	0.92	1.10	-0.83	.407
Ethnicity = Asian, Pacific Islander	0.05	0.10	1.05	2.06	0.51	.609
Ethnicity = Other	-0.20	0.24	0.82	1.02	-0.81	.420
Ethnicity = Unknown	-1.11	0.64	0.33	0.19	-1.72	.085
GPA	-0.56	0.04	0.57	0.04	-15.28	<.0005
SAT/ACT Score	-0.02	0.01	0.98	0.49	-2.00	.046
Constant	0.08	0.19	1.08	2.64	0.41	.681

Note. B = Unstandardized Model Coefficients; *SE* B = Standard Error of the Model Coefficients; OR = Odds Ratio; *SE* OR = Standard Error of the Odds Ratio; *z* = z Statistic; *p* = Significance.Reference Group for Cohort = 2005 pre-withdrawal policy implementation; Reference Group for Major = Undeclared; Reference Group for Gender = Male; Reference Group for Ethnicity = White

Similarly, a negative binomial model was also derived from the training set. The findings of the negative binomial regression model are presented in Table 19. Both the Poisson and

negative binomial models fit the training data well. It was decided after review of the three training models that both the Poisson model and the negative binomial model contained coefficients and associated odds ratios that were more interpretable than the OLS regression model. The Poisson or negative binomial models give better structure and fit with count data. Therefore, the OLS regression model was removed from further consideration. The Poisson and negative binomial models were then tested with the validation data set.

Table 19

Negative Binomial Regression Coefficient Table for the Dependent Variable of Number of Courses Withdrawn Regressed on the Independent Variables of Study, using the Training Set (N = 2,097 Students)

Variable	B	*SE* B	OR	*SE* OR	*z*	*p*
Cohort	-0.25	0.15	0.78	0.07	-2.71	.007
Major = STEM	0.20	0.13	1.22	0.11	2.24	.025
Major = Liberal Arts, Social Sciences, and Education	-0.36	0.20	0.70	0.08	-3.21	.001
Major = Professional (Law, Architecture)	-0.29	0.30	0.75	0.23	-0.95	.341
Major = Business	-0.04	0.07	0.96	0.12	-0.31	.754
Major = Other	-0.22	0.20	0.80	0.14	-1.24	.214
Change in Major	0.21	0.16	1.23	0.15	1.64	.101
Gender	0.18	0.12	1.20	0.09	2.43	.015
Ethnicity = Black	0.13	0.12	1.14	0.12	1.17	.242
Ethnicity = Hispanic	-0.08	0.09	0.93	0.10	-0.70	.484
Ethnicity = Asian, Pacific Islander	0.06	0.08	1.06	0.11	0.60	.552
Ethnicity = Other	-0.18	0.21	0.84	0.20	-0.73	.465
Ethnicity = Unknown	-1.09	0.82	0.34	0.20	-1.79	.074
GPA	-0.57	0.15	0.57	0.02	-14.35	<.0005
SAT/ACT Score	-0.02	0.01	0.98	0.01	-2.08	.037
Constant	3.45	1.46	31.56	19.43	5.61	<.0005

Note. B = Unstandardized Model Coefficients; *SE* B = Standard Error of the Model Coefficients; OR = Odds Ratio; *SE* OR = Standard Error of the Odds Ratio; *z* = z Statistic; *p* = Significance.
Reference Group for Cohort = 2005 pre-withdrawal policy implementation; Reference Group for Major = Undeclared; Reference Group for Gender = Male; Reference Group for Ethnicity = White

Validation sets. The records of one-quarter of the students of the study (*N* = 1,049 student's, *N* = 4,196 records) were randomly chosen from the remaining dataset (*N* = 2098 students, *N* = 8,392 records) to build the Poisson and negative binomial validation models. Both the Poisson and negative binomial models failed to converge. However, STATA returned estimates for the Poisson model after 100 iterations, although the model did not reach convergence. Table 20 presents the parameter estimates of the un-converged Poisson model. The Poisson model included a very high coefficient value and standard error for the variable of Ethnicity = Unknown (*B* = -20, SE *B* = 28,466.65). This high coefficient and standard error could have been indicative of a poor model fit due to a phenomenon called complete or quasi-complete separation. Complete separation is defined when all of the observations of a predictor variable have a probability of 1 of being allocated to a particular classification on the dependent variable. In the case of quasi-complete separation, the maximum likelihood estimates may not exist and the odds ratio estimates and/or standard errors will be very large. In the case of this study, 80 of the 94 records (85%) that were classified as Ethnicity = Unknown had zero dropped classes. It was not readily known if the large estimate and standard error was a function of the failed convergence of the Poisson model, a function of quasi-complete separation, a function of both, or a function of other unknown phenomena.

The variable of Ethnicity = Unknown was aggregated with the Ethnicity = Other variable and the new variable, Ethnicity = Other, Unknown, was used to model another Poisson regression and negative binomial regression with the validation set.

Table 20

Poisson Regression Coefficient Table for the Dependent Variable of Number of Courses Withdrawn Regressed on the Independent Variables of Study, using the Validation Set (N = 1,049 Students)

Variable	B	*SE* B	OR	*SE* OR	*z*	*p*
Cohort	-0.44	0.14	0.64	0.21	-3.07	.002
Major = STEM	0.41	0.12	1.50	0.45	3.36	.001
Major = Liberal Arts, Social Sciences, and Education	-0.18	0.16	0.84	0.75	-1.11	.269
Major = Professional (Law, Architecture)	0.07	0.35	1.07	5.35	0.20	.845
Major = Business	-0.11	0.19	0.89	1.49	-0.60	.547
Major = Other	-0.10	0.26	0.90	2.32	-0.39	.694
Change in Major	0.23	0.16	1.26	0.89	1.42	.154
Gender	-0.10	0.10	0.91	0.95	-0.95	.341
Ethnicity = Black	0.12	0.16	1.13	1.43	0.79	.431
Ethnicity = Hispanic	0.15	0.16	1.16	1.22	0.95	.343
Ethnicity = Asian, Pacific Islander	0.22	0.14	1.25	0.77	1.63	.104
Ethnicity = Other	-0.45	0.45	0.64	0.64	-1.00	.318
Ethnicity = Unknown	-20.00	28466.65	---	---	<0.005	.999
GPA	-0.62	0.05	0.54	0.05	-11.76	<.0005
SAT/ACT Score	<0.005	0.01	1.00	4.33	-0.23	.817
Constant	-0.16	0.27	0.86	1.50	-0.57	.571

Note. B = Unstandardized Model Coefficients; *SE* B = Standard Error of the Model Coefficients; OR = Odds Ratio; *SE* OR = Standard Error of the Odds Ratio; *z* = z Statistic; *p* = Significance.
Reference Group for Cohort = 2005 pre-withdrawal policy implementation
Reference Group for Major = Undeclared
Reference Group for Gender = Male
Reference Group for Ethnicity = White

Table 21 presents the model findings for the negative binomial model which did not converge though estimates were reported after the 50th iteration of the model.

Table 21

Negative Binomial Regression Coefficient Table for the Dependent Variable of Number of Courses Withdrawn Regressed on the Independent Variables of Study, using the Validation Set and aggregated variable of Ethnicity = Other, Unknown (N = 1,049 Students)

Variable	B	*SE* B	OR	*SE* OR	*z*	*p*
Cohort	-0.47	0.26	0.63	0.09	-3.16	.002
Major = STEM	0.42	0.23	1.52	0.19	3.24	.001
Major = Liberal Arts, Social Sciences, and Education	-0.19	0.18	0.83	0.14	-1.13	.258
Major = Professional (Law, Architecture)	0.04	0.12	1.04	0.37	0.12	.906
Major = Business	-0.12	0.15	0.88	0.17	-0.64	.523
Major = Other	-0.11	0.17	0.90	0.23	-0.41	.684
Change in Major	0.23	0.20	1.26	0.22	1.37	.171
Gender	-0.11	0.11	0.90	0.10	-0.99	.323
Ethnicity = Black	0.15	0.16	1.17	0.19	0.94	.348
Ethnicity = Hispanic	0.15	0.16	1.16	0.19	0.94	.349
Ethnicity = Asian, Pacific Islander	0.23	0.18	1.25	0.18	1.61	.108
Ethnicity = Other, Unknown	-0.55	0.50	0.58	0.26	-1.24	.216
GPA	-0.61	0.19	0.54	0.03	-10.99	<.0005
SAT/ACT Score	-0.01	0.01	0.99	0.01	-0.49	.627
Constant	15.70	2.59	6595040.00	2808000.00	36.88	<.0005

Note: Model did not converge though estimates were reported after the 50th iteration model.

Tables 22 presents the model findings for the Poisson model which converged. The odds ratios and significance between the negative binomial and Poisson models were very similar.

Since the Poisson model converged and returned good estimates, it was chosen as the final model to construct with the test data set.

Table 22

Poisson Regression Coefficient Table for the Dependent Variable of Number of Courses Withdrawn Regressed on the Independent Variables of Study, using the Validation Set and aggregated variable of Ethnicity = Other, Unknown (N = 1,049 Students)

Variable	B	*SE* B	OR	*SE* OR	*z*	*p*
Cohort	-0.44	0.14	0.64	0.21	-3.08	.002
Major = STEM	0.41	0.12	1.50	0.45	3.35	.001
Major = Liberal Arts, Social Sciences, and Education	-0.18	0.16	0.83	0.75	-1.11	.266
Major = Professional (Law, Architecture)	0.06	0.35	1.07	5.61	0.19	.852
Major = Business	-0.11	0.19	0.89	1.49	-0.60	.548
Major = Other	-0.10	0.26	0.90	2.32	-0.39	.697
Change in Major	0.23	0.16	1.26	0.88	1.43	.153
Gender	-0.10	0.10	0.91	0.98	-0.93	.350
Ethnicity = Black	0.12	0.16	1.13	1.45	0.78	.434
Ethnicity = Hispanic	0.15	0.16	1.16	1.23	0.94	.345
Ethnicity = Asian, Pacific Islander	0.22	0.14	1.25	0.77	1.63	.104
Ethnicity = Other, Unknown	-0.52	0.45	0.59	0.52	-1.15	.248
GPA	-0.62	0.05	0.54	0.05	-11.78	<.0005
SAT/ACT Score	<0.005	0.01	1.00	4.15	-0.24	.813
Constant	-0.15	0.27	0.86	1.56	-0.55	.580

Note. B = Unstandardized Model Coefficients; *SE* B = Standard Error of the Model Coefficients; OR = Odds Ratio; *SE* OR = Standard Error of the Odds Ratio; *z* = z Statistic; *p* = Significance.
Reference Group for Cohort = 2005 pre-withdrawal policy implementation
Reference Group for Major = Undeclared
Reference Group for Gender = Male
Reference Group for Ethnicity = White

Test set. Table 23 presents the findings of the Poisson regression model with the final 25% of the original data set (*N* = 1,048 students; *N* = 4,192 records). The independent variable of Cohort = 2007 Withdrawal Policy Implementation was statistically significant (*OR* = 0.77, *SE OR* = 0.38; *p* = .042), indicating that students who attended school after implementation of the withdrawal policy were 23% less likely to withdraw from a class, when compared to students who attended school before implementation of the withdrawal policy. Students who were classified as Ethnicity = Asian, Pacific Islander were 62% more likely to drop a class than White students (*OR* = 1.62, *SE OR* = 0.46; *p* < .0005). The variable of GPA was also significant for the dependent variable of Number of Dropped Classes (*OR* = 0.46, *SE OR* = 0.03; *p* < .0005). The magnitude of the odds ratio indicates that for each one unit increase in a student's GPA, the student is 54% less likely to drop a class.

Table 23

Poisson Regression Coefficient Table for the Dependent Variable of Number of Courses Withdrawn Regressed on the Independent Variables of Study, using the Test Set and aggregated variable of Ethnicity = Other, Unknown (N = 1,049 Students)

Variable	B	*SE* B	OR	*SE* OR	*Z*	*p*
Cohort	-0.26	0.13	0.77	0.38	-2.03	.042
Major = STEM	-0.01	0.13	0.99	8.97	-0.11	.916
Major = Liberal Arts, Social Sciences, and Education	0.13	0.14	1.14	1.26	0.90	.371
Major = Professional (Law, Architecture)	-0.29	0.41	0.75	1.04	-0.72	.470
Major = Business	-0.10	0.17	0.91	1.62	-0.56	.574
Major = Other	0.01	0.26	1.01	20.28	0.05	.959
Change in Major	0.11	0.18	1.12	1.78	0.63	.526
Gender	-0.14	0.10	0.87	0.63	-1.38	.167
Ethnicity = Black	0.02	0.16	1.02	6.83	0.15	.881
Ethnicity = Hispanic	0.08	0.15	1.08	2.16	0.50	.615
Ethnicity = Asian, Pacific Islander	0.48	0.14	1.62	0.46	3.51	<.0005
Ethnicity = Other, Unknown	-0.59	0.43	0.56	0.41	-1.36	.172
GPA	-0.77	0.05	0.46	0.03	-15.41	<.0005
SAT/ACT Score	0.01	0.01	1.01	1.18	0.86	.388
Constant	0.10	0.28	1.10	3.15	0.35	.728

Note. B = Unstandardized Model Coefficients; *SE* B = Standard Error of the Model Coefficients; OR = Odds Ratio; *SE* OR = Standard Error of the Odds Ratio; *z* = z Statistic; *p* = Significance.
Reference Group for Cohort = 2005 pre-withdrawal policy implementation
Reference Group for Major = Undeclared
Reference Group for Gender = Male
Reference Group for Ethnicity = White

Hypothesis Testing. The Poisson model findings of the test data set were used to address the research question and statistical hypotheses of the study. The conclusions are presented according to each individual hypothesis.

RQ1: Did FTIC students who entered the university following the implementation of the 2007 Texas revised course withdrawal policy and course completion drop fewer courses than FTIC students who entered the university prior to implementation of the Texas revised course 2007 withdrawal policy?

Conclusion as relates to H01. The independent variable of Cohort = 2007 Withdrawal Policy Implementation was statistically significant (*OR* = 0.77, *SE OR* = 0.38; *p* = .042), indicating that students who attended school after implementation of the withdrawal policy were 23% less likely to withdraw from a class, when compared to students who attended school before implementation of the withdrawal policy. There is sufficient evidence to indicate that there is a statistically significant positive relationship between the predictor of withdrawal policy (pre vs. post-implementation) and the criterion of the number of courses dropped, after controlling for (a) student gender, (b) student ethnicity, (c) student ACT or converted SAT score, (d) student major, (e) change of student major, and (f) semester GPA.

Conclusion as relates to H01a. The variable of gender was not statistically significant (*p* = .167). 1aThere is not sufficient evidence to indicate that the independent variable control of student gender is a significant predictor of the criterion of the number of classes dropped.

Conclusion as relates to H01b. Students who were classified as Ethnicity = Asian, Pacific Islander were 62% more likely to drop a class than White students (*OR* = 1.62, *SE OR* =

0.46, $p < .0005$). 1bThere is sufficient evidence to indicate that the independent variable controls of student ethnicity are significant predictors of the criterion of the number of classes dropped.

H01c *Conclusion as relates to H01c.* Significant findings were not returned for the variable of student ACT or converted SAT score ($p = .388$).1c There is not sufficient evidence to indicate that the independent variable control of student ACT or converted SAT score is a significant predictor of the criterion of the number of classes dropped.

H01d Significant findings were not returned for any of the five student majors of the regression model. There is not sufficient evidence to indicate that the independent variable controls of student major are significant predictors of the criterion of the number of classes dropped.

H01e *Conclusion as relates to H01e.* Significant findings were not returned for the variable of change in major ($p = .526$).There is not sufficient evidence to indicate that the independent variable change of student major is a significant predictor of the criterion of the number of classes dropped.

Conclusion as relates to H01f. The variable of GPA was also significant for the dependent variable of Number of Dropped Classes ($OR = 0.46$, $SE\ OR = 0.03$; $p < .0005$). The magnitude of the odds ratio indicates that for each one unit increase in a student's GPA, the student is 56% less likely to drop a class. Therefore, null hypothesis 1g is rejected. There is sufficient evidence to indicate that the independent variable control of semester GPA is a significant predictor of the criterion of the number of classes dropped.

Summary

Chapter 4 began with a restatement of the purpose of the study, the research questions and statistical hypotheses. Descriptive findings were presented and tabled. Assumptions for the GEE model were presented and results of the assumption checks were detailed. Training models using 50% of the dataset were tested via OLS regression, Poisson regression, and negative binomial regression. An adjustment was made to aggregate the independent variable of Ethnicity = Unknown with the independent variable Ethnicity = Other. The Poisson and negative binomial models were then tested with the validation dataset (25% of the remaining half of the data) to further investigate model fit.

Finally, the Poisson regression model was chosen as the final model, and tested with the remaining 25% of the data. Three predictors were statistically significant. The independent variable of Cohort = 2007 Withdrawal Policy Implementation was statistically significant (OR = 0.77, $SE\ OR$ = 0.38; p = .042), indicating that students who attended school after implementation of the withdrawal policy were 23% less likely to withdraw from a class, when compared to students who enrolled before implementation of the withdrawal policy. Students who were classified as Ethnicity = Asian, Pacific Islander were 62% more likely to drop a class than White students (OR = 1.62, $SE\ OR$ = 0.46; $p < .0005$). The variable of GPA was also significant for the dependent variable of Number of Dropped Classes (OR = 0.46, $SE\ OR$ = 0.03; $p < .0005$). The magnitude of the odds ratio indicates that for each one unit increase in a student's GPA, the student is 54% less likely to drop a class.

Chapter 5 will present a discussion of the results as well as implications of the findings as relates to the literature review and suggestions for further research.

CHAPTER 5

Discussion

The purpose of this study was to investigate whether a newly revised withdrawal policy resulted in a reduction on the number of courses that students dropped. Findings have been identified as either not significant or significant. Studies were reviewed that provided many variables and factors that were significant in prior persistence studies. However, not all of these variables and factors are significant in this study that was narrowly focused in course completion is an intermediate outcome of degree completion. Moore and Shulock (2009) identified credit accumulation as an important predictor of degree completion – the more courses that students complete, the more likely they are to persist. This finding is also supported by Adelman's (1999) analyses of national data for students intending to complete a bachelor's degree indicated that earning fewer than 20 units in the first year of enrollment is negatively related to degree completion. Other research supports this finding, with one study demonstrating that, among students beginning their enrollment in a 4-year institution, only 45 percent of those completing fewer than 20 units in the first year went on to complete a degree compared to 91 percent completion among students with 30 credits in the first year (McCormick & Carroll, 1999). An analysis focused on first generation students found that they earn fewer credits in the first year than other students (Chen & Carroll, 2005). Completing 30 credits in the first year was positively related to degree completion among these students. If students withdraw from a class, they reduce the number off credits they accumulate for the semester, therefore reducing their chances of earning a college degree (McCormick & Carroll, 2009; Moore & Shulock,2009)

Summary of Data Collection Techniques

The Office of Institutional Research provided enrollment data for 2 cohorts of students. The first cohort consisted of Fall 2005 FTIC students and their courses over two years (four semesters of; two years (a) Fall 2005, (b) Spring 2006, (c) Fall 2006, and (d) Spring 2007). This cohort had a total of 2,128 students who met the inclusion criteria. The second cohort was made up of Fall 2007 FTIC students and their courses enrolled for two years (four semesters of; a) Fall 2007, (b) Spring 2008, (c) Fall 2008, and (d) Spring 2009). The cohort had a total of 2,067 students who met the inclusion criteria. Only those FTIC who enrolled in the fall semester and had SAT or ACT scores and were enrolled in one class at least all 4 semesters were included in the sample for this study. The data included information on gender, class dropped, semester dropped, GPA.

Findings

The following is the discussion of the findings from the statistical analyses outlined in Chapter 4. The research question for the study was: Did FTIC students who entered the university following the implementation of the 2007 Texas revised course withdrawal policy and course completion drop fewer courses than FTIC students who entered the university prior to implementation of the Texas revised course 2007 withdrawal policy? The study also included independent control variables to identify whether there was a relationship between number of withdrawals and (a) student gender, (b) student ethnicity, (c) the differences in demographic student ACT or SAT score, (d) , student major, (e) change of student major, and (f) semester GPA. The finding in this study is the new withdrawal policy had a significant association with reducing the number of number of course withdrawals. The independent variable of Cohort =

2007 Withdrawal Policy Implementation was statistically significant (OR = 0.77, SE OR = 0.38; p = .042), indicating that students who attended UH after implementation of the withdrawal policy were 23% less likely to withdraw from a class, when compared to students who attended school before implementation of the withdrawal policy. There is sufficient evidence to indicate that there is a statistically significant positive relationship between the predictor of withdrawal policy (pre vs. post-implementation) and the criterion of the number of courses dropped, after controlling for student gender, student ethnicity, student ACT or converted SAT score, student major, change of student major; and college GPA.

A number of studies concluded that excessive course withdrawals have a negative impact on degree completion (Adelman, 1999, 2005, 2006; Cabrera, Burkum, & La Nasa 2005; Chen & Carroll, 2005; Summers, 2000), making measures of a student's rate of successfully completing courses an important indicator of likely success. Adelman (2006) found that withdrawing from or repeating 20 percent or more of courses decreased the probability of completing a bachelor's degree by approximately 50 percent. Others have found somewhat smaller but still substantial effects of excessive course withdrawal. Chen and Carroll (2005) found that students who withdrew from or repeated less than 10 percent of their courses were more likely to earn a bachelor's degree. Cabrera, Burkum, & La Nasa (2005) study showed that students who dropped 10 to 20 percent of courses were 13 percent less likely to complete a degree, and those who dropped 20 percent or more courses were 27 percent less likely to complete a degree. Moore and Shulock (2007) used national survey data sets of California community college students and found that as the percentage of courses dropped, the likelihood of completion declined after controlling for other factors. This effect held for full- and part-time students and for students of all racial/ethnic groups.

Research shows that for some students who persist, first-semester course taking patterns continue over subsequent semesters (Duby & Schartman, 1997) and a pattern of withdrawing courses over time is detrimental to timely degree completion. Researchers have found that dropping and repeating courses had a strong correlation with a longer time to degree (Adelman, 2006; Jones-White, Radcliffe, Huesman, & Kellogg, 2009; Knight 1994, 2004; Knight & Arnold, 2000; Weissman, 1999). Research on time to degree (Knight, 2004; Knight & Arnold, 2000) shows that the number of courses a student fails is one of the strongest predictors of the number of total terms enrolled and the number of terms elapsed prior to earning a degree. This policy change in Texas was important as part of a solution to increase retention and reduce time to degree.

This study found two control variables to be statistically significant to predict the number of courses dropped for students: GPA and ethnicity.

GPA

The variable of GPA was also found to be significant for the dependent variable of Number of Dropped Classes (OR = 0.46, SE OR = 0.03; $p < .0005$). The magnitude of the odds ratio indicates that for each one unit increase in a student's GPA, the student is 54% less likely to drop a class. This finding is supported by many persistence studies. Pascarella and Terenzini (2005) argue that undergraduate grades are the important factor in predicting success in college. Many other studies support this finding (Adelman, 2004, 2006; A. W. Astin, 1997; Bennett, 2003; Pascarella & Terenzini, 2005). In *How College Affects Students*, Pascarella and Terenzini (2005) state, "the research is unwavering in finding that grade performance, even when controlling other factors, is a statistically significant and positive predictor of persistence and

graduation" (Pascarella & Terenzini, 2005, p. 438). DesJardins, Ahlburg, McCall, and Moye (2002) found that there is a very positive relationship between college grade point average and persistence and timely graduation. They found that every one grade point increase in GPA more than doubled a student's chance of earning their degree. Adelman (2006) also found that if a student's first-year GPA falls into the top two quintiles, the probability of earning a degree increases by nearly 22%. Nora and Cabrera (1996) found that students' GPA at the end of the first year was three times more important for African American and Hispanic students' persistence than for White students.

Ethnicity

Student ethnicity was tested as a control variable. Students who were classified as Ethnicity = Asian, Pacific Islander were 62% more likely to drop a class than White students (OR = 1.62, SE OR = 0.46, $p < .0005$). The study of ethnicity and its impact on student attrition has produced mixed results. In a study of African-American and White students, Astin (1975) found in no significant differences in retention after controlling for test scores and high school grades; however Hispanic student retention remained lower than their peers. A study conducted by the American Federation of Teachers (2003) found that there is a significant gap in degree attainments between minority students and white students. The impact of ethnicity on academic achievement is often compounded by socioeconomic status, parental education level, and student academic preparedness (American Federation of Teachers, 2003; DesJardins, Ahlburg, & McCall, 2002). A study by DesJardins, McCall, Ahlburg, & Moye (2002) showed that when controlling for GPA, the negative effects of belonging to an underrepresented minority group were diminished by 58%, revealing that much of the effect of race on graduation operates through a student's GPA. In this study, the Asian or Pacific Islander students were more likely

to drop a class more than any other ethnicity. This finding was surprising and could be explained by several factors. It appears that the Asian or Pacific Islander students were over-represented on the pre-implementation cohort. Before the inclusion criteria were applied, available FTIC students from the pre-implementation FTIC cohort (Fall 2005) had 23.9 percent Asian or Pacific Islander students. After the inclusion criteria were applied, this ethnic group increased to 33 percent of the total students that were included in the study for the pre-implementation cohort. More Asian students meet the inclusion criteria for the pre-implementation cohort. For the post-implementation cohort (Fall 2007 FTIC), 26.6 percent of the available FTIC were Asian or Pacific Islander students. After the inclusion criteria were applied, this ethnic group increased to 28.9 percent of the total students that were included in the study which was proportional to the other ethnic groups.

This unexpected finding pertaining to the Asian and Pacific Islander students (in literature commonly referred to as Asian or Asian Pacific Americans (APAs)) prompted this researcher to closely examine literature on APAs and persistence. A perception exists that Asian Americans in the United States have overcome the various cultural, racial, and social barriers to advancement and have established themselves as a successful "model minority." The model minority stereotype attribute educational and economic success to all Asian Americans ignoring the between- and within-group differences of culture assimilation, social, political, economic, and education backgrounds (Educational Testing Service, 1997; Hune, 2002; Kim & Yeh, 2002; Siu, 1996; Yin, 2000). There are subgroups of APA students who demonstrate very low college attendance and persistence rates. Some of the subgroup of APA students experience considerable difficulty in the college environment, and face a high risk of leaving college before completing their degree (Hune, 1995, 2002). Since the late 1970s, the American media has

portrayed APAs as a "model minority" and researchers argue that no attention has been paid to this student population group. Hune (1995) points that this perception gives the appearance that all APA students are excelling. However, a more detailed analysis of the data reveals that these conclusions are not accurate - for example, while 58.4% of Asian Indians in the United States had completed a bachelor's degree, only about 5% of Laotian and Cambodian students and 2.9% of Hmong in the United States were college graduates in 1990 (Siu, 1996). Kiang (1992) describes the same phenomenon that even though Asian Pacific Americans are most often portrayed as high-achieving Ivy-league students, the reality is that 40% of APA's enrolled in higher education actually attend two-year colleges, and 82% attend public institutions. In order to create a more accurate picture of the academic performance and needs of APA students, researchers argue that data on these populations must be disaggregated by criteria such as ethnicity, English proficiency, and generation in the United States (Educational Testing Service, 1997; Hune, 2002; Kim & Yeh, 2002). Subgroup analyses are necessary to fully uncover and understand the complex factors affecting the college persistence and educational success of this population. There are fifty-seven distinct ethnic groups fell under the category of "Asian Pacific Islander" even though with respect to ethnicity, most research on Asian Pacific American college students focuses on those of East Asian descent (Chinese, Japanese, and Korean), because of their significant numbers and longer history in the United States (Siu, 1996). English proficiency is another critical factor that is overlooked when examining the success of APA students. Numerous studies on ESL (English-as-a-Second-Language) learners indicate that students who have limited English proficiency experience significant language barriers and are subsequently at a greater risk of leaving college prior to graduation (Pang, 1995; Siu, 1996; Suzuki, 2002). Data pertaining to APA subgroups for the UH students in this study were not

collected and so it is not possible to disaggregate the data. The APA students in this study could have identified in several ethic categories – other which included non-resident aliens, unknown, or Asian or Pacific Islander. Out of the international student population at UH enrolled in fall 2005 and fall 2007, 1452 students in fall 2005 were from Asia and 1637 students in fall 2007 were from Asia. The finding in these studies suggests that there is a possibility that some of the APA students in the study may have language and cultural that impact student success as defined by course completion. UH student data on APA students is not disaggregated further but these data suggests that disaggregating the data would be crucial to understanding the specific challenges that this group may face in completing their courses.

For this study, significant findings were not returned for the control variables of gender, SAT score, major, and change in major. In a study that investigated the impact of demographic variables of age, gender, ethnicity, and financial aid eligibility on completing online classes, Aragon and Johnson (2008) did not find significant differences between the completers and non-completers of age, ethnicity, or financial aid eligibility. Giles (1999) and Willging and Johnson (2004) also found that age and ethnicity were not significant to dropout or persistence in the online classroom.

Gender

The variable of gender was not statistically significant ($p = .167$). There are no studies that look at gender as a factor of not dropping courses or course completion. Results are mixed when examining the role of gender in college persistence. Several studies indicate that women attain a bachelor's degree at a higher rate than their peers (Adelman, 2004; Stephen L. DesJardins, Ahlburg, & McCall, 2002; L Horn, 2006). In a study specifically examining urban

community college students, Jones (1997) found that women had higher levels of academic achievement and enrollment persistence. Other studies found that men outperformed women or that there was no gender difference in achievement outcomes (Adelman, 2004; A. Astin, 1975; L. Hagedorn, Maxwell, Chen, Cypers, & Moon, 2002; Linfante, 2002). Arbona and Nora (2007) found that minority women were 33% more likely to obtain a degree than men.

SAT/ACT Score

Significant findings were not returned for the variable of student ACT or converted SAT score ($p = .388$). This finding is supported by a study by Desjardins, McCall, Ahlburg, and Moye (2002) who found that while the academic resources a student brings to college are an important indicator of college success, this variable changes over time. The impact of prior academic resources on graduation also depends on other factors, such as college GPA. When actual college performance variables are included, some of the effects of prior academic resources appear to operate indirectly through the college GPA (DesJardins, McCall, et al., 2002). They argued that academic resources utilized in college are more important than the prior academic resources students bring with them to college.

Major

Significant findings were not returned for any of the five student majors of the regression model. Astin (2001) provided evidence that different majors had different effects on student retention. He found that students pursuing business, or social sciences had lower risk of attrition, while students pursuing engineering had higher risk of attrition. DesJardins, Kim, and Rzonca (2002) demonstrated that freshmen majoring in business or engineering were less likely to drop

out. Lewallen (1993) research revealed that students with an undecided major did not have a higher risk of attrition.

Change in Major

Significant findings were not returned for the variable of change in major ($p = .526$). Studies on the impact of changing majors to degree completion or on major persistence are rare (Foraker, 2012). The few studies available on the impact of changing major had conflicting results. The researcher expected to find a significant relationship hypothesizing that a change in major may change the class requirements resulting in a withdrawn class. The literature suggests students who are indecisive about what they wish to study have a greater prevalence of withdrawing from school due to their weaker commitment to their education (Joyce, 2006). Foraker (2012) found that changing major after the second year was associated with lower graduation rates and longer time-to-graduation; but his study ignored background student characteristics. A single institution study on the impact of changing major by Micceri (2001) reported that students who had changed their major at least once had a higher overall graduation rate than those students who had not changed majors. Kreysa (2007) found that for students requiring remedial courses, changing majors increased the likelihood of graduation, but for non-remedial students, changing majors decreased the likelihood of graduating.

Study Limitations

A limitation of the study was the use of data from only one university in Texas therefore, the research findings will have limited generalizability. To get a more in-depth understanding it would be beneficial to explore data from several Texas institutions since this was a statewide policy. Another limitation of the study was the fact that only first time freshmen students were

used in the study. The study only included students who were continuously enrolled and did not examine course dropping patterns for students who did not persist. Expanding the study to include these students would be beneficial and may provide additional clarity on predictors of class dropping. As noted in the literature review, there are numerous variables that can be studied in college persistence research. The variables used in this study were limited to variables that were available from the Office of Institutional Research at the Big Town University. By studying only a portion of the variables, there is a threat to internal validity as conclusions about the factors that have an impact on the number of classes dropped were limited to what was available based on staff time constraints.

Recommendations for Policy and Practice

This study focused on course withdrawals and their impact on persistence. Academic advisors can help students understand the impact of course withdrawals up front to help impact any decisions they may have in their course of study to drop any courses. Academic advisors should also track outcomes like GPA to identify students who are struggling. Early intervention can be implemented to improve the likelihood the student will not need to drop the class to maintain a required GPA. Academic advising should focus on long-term academic planning so that students can understand the full implications of dropping a class – like time and sequencing of course offerings, impact of required course prerequisites to their program of study. Academic advisors should target students with lower GPAs to provide them with extra assistance to support timely and efficient course completion though there may be concerns with stigma that may have an impact on this strategy. Students who are found to have an excessive number of course repeats, failures, and withdrawals should be monitored and required to have mandatory

advisement prior to future enrollments. Mid-semester grades and early alert reports for these students should be monitored for potential problems. Students also dropped more classes in the spring semester compared to the fall semester so advisors could pay special attention to progress metrics in the spring semesters.

This study also highlights some needs specialized academic support programs for APAs. Just like there are resources dedicated to Hispanic students, African American students, and other under-represented groups on campus, UH in particular would evaluate its support infrastructure for APA students. Suzuki (2002) suggests increased outreach to underrepresented APA in admissions recruitment as well as when advertising programs and services on campus. Many college admissions and outreach offices target African-American, Latino and Native-American students, but tend to exclude all Asian Pacific American students, even if they are from underrepresented ethnic groups or come from low-income backgrounds. Institutions should include eligible APA students in retention programs for underrepresented minorities. Many campuses offer services and programs for other minority groups, such as ethnic-specific advising groups, tutoring programs, counseling/peer support groups, peer and faculty mentoring programs, and leadership development programs. However, these types of programs are not usually available for underrepresented APA students.

Much emphasis has been placed on degree completion but as discussed in the literature review, policy makers should equally focus on intermediate measures of student progress and success. Effort should be exerted to identify signals for students who may be on or off track for completing a degree. Progress metrics like remediation (entry and success), success in first-year math and English or core curriculum, credit accumulation, retention rates, course completion,

and time and credits to degree should be considered. Currently, student retention and graduation rates are being used as a way to evaluate the accountability and performance of colleges and universities but legislators should continue to find ways to also include these intermediate measures in the accountability metrics.

Some institutions and states are considering imposing consequences for students extending their degrees beyond four years. Some plan to restrict financial aid offerings beyond four years or charge an increase in tuition for hours completed above a set maximum (DesJardins, Kim, & Rzonca, 2002). The policy that was the subject of this study penalizes students who exceed the number of withdrawals seeking to increase efficiency and timeliness to degree. Legislators should also find ways to incentivize students positively to complete more courses. To encourage timely graduation, some colleges offer flat-rate tuition for students taking over a certain number of hours. For example, students below full-time (12 hours) would pay a per-credit hour fee, while students who take 12 or more hours would pay the same flat fee whether they are enrolled in the minimum 12 hours or a maximum of 19 hours. Students at these institutions would be encouraged to take more than 12 hours each semester to benefit from "free" classes (Selingo, 2001).

Policy makers should require disaggregated statistics on APAs. While many institutions may resist this idea because it may require additional resources, there is increasing evidence to suggest that aggregated data on this population simply does not provide accurate results. In order to gain a more thorough understanding of APA students, institutions should report ethnic-specific data in addition to race-specific data. Furthermore, Hune (2002) indicates that separating Asian foreign students from Asian Pacific Americans will also result in more useful analyses.

Future Research

One of the possible predictors of classes dropped is classes a student is enrolled in so a study of this magnitude should look into the relationship with attempted hours for the student. Since this policy was implemented statewide, a study should include students from other Texas higher education institutions. Additionally, information from the students themselves regarding their reasons for dropping classes would be beneficial. There are many other student characteristics affect whether or not students will withdraw from one or all classes. Clearly, academic variables such as grades, placement test scores, educational achievement, and academic preparation are related to retention and withdrawal (Sandiford and Jackson, 2003). There are other student variables that relate to retention as well, including campus involvement (Astin, 1993; Crawford, 1999), transitions to college and freshman orientation courses (Derby and Smith, 2004; Pomalaza-Raez and Groff, 2003), clear educational objectives (Goel, 2002; Walters, 2003), financial aid (Singell, 2001), student support services (Harter, 2000), access to technology and physical facilities (Lau, 2003), and even students' learning styles (Vare, Dewalt, and Dockery, 2000) that could be investigated via a student survey.

Specific to the finding on a significant drop rate for APA students, a qualitative study on the students and their reasons for dropping classes would greatly benefit University administrators and staff to assist them in recognizing the needs of this population before successful implementation of new programs and policies can occur. It is always harmful to generalize across entire populations; in the case of APAs, educators have assumed their success for too long (Educational Testing Service, 1997).

Conclusion

Student success and retention are a concern for institutions of higher education. As state governments push for higher accountability standards, and the possibility of formula funding looming, it is important for institutions to examine factors that lead to student attrition like course dropping and mitigate any institutional factors.

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