A Dissertation

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A Study of the Influence Undergraduate Experiences Have on Student Performance on the Graduate Management Admission Test

by

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Submitted to the Graduate Faculty as partial fulfillment of the requirements for the Doctor of Philosophy Degree in Higher Education

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August, 2014
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Research into factors that contribute to student success have used undergraduate grade point average (GPA) as the dependent variable. However, undergraduate GPA is subject to grade inflation and to differences in institutional and program rigor. To provide a common benchmark across institutions and programs, this study used the Graduate Management Admission Test (GMAT) composite score as the dependent variable. Astin’s Input-Environment-Outcome (I-E-O) model was used as the conceptual framework. Correlation analysis and a blocked form of stepwise regression were used to partial out the impact of 107 variables arrived at from the national Higher Education Research Institute’s Freshman and College Senior Surveys on the dependent variable—GMAT composite scores. In all, 10 variables were identified as having a significant influence on student performance on the GMAT, with Scholastic Assessment Test math and verbal scores and institutional Selectivity having the greatest influence. While prior studies have attempted to use a variety of standardized tests, previous research did not account for prior student academic abilities and other input characteristics to accurately assess the added value of other variables. This study offers new, useful information for educators and administrators in their goal of promoting academic excellence.
For my wife, Kathryn, and my family.
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Chapter One

Introduction

The National Center for Educational Statistics (NCES) reports that undergraduate enrollment rose 211% between 1970 and 2007 (NCES, 2010). Despite this increase, slightly more than half (50.5%) of students who enroll graduate within six years of beginning their course of study, a rate that has changed little based on student cohorts from the 1995-96 and 2003-04 academic years (Lederman, 2011; NCES, 2010). According to ACT (2010), graduation rates from both public and private institutions declined from 55.2% in 1988 to 41.9% in 2001 for students graduating within five years of starting their programs of study. The National Postsecondary Education Cooperative (NPEC) found four-year graduation rates to be even lower, reaching only 37.9% in 2004 (Kuh, Buckley, Bridges, & Hayek, 2006; NCES, 2012).

This declining trend in graduation rates is a long-term issue, not a recent phenomenon, representing either ineffective solutions to increase graduation rates, a lack of understanding of the factors that contribute to student success, or both. With no clear pathway to reverse the downward trend, more research is needed to uncover those factors that contribute to student success (Tinto, 2006). To make informed decisions to address declining graduation rates, higher education administrators and U.S. policy makers must have better information about the influence of student experiences on success in college (Whitehurst, 2010).

Concerns about graduation rates are by no means exclusive to administrators and policy makers; they are also a concern for students pursuing a pathway to an advanced degree and, by extension, to a career. If each student’s goal is economic independence,
an undergraduate degree brings him or her closer to that goal. According to Kuh, Cruce, Shoup, Kinzie, and Gonyea (2008), the bachelor’s degree has replaced the high school diploma as a “mainstay for economic self-sufficiency” (p. 2). Beyond its benefits to the individual, a degree acts to economically enhance families, institutions, and communities (Tinto, 2004). Future generations of students are also influenced by the information about graduation rates, and make decisions about college based upon this data (Kuh, Cruce, Shoup, & Kinzie, 2008).

**Student Economic Impact**

An important economic driver in the decision to either stay in school or to quit is the wage premium potential of a college degree. Wage premium potential can be expressed as the cost-benefit ratio of obtaining a degree compared to anticipated future wages (Kuh, Buckley, Bridges, & Hayek, 2006). According to the U.S. Bureau of Labor Statistics (BLS), the median weekly salary for high school graduates is $652 compared to $1,066 for employees with bachelor’s degree (www.bls.gov). Over 40 years, this wage differential exceeds $1 million in total earnings. The perceived economic incentive to complete a degree evaporates when students believe the wage premium is less than the combined cost of obtaining a degree and wages lost while in school—the cost-benefit of obtaining a degree.

**Institutional Impact**

Lower graduation rates also affect the finances of higher education institutions through lost tuition, subsidy, and reputation (DeBerard, Spielmans, & Julka, 2012). Lost revenues from tuition, subsidy, room-and-board, meals, bookstore sales, and reduced
alumni contributions caused by student attrition as a result of reduced graduation rates contribute to budgetary concerns.

Performance-based funding will change the budget landscape from providing subsidy just for enrolling students to a graduated subsidy system that rewards institutions for student success in meeting milestones leading to graduation (Go, 2008). The federal government is on the threshold of implementing policies and procedures that tie monetary support to colleges and universities to graduation rates, tuition rates, loan default rates, low student debt, and student employment upon graduation (Fain, 2013). Furthermore, declining graduation rates negatively impact institutional reputations and alumni relations (Barefoot, 2004; Saweczko, 2008). The long-term financial impact of student attrition may lead to degraded institutional reputation, eventually impacting research grants, gift giving, and donations.

National Concerns

Among countries surveyed, the U.S. has slipped to 12th place on the proportion of adults obtaining a post-secondary degree or certificate, impacting the nation’s ability to maintain its economic leadership in the world (de Vise, 2010). There are concerns that today’s youth will be the first generation to be less educated than their parents. Education is a key component to competing in a global economy, providing financial prosperity, strengthening individual industry, and improving personal lifestyle. A priority in addressing access and success concerns is to restore the resources necessary to assure the higher education system is a viable pathway for the next generation (Jones, 2010). The Brookings Institute reported that if the U.S. is to regain a position of leadership in education, better information is needed by policy makers about the
undergraduate educational experience leading to graduation and employment (Whitehurst, 2010). Enrollment, rising costs, the economy, funding, stakeholder unrest, and both environmental and institution turmoil, act together like a perfect storm, constraining resources for higher education (Chapman & Ludlow, 2010). However, these external forces are only one set of factors contributing to student persistence and graduation.

**College Environment**

Forces in the college experience itself may influence a student’s decision to persist or to drop out. Tinto indicated a student’s decision to persist to graduation is a function of both the student’s academic and social integration into college (Tinto, 1975, 2004). As for academic performance, for every four students who leave college before graduation, only one does so due to poor grades (Kuh et al., 2006). The remaining three leave for reasons other than academic dismissal. Tinto’s research suggests fears about possible dismissal from college may also impact a student’s social integration.

Social integration includes peer interaction, extracurricular activities, and interactions with faculty and staff. These activities act like a magnet, keeping and holding students in school. Zhao and Kuh (2004) found that the impact of pre-college abilities and characteristics that influence a student’s initial success in college diminish after the first academic year, when the influences of the college environment are examined. Their research focused on the benefits of social integration—engagement and involvement in educational activities—among students who were at risk, in improving both their persistence and grades. At-risk students are those with lower academic skills, are first-generation students, or are economically disadvantaged (Kuh, Buckley, Bridges,
& Hayek, 2006; Pascarella, Pierson, Wolniak, & Terenzini, 2004; Tinto, 2004). Zhao and Kuh’s (2004) research focused on the role learning communities and interdisciplinary courses play in strengthening academic development among at-risk students (Carini, Kuh, & Klein, 2006). Improving peer-to-peer interaction is vital to social engagement, and to helping students persist in college.

Social integration is a key element in a student’s decision to stay in school or to depart. Contact with both faculty and staff strengthens the relationship students have to an institution, which in turn strengthens a student’s commitment to persist to degree completion (Tinto, 1975). This symbiotic relationship between the student and college environment is the foundation of the “reciprocal engagement” theory of student persistence proffered by Outcalt and Shewes-Cox (2002, p. 2).

Research Opportunities

Other researchers have explored the issue of student persistence in college (Pascarella & Terenzini, 1991, 2005; Reason, 2003; Tinto, 2006, 2007). In their research on persistence, Kuh, Buckley, Bridges, and Hayek (2006) and others consider graduation the primary measure of student success. Reason (2003) stated that persistence toward graduation may not be every student’s goal, that each student’s goals differ, and that research that attempts to identify factors that influence persistence to graduation should be based on various student populations. Reason (2003) argued that theories of persistence and student success based upon traditional 18-to-22-year old, full-time, White students attending a residential campus simply do not apply to today’s varied and diverse student populations. Tinto (2004) concurred, stating that the process of aggregating data from prior studies to identify factors that influence student success obscures results that
influence subgroups of students (Tinto, 2004). This highlights the need for ongoing research to assess the changes to criterion variables in a dynamic population of students.

Many of the studies referred to by Reason and Tinto identified high school grade point averages (GPA), coupled with Scholastic Aptitude Test or Scholastic Assessment Test (SAT) or American College Testing (ACT) test results, as good predictors of undergraduate GPA in the first academic year, but were of little value in predicting persistence to graduation (Truell & Woosley, 2008). Similarly, undergraduate GPA and Graduate Management Admission Test (GMAT) results are used to screen applicants and to predict success in master in business administration (MBA) programs, and are recognized as standard instruments to assess a student’s academic readiness for graduate business school (Heckman & Schultz, 2005).

**Criterion Variable Selection**

The Graduate Management Admission Council (GMAC), which develops and administers the GMAT, reported that nearly 90% of MBA and other business-related graduates found employment after graduation in 2010 (GMAC, 2010). This is good news for students when considering the wage premium of an academic degree. The allure of employment drives growth in both undergraduate and graduate business majors. Data from the *2010 Statistical Abstract of the United States* shows 14.3% of students in 2009—nearly one in eight—chose a business-related major, making business the largest undergraduate field of study (U.S. Census Bureau, 2011).

As a forward-looking predictor of student performance in a graduate program, the GMAT provides a lens with which to examine variables and changes that impact student success in the four-year undergraduate experience. This research was guided by Astin’s
Input-Environment-Outcomes (I-E-O) data analysis framework to assess the influence input and environment variables, independently or collectively, have on student performance. The majority of existing academic research on the impact of input and environment variables uses student undergraduate GPA as the dependent variable in regression and correlational studies. However, this research used GMAT scores as the dependent variable (DV) in a blocked stepwise regression (also known as hierarchical regression) analysis to identify undergraduate experiences that impact the GMAT composite score. Using the GMAT composite score, this study removed the inherent subjectivity and criticisms attached to the undergraduate GPA due to grade inflation and differences in institutional rigor.

The evaluation of any test instrument hinges on two factors, reliability and validity (Tavakol & Dennick, 2011). The reliability of a test instrument is the ability to repeatedly produce the same results on successive attempts. Cronbach’s alpha is the statistical measure of the degree of reliability that a test instrument will produce consistent results (Tavakol & Dennick, 2011). The range of values for Cronbach’s alpha extends from 0 to 1, with 0 representing no consistency, and 1 representing complete consistency. Educational Testing Service (ETS) reports that the GMAT has an Cronbach’s alpha internal consistency of .90. Validity is a measure of the correlation between test results and the criterion variable, and has a range of values from 0 to 1. Research by Oh, Schmidt, Shaffer, and Lee (2008) found that original validity estimates for the GMAT were underestimated in predicting first-year graduate student GPAs (GGPA) and should be a revised value of .51. The blocked stepwise regression analysis
controlled for the influence of input predictor variables and provided the ability to assess the value each block of added variables contributed to this research.

To evaluate the predictor variables in the undergraduate experience to be considered, this study used data collected by the Higher Education Research Institute (HERI) as part of its Cooperative Institutional Research Program (CIRP). CIRP was created to assist survey research through the collection of data about student undergraduate experiences. CIRP’s The Freshman Survey (TFS) contains data from students at the beginning of their college career, while its College Senior Survey (CSS) provides information about the campus and academic experiences at the end of the undergraduate experience.

**Statement of the Problem**

The data on national graduation rates indicate that higher education institutions lack a clear understanding of the influences and factors that contribute to student success. The fact that roughly half of students who enroll in higher education fail to earn their degree within six years has become a lightning rod for critics of higher education, and a source of concern both for higher education administrators and stakeholders alike. Previous studies have used undergraduate GPA as a means to identify undergraduate experiences that have the greatest influence on student success. However, GPA is a subjective measure of academic performance, subject to variances in institutional and program rigor and grade inflation.

**GPA and SAT Comparison**

Research conducted by the College Board illustrates the problem associated with using high school GPA as a measure of student performance. During the research period
1996 to 2006, the high school GPA rose from 2.636 to 2.884 (Godfrey, 2011). However, SAT verbal scores in 1996, 2001, and 2006 showed no change. College and university GPA’s for public and private institutions for the academic years 1991-92, 1996-97, 2001-02, and 2006-07 were 2.93, 2.99, 3.07, and 3.11 respectively (Rojstaczer, 2010). Figure 1 shows the difference between private and public higher education GPA scores over a 15-year period. There is no consistency in grading between colleges and universities. Even within the same institution, there is much variability in the assignment of grades (Johnson, 1997). Johnson also points out that, within the same course, there are differences in assigning grades based on objective and subjective influences. The subjective portion is unique to each instructor and is an attempt to account for the instructors’ perception of student effort. By continuing to use this data to make admission decisions, higher education administrators are prone to mistakes (Rojstaczer & Healy, 2010). According to the College Board, combined SAT scores for 1991 averaged 994.18 and declined to 992.98 by 2006 (Rojstaczer, http://www.gradeinflation.com/, 2010). The question and conflict that arises based upon this data is, how can college GPAs increase, while SAT scores decline?

The ACT composite score reflects a similar trend for the five-year time period of 1999-2000 through 2003-2004, reporting an average score of 21.0, 21.0, 20.8, 20.8, and 20.9 respectively (American College Testing [ACT], 2004). The ACT composite score reflects scores in English, math, reading, and science. ACT math scores during the period coinciding with the time frame of the data used in this study were 20.7, 20.7, 20.6, 20.6, and 20.7. The corresponding English scores for this period were 20.5, 20.5, 20.2, 20.3, and 20.4. These scores on standardized external exams do not reflect the same
increases that are occurring in the GPA (ACT, 2004). These test results, coupled with the SAT composite score, indicate that student GPA scores are moving upward, which is inconsistent with other academic measures.

Figure 1. College GPAs, 15-year trend (ACT, 2004).

The Dependent Variable

The undergraduate GPA has been used in many similar studies as the dependent variable. The evidence indicates that this variable is subject to intra- and inter-institution grade inflation that introduces uncontrolled variability, and could distort the results of studies that use it.

By using an objective measure—student performance on the GMAT—key variables may be isolated so that higher education administrators can focus on those factors in the undergraduate experience that most influence student success.
Purpose of the Study

The purpose of this research was to determine what influence, if any, input and environment variables have on student success, as measured by performance on the GMAT composite score. CIRP’s CSS, which contains the GMAT composite score, was merged with its TFS to create a record of changes that occurred during the college experience. The merged data set was used for this study.

Conceptual Framework

Astin’s (1977, 1984) I-E-O data analysis framework guided this research. The focus of the I-E-O data analysis framework is on the outcomes aspect of student learning, or what Astin refers to as talent development. Astin theorizes that student success—the outcome—is affected by student characteristics and abilities upon entering college, which he refers to as the input variables. Examples of input variables include high school GPA, SAT and ACT scores, and other attributes and characteristics that could impact student success. Astin also posits that during the college experience, students are affected by academic activities and surroundings, which he refers to as either within-college or between-college variables. Within-college variables can be subdivided into blocks that include: campus climate, such as participation in multicultural activities, diversity initiatives, and community service events, among others; faculty-student interactions, such as working on research projects, advising, conducting joint presentations, mentoring, teaching a class, or being a guest in a faculty member’s home; student-student interactions, such as working on group projects, tutoring, or participating in other social activities; involvement in college experiences, such as participating in an internship, working on campus, being elected to an office, or joining a group or club; non-college
involvements, such as getting married, engaging in off-campus employment, or commuting to campus; and, intermediate educational outcomes, such as attaining honors distinction, being satisfied with lab facilities, and identifying degree aspirations on the CIRP CSS. Between-college variables are characteristics that differentiate institutions by type (i.e., two-year, four-year, university) or control (i.e., public, private, for-profit).

**Theoretical Framework**

Astin’s student involvement theory served as the theoretical framework for this research. Astin postulated that there is a direct relation between student involvement in college and academic achievement (Astin, 1993; Pascarella & Terenzini, 1991). The greater a student’s social, physical, and psychological commitment to college activities, the more likely the student is to graduate. The student involvement theory transforms the thinking about student learning and development from course content, resource acquisition and use, and individualized instructional methods, to more engagement and active participation of students (Astin, 1994).

Astin (1994) provided two characterizations of students to illustrate his point. One student is highly motivated academically, is actively involved in his/her studies, reads assignments, meets with faculty, participates in class, completes homework, is involved in activities outside of class, and is more likely to succeed in college. The second student is unprepared for class, does not complete assignments, may skip classes, is not active in campus activities, does not meet with faculty, and is less likely to succeed. Astin’s examples characterize the polar extremes in student behavior that is the key to performance and success. Astin also indicated that most students lie on a continuum between these two extremes. Astin introduced the phrase “time on task” (1994, p. 518)
as a descriptor of student involvement or the effort a student puts forth on assignments and other academic activities. In separate research, Tinto (1994) found that the very factors Astin identified as contributing to student success, persistence, and graduation are missing in students who leave college without graduating.

Tinto illustrated this point in his Academic and Social Integration Model (see Figure 2). The student environment is comprised of the Academic Integration and Social Integration domains. The Academic Integration Domain consists of the student Academic Performance and Faculty/Staff Interaction. Students who experience academic difficulties are more likely to withdraw from school or to face academic dismissal. The student who perceives a lack of support or interaction with faculty/staff is very much at risk. The Social Integration Domain consists of Extracurricular Activities and Peer Group Interactions. Students lacking in extracurricular activities have less contact within the college environment and less to look forward to in their academic experience. Peer group interaction is a key ingredient that transforms the college experience away from a solitary activity and creates a feeling of community and belonging. The stronger a student’s Academic and Social Integration, the more likely he or she will remain in college.

*Figure 2. Tinto’s Academic and Social Integration Model (1994, p. 114).*
Research Questions

The research questions addressed in this study were:

1. What influence, if any, do entering student characteristics have on performance on the GMAT composite score?
2. What influence, if any, do between-college variable categories have on performance on the GMAT composite score?
3. What influence, if any, do student-student interaction variables have on performance on the GMAT composite score?
4. What influence, if any, do student-faculty interaction variables have on performance on the GMAT composite score?
5. What influence, if any, do campus climate variables have on performance on the GMAT composite score?
6. What influence, if any, do involvements in college activity variables have on performance on the GMAT composite score?
7. What influence, if any, do involvements in non-college activity variables have on performance on the GMAT composite score?
8. What influence, if any, do intermediate educational outcomes variables have on performance on the GMAT composite score?

The many variables in the student environment contained in CIRP’s TFS and CSS surveys required the researcher to create categories of independent variables to measure their impact on GMAT scores. The categories for segmenting variables included input, within-college, and between-college categories (Astin, 1970). The input variable category included data about student academic performance at the point of entry into
college, including high school GPA and results on standardized tests. The within-college category contained variables related to a student’s interaction with faculty, fellow students, advisors, and support staff. The between-college category included institutional variables such as size and control.

**Significance of the Study**

This study used a standardized graduate admissions test score—the GMAT composite score—as the dependent variable to identify variables that influence student success. The common scale of this standardized test eliminated potential variances caused by differences in grading policies and institutional or program rigor when using undergraduate GPA as the measure of academic success. This research focused on the change in students throughout their college career by using data from CIRP’s TFS and CSS surveys.

**Definition of Terms**

American College Testing (ACT) – ACT provides an assessment test of a student’s high school academic achievement and readiness for college. The ACT test covers English, reading, math, science, and writing.

Association for Institutional Research (AIR) – AIR is the administrative body for the National Postsecondary Education Cooperative (NPEC) responsible for managing grants and publishing research results.

At-risk students – These are students with low academic abilities, who are economically disadvantaged, or who are first-generation students.
Authentic assessment – An assessment designed to measure student abilities on jobs and tasks encountered in the workplace. The job requirements and tasks form the basis of the curriculum, and a rubric is used to assess student mastery of workplace skills.

Between-college variables – A category of variables or characteristics that distinguish educational institutions. Examples include alumni earnings, tuition, job placement rates, number and rank of faculty, scholarships granted, and institutional reputation.

Blocked variables – The process of categorizing or grouping variables related to a common theme.

Brookings Institution – A private, non-profit organization that performs research and provides consulting services on a variety of topics.

Bureau of Labor Statistics (BLS) – The U.S. BLS is the primary agency for investigating and reporting labor economics and statistics.

Certified Public Accountant (CPA) – The CPA is a designation an accountant earns by demonstrating technical expertise or competence in the field of accounting. Accountants may not offer services to the general public without this designation.

College Board – Organization providing communication, research, and testing to the educational community designed to facilitate excellence in education and providing students a pathway to higher education.

College Level Examination Program (CLEP) – Established and administered by the College Board, CLEP consists of tests in key areas used by colleges and universities to assess student learning and to grant credit based upon test results.
College Senior Survey (CSS) – Survey administered by the Higher Education Research Institute as students complete their undergraduate program.

Collegiate Assessment of Academic Proficiency (CAAP) – An exam administered by ACT for general education outcomes assessment, usually at the end of the high school sophomore year.

Cooperative Institutional Research Program (CIRP) – CIRP maintains the largest database of information on students, tracking longitudinal information since 1966. Since 1973, CIRP surveys have been administrated by the Higher Education Research Institute (HERI).

Correlation – Statistical method used to identify the relationship between two or more variables. The correlation is expressed as a value that is either positive, indicating a positive or direct relationship, or negative, representing a negative or inverse relationship. An important aspect in correlation is that two or more variables may be related to each other, but correlation is not an indication of causation.

Dependent variable – In a statistical analysis, the dependent variable is observed for changes as the independent variable is manipulated. An example might be the impact of study time (the independent variable) on GPA (the dependent variable).

Direct assessment – Data collected from the results of tasks or activities performed by students. An example is the score received on an algebra test or an essay.

DOE – Abbreviation for the U.S. Department of Education.

ETS – Abbreviation for Educational Testing Service, an assessment development and research organization, which administers a variety of test instruments.
Freshman Survey – Survey administered by the Higher Education Research Institute as students begin their educational careers.

Higher Education Research Institute (HERI) – HERI is located at the University of California, Los Angeles, and was created to collect and store student data as an accurate record of change in higher education.

I-E-O Model – The Input-Environment-Outcomes data analysis framework developed by Astin to organize and analyze the college experience and its impact on student learning.

Independent variable – In statistics, independent variables are naturally occurring variations that may affect a dependent variable positively, negatively, or not at all.

Indirect assessment – Evaluation using reports of student abilities, not measurements of actual tasks performed by students.

Input variables – The abilities and characteristics of students as they enter college. Examples include high school GPA, ACT, or SAT scores, and involvement in high school extracurricular activities.

Interdisciplinary course – A course that requires application of skills acquired across several academic fields, which otherwise could not be addressed in a single course (Callahan, Breakwell, & Suhayda, 2011).

Intermediate educational outcomes – This category includes variables such as satisfaction with the library facilities, computer center, laboratory and equipment, perceived quality of instruction, opportunities for extracurricular activities, advising, and career counseling.
National Postsecondary Education Cooperative (NPEC) – A branch of the U.S. Department of Education that provides a communication research conduit to higher education.

Partialled out – In a regression analysis, an independent variable exerts an influence on the dependent variable, masking the influence or true impact of other variables. Sequentially regressing—using those variables that need to be partialled out first—allows for the true impact of subsequent variables to be determined by the incremental regression values.

Performance-based funding – A funding model that uses student performance as the basis for state subsidy. Used as an alternative to subsidy based upon enrollment only.

Preliminary Scholastic Assessment Test (PSAT) – PSAT measures a student’s abilities in reading, mathematics, and writing.

Regression – The analysis provides a numeric coefficient representing the amount of influence the independent variable(s) has on the dependent variable.

Scholastic Assessment Test (SAT) – Formerly the Scholastic Aptitude Test, the SAT was developed by the College Board and is used to assess student abilities and readiness for college.

Statistical Abstract of the United States – A U.S. Census Bureau publication of social, economic, political statistics.

Statistical Package for Social Science (SPSS) – SPSS is a software package used to perform statistical data analysis. SPSS version 17 was the software used for this study.

Swirling – The term used to describe the act of students who attend more than one institution to accumulate college credit (McCormick & Carroll, 1997).
Within-college – Category of variables that relate to student interaction with faculty, fellow students, advisors, and support staff.

Assumptions

This research made several assumptions about the data. The first was that student responses on CIRP’s TFS and CSS surveys reflected their best effort and truthfulness. A second assumption was that students performed at their highest potential on the GMAT exam because of its importance to the MBA admission decision, or as a factor bearing on future employment. In addition to the consequences to career and college, the cost and time commitment involved in the GMAT exam also helps to ensure optimum student performance. Thirdly, the GMAT overcomes some criticisms and concerns when using cumulative GPA as a measure of academic success. The GMAT test contains two analytic, written portions, in addition to objective test sections that alleviate concerns about capstone exams that contain only objective questions. The GMAT also includes both verbal and computer adaptive segments that further remove it from purely objective, multiple-choice assessment tests (GMAC, 2010).

Limitations

According to Creswell (2007), limitations are weaknesses that may affect a study’s results. The first limitation of this study related to the assumption that students were accurate and truthful in their responses to CIRP’s TFS and CSS surveys. A second limitation is that only college graduates were used in this study, thereby eliminating the influence variables have on students who do not graduate. Eliminating students who do not graduate may exaggerate the positive or negative influence on the dependent variable.
Implications for Theory and Practice

There are two elements used in this study that may have an impact on theory and practice. The first element is the use of the GMAT test to assess student readiness and to predict performance in an MBA program as a dependent variable in a correlation and regression analysis study to identify variables that impact student success in the undergraduate experience. Most of the studies reviewed used undergraduate GPA as the target variable, not the composite GMAT test score, which was used in this study. A second element is the combination of CIRP’s TFS and CSS surveys to provide a perspective of changes students experience during their college career. This study examined the changes that occurred—or did not occur—to students during their college career, and the impact of these changes on student performance on the GMAT exam.

Conclusion

The results of this study provided information about the undergraduate experience to students, parents, administrators, and other stakeholders. This study identifies the critical success factors that influence student performance on the GMAT. Programming can be adjusted to modify key success factors in the undergraduate experience so as to improve results on student test performance. This study used results of the GMAT, an MBA program readiness exam, as an assessment tool to identify key areas in the undergraduate experience that affect student performance. A review of the literature found this may be the first time the GMAT exam was used to evaluate variables in the undergraduate experience, since Astin did the analysis for his book What Matters in College. Use of the GMAT external exam as the dependent variable addresses concerns that internal exams may not be as reliable an indicator of student academic abilities. In
addition to the consequences to career and college, the cost and time commitment involved in taking the GMAT exam also helps to ensure optimum student performance. The GMAT test overcomes some criticisms and concerns when using standardized tests. The GMAT test includes two analytic, written portions in addition to the objective test sections that help alleviate concerns about multiple-choice, capstone assessment exams. The GMAT also includes both verbal and computer adaptive segments that help further remove the GMAT from purely objective, multiple-choice assessment testing (GMAC, 2010). In addition, this study used merged data sets from CIRP’s TFS and CSS surveys to identify significant undergraduate variables that influence performance on the GMAT. The GMAT exam was revised in 1994 after Astin had completed his research for his book What Matters in College published in 1989. The changes to the GMAT exam in 2012 were driven by feedback from 740 business schools (Vatsa & Iqbal, 2012). The changes specifically addressed data analysis skills necessary for success in academic programs and careers.
Chapter Two

Literature Review

Introduction

This study examined factors that influence change in undergraduate students during their academic experience, and what, if any, impact the change or changes have on student achievement. The emphasis in assessing the impact of education today has shifted from student access to student achievement. This research will provide objective evidence as to the educational environment, leading to discussions and recommendations as to how to improve student achievement in undergraduate education. Identifying key variables that contribute to student success will provide decision makers with data to drive institutional changes in serving students and increasing student achievement.

This chapter reviews prior studies on the impact of college on students, and will lead to a greater understanding of the relationships between environmental variables and student achievement. The first task is to define student success, as it will be used in this review of the literature on student academic achievement. From this literature review, the second task is to identify key variables that influence student achievement. The literature review is organized into five sections: documenting educational quality; social and human capital; the Bowen Report; academic readiness exams; and, key variables from the research questions.

Documenting Education Quality

Several means have been used to identify quality education, including institutional measures, state involvement, federal government participation, regional
accreditation, secondary accreditation, and direct assessment of student performance. Each will be addressed in turn.

**Institutional measures.** One goal of education is “achieved by creating an environment to bring about a desired change in people” (Bowen, 1977, p. 13). Historically, stakeholders used appropriate measures of institutional growth, size of endowment funds, research grant approvals, capital improvements, number of majors, and other proxy measures as indicators of institutional quality (Astin, 1991). Expanding physical facilities may be an appropriate between-college factor, distinguishing one institution from another, but it is not a measure that demonstrates effective teaching, student learning, or achievement. Another method by which institutions communicate quality is to identify the research performed and grants received. While these indicators may indirectly benefit students, they do not directly measure or address student performance.

Today, stakeholders seek additional measures of quality teaching and effective student learning to make funding, enrollment, and academic decisions (Hutton, 2006). The federal government requires accreditation as a quality measure to provide federal financial aid. Accreditation has been used as a measure of quality assurance, and achieving accredited status communicates to stakeholders that a program or institution meets high standards (Eaton, 2009). Current, regional accreditation requirements include a focus on an institution’s mission, compliance with standards, preparation of an institutional self-study, and a peer-review evaluation and report (Brittingham, 2009).

**State involvement.** Beginning in the early 1970s, several states began to insist on direct measures of student performance, seeking to document that effective teaching
and learning was taking place so as to justify state subsidies of higher education (Black & Duhon, 2003). Early studies attempted to address whether or not a college education was a value-added experience that imparted knowledge to students. From a review of these studies, researchers were able to segment learning into two categories, general knowledge and specific knowledge (Bloom, 1964). The general education component category included courses in English, humanities, math, natural sciences, and social sciences (Harris & Hurst, 1972). In 1900, the College Board was created to improve access to higher education through the creation of standardized tests. These tests evolved and exist today as the Scholastic Assessment Test (SAT), the Preliminary Scholastic Assessment Test (PSAT), and the College Level Examination Program (CLEP). The emergence of these college-readiness exams to measure student academic ability is a significant milestone.

In an effort to document the value of the educational experience, the General Examination version of the CLEP was administered to freshmen entering Georgia College in 1966 and re-administered at the end of six quarters to the same student cohort (Harris & Hurst, 1972). The goal of the research was to demonstrate the intellectual gains that occurred during the college experience in the five subject areas covered by the CLEP exam—English, humanities, math, natural science, and social science. Results of the study showed that students gained between 31 and 61 points in the test’s five areas. Eleven other studies verified that graduating from college was a value-added experience by comparing results on the CLEP general education exam. Harris and Hurst found that all 177 students in the Georgia CLEP study had gains each year, with students with the lowest initial scores gaining the most, and those with the highest scores gaining the least.
Studies reviewed by Bloom (1964) and Harris and Hurst (1972) attempted to qualify the value of education by using an external examination. On the surface, the results appear to corroborate the claim that education improves student performance and achievement as measured on an exam. However, critics point out that these studies did not take into account external factors, such as employment, or input variables, which may also contribute to test score improvement.

Colleges and universities continued to report enrollment growth, new building construction, and higher endowments and numbers of graduates as proxy measures of quality and as evidence of their success in creating a “growth-inducing environment” (Bowen, 1977, p. 13). Institutional reports compiled in the early 1970s included performance information based on budgets, efficiency audits, and program reviews, but lacked any direct measures of student academic achievement (Black & Duhon, 2003). These same or similar factors were used as quality indicators to differentiate institutions, but lacked any direct measure of student academic performance (AASCU, 2005; Gutierrez & Dantes, 2009).

During the 1980s, the quality focus shifted to regional accrediting associations, even as criticism continued to mount that the criteria for accreditation, standards, and other requirements did not use direct measurements of student learning (Trout, 1979).

**Federal government participation.** Federal involvement in higher education has evolved over time, but initial control was the domain and responsibility of state governments. In 1862 and 1890, passage of the federal Morrill Acts ushered in a new era of federal and state involvement and control in the administration and curricular matters of post-secondary education. Known as the College Land Grant Acts, the Morrill Acts
provided each state with acreage to stimulate development of agricultural and mechanical, industrial education programs (Thelin, 2004). The Morrill Acts changed education by providing federal funding and, by extension, federal control, and transitioning education to include applied education.

The progressive direction and federal control of higher education was also exhibited by the recommendations of the Spellings Commission in 2006. Appointed by the U.S. Secretary of Education, and formally known as the Commission on the Future of Higher Education, the Spellings Commission concluded that direct assessment of student learning must be in place to document effective teaching and student achievement (Ewell, 2008). The requirements of state and federal governments and accrediting associations for measures of accountability have led educational institutions to implement measures to document student learning. Many institutions have adopted external testing as the method to demonstrate that their programs are value-added (Schaffhauser, 2011). These authentic assessments document the learning acquired by students in specific content areas and a student’s readiness to perform in a career. The Certified Public Accountant (CPA) exam for accounting students is an example of an end-of-program test used to confirm both quality teaching and student learning.

**Regional accreditation.** Regional accreditation emerged as a default quality indicator in the 1950s to satisfy the government’s need to provide public assurance that federal funding under the GI (Government Issue) Bill did not support diploma mills and other educational charlatans (Thelin, 2004). Regional accreditation evolved from a system of industry oversight by leading institutions and relied on peer review, relieving
the government of any requirement to create and manage another government agency.

Without regional accreditation, a college is not eligible for federal Pell Grant funding.

**Secondary accreditation.** The emergence of the multiversity, institutional growth, and the complexity of college and university programs have led stakeholders to look for additional quality indicators. Secondary or specialized accreditation has emerged as a quality indicator that colleges and universities use to attract students and funding, and to enhance institutional prestige and image (Tullis & Camey, 2007). Secondary or specialized accreditation occurs in many disciplines and on an international basis. Examples include the National League for Nursing (NLN), the National Council for Accreditation of Teacher Education (NCATE), the Association to Advance Collegiate Schools of Business (AACSB), and the Accreditation Council for Business Schools and Programs (ACBSP). Colleges and universities earn programmatic accreditation by demonstrating compliance with standards, submitting to a self-study, agreeing to an on-site review by a team of peers, and attaining and maintaining accredited status. Although attaining both regional and secondary accreditation are commendable, and speak to an institution’s ability to deliver quality education, stakeholders demand performance based upon direct student measures.

Until recently, standards established by regional and specialized accrediting bodies have dealt primarily with inputs and environment factors, and have not focused on direct measures of student achievement. Accountability for student learning outcomes is not a new concept; historical records dating from 1642 show that the Massachusetts Colonial Legislature imposed fines for parents who did not provide their children with appropriate instruction (Rothstein, Jacobsen, & Wilder, 2009). In the 18th century, Aaron
Burk, John Witherspoon, and Ben Franklin expressed concerns about the ability of education to prepare young men with skills to establish a career, manage finances, and contribute to society (Vine, 1976).

**Assessing student performance.** Today, like a tsunami racing across the ocean, there is growing concern, speculation, and doubt about the abilities of college graduates to perform in the job market. The U.S. Department of Education (DOE) has expressed its concern as to whether students will be able to pay off their loans from wages earned from employment with “degrees and credentials that are of little value” (Sanchez, 2010, p. 1). Stakeholders, including employers, taxpayers, funding sources, students, and parents, are calling for more accountability and evidence that students receive a quality education and are competent and capable of establishing a career, managing finances, and contributing to society after graduation (Ewell, 2008).

In response to assessment demands, Astin (1985) created the Input-Environment-Outcomes (I-E-O) data analysis framework. The focus of the I-E-O data analysis framework is on the outcomes aspect of student learning, or what Astin refers to as talent development. As students arrive at college, they bring their accumulated attitudes and abilities, which Astin refers to as inputs. The physical and intellectual resources an institution provides are the environment category, or the student growth-inducing category. The outcomes category refers to the results of student effort or student learning, or what Astin refers to as talent development in his I-E-O data analysis framework. In addition to the I-E-O data analysis framework, Astin posits that there is a direct relation between student involvement in college and academic achievement (Astin,
Astin’s Involvement Theory will be used to guide the selection of variables examined in this research.

Today, as in the 1700s, stakeholders express the same concerns as to the effectiveness of education to provide young adults the wherewithal to establish a career, manage financial affairs, participate actively in governance, and provide social and economic stability (Vine, 1976). Higher education has long been seen as a benefit to both the individual and the public at large, yet, its current outcomes fuel the debate as to its overall value, and who should pay for it.

**Social and Human Capital**

In 1904, Max Weber attributed economic prosperity to a Protestant work ethic, but recent research provides an alternative theory. The increased level of education through reading the Bible was highly correlated to prosperity (Becker & Woessmann, 2009). Individuals who fail to attain a college degree or increase personal human capital have fewer job opportunities and are disadvantaged financially, compared to peers who obtain degrees (Prevatt, Li, Welles, Festa-Dreher, Yelland, & Lee, 2011). The U.S. Bureau of Labor Statistics confirms that employment and economic benefits increase at all levels of education (Romans, 2011). These results are consistent with the research on Human Capital Theory: that increased levels of education have a significant and positive impact on salary (Xiao, 2001).

As the operating costs, capital costs, and foregone income associated with higher education continue to increase, the demand for efficiency and accountability measures also increase—along with demand to demonstrate to stakeholders that education is value-added. Another problem that has surfaced is that students who prepare for college in high
school and enroll in college are not graduating. Those who do are taking, on average, six years of coursework to complete their undergraduate degrees, making the title ‘four-year degree’ a misnomer (National Center for Higher Education Management Systems [NCHEMS], 2013). Individuals are evaluating the cost of education and comparing the benefits of future salary using an analysis similar to the Ben-Porath Model of Human Capital Theory, which posits that if individuals perceive future earnings will decrease, they will likely curtail initiatives that increase human capital, such as education or training (Andolfatto, Ferrall, & Gomme, 2000). This problem related to graduation rates has caused some to refer to colleges and universities as failure factories (Leonhardt, 2009) or to compare declining college graduation rates to ships that go missing in the Bermuda Triangle (Esch, 2009).

As a starting point in determining an appropriate measure of student success, the 2007 Association for the Study of Higher Education Report summarized several measures of student success, including GPA, performance on certifying exams, and scores on graduate school readiness exam scores (Kuh, Kinzie, Buckley, Bridges, & Hayek, 2007). Institutions have used the number of graduates and graduation rates as measures of institutional performance and quality, but both lack direct measures of student performance and demonstrated mastery of learning outcomes.

**The Bowen Report**

The Bowen Report recapped an analysis of an estimated 10,000 studies that examined the impact of college on students. Bowen divided these studies into three eras—the Early Period, Middle Period, and the Recent Period (Bowen, 1977). From the
research, Bowen identified the primary institutional function as education, research, and public service.

**Early period studies.** Early Period (prior to 1965) studies looked for data that corroborated institutional success or documented incremental annual gains in learning, using student GPA as an appropriate measure. There are three major concerns to using GPA as a dependent variable to measure student success. First, GPA does not take into account institutional or programmatic rigor. GPA is influenced by institutional selectivity, grading policies, and instructional delivery methods, and may not be the most consistent measure of student performance. With respect to academic rigor, students transferring from two-year colleges to four-year colleges have higher GPAs, while their scores on standardized tests, such as the ACT, were initially lower, leading one to ask how student overall GPAs can be higher for students with lower standardized test scores (Carlan & Byxbe, 2000). Second, grade inflation has been a recurring problem for more than 40 years, eroding the utility of GPA as representative of student performance (Wongsurawat, 2009). Because of the issue of grade inflation, use of GPA as a measure of achievement is a source of concern for academic researchers (Abedi, 1991). Another concern of the studies reviewed is that most studies used small sample sizes, leading Abedi to conclude that GPA is not a good predictor of academic achievement due to its lack of reliability and validity. The GPA was created in the 18th century, and copied a method used to evaluate job performance among workers, where an A represented superior quality, B progressively less quality than A, C progressively less quality than B, and so on (Soh, 2011). This letter-grading scheme was adopted long before modern student assessment techniques were refined. The final concern regarding use of the GPA
as a dependent variable to measure student success is that, while the GPA is useful in ranking or indexing students, it is considered a short-term measure of student performance within an institution (Truell & Woosley, 2008).

Early Period studies reviewed by Bowen were flawed because they made no attempt to account for the influence of inputs, impact of work, or other environmental factors on student performance. Without a segregation or attempt to partial-out these influences, there was no way to say that student learning was exclusively the result of the institution’s effort. The research that was conducted had no control groups, and generally overstated gains in student learning. According to the literature as to how college affects students, early-period studies were commissioned to determine whether education was value-added when students attended college. From a research point of view, these studies fell short in confirming a value-added experience (Bowen, 1977).

**Authentic external assessment.** These studies signaled a transition to the use of general-purpose exams to document the benefits of a college education. Three important criticisms emerged from these early studies. First, there were no control groups (those not attending college) by which to compare the treatment group (those attending college). Could individuals in the non-treatment group have had similar gains had they taken the assessment? Second, there was no effort to account for the impact of student ability and talent prior to the assessment process. Finally, variables such as work, family, and community were not accounted for when measuring student success. An exam like CLEP creates a uniform scale that is better than a GPA when comparing student achievement within- and between-institutions. The GPA offers a short-term perspective,
while external testing provides a longer-term, summative perspective of student abilities and, in some cases, can be used to effectively predict future performance.

Bloom’s (1964) review indicated there were greater gains in specific knowledge versus general knowledge. This anomaly marks the emergence of the economic aspect in gauging the value education imparts to students, and fuels the fire of who should pay for college. The economic perspective for both individuals and society focused on the cost of education, and stakeholders began to focus on the concept of return-on-investment (ROI). Human Capital Theory identifies how increased education benefits employees, firms, and the community in the form of improved skills and wages, greater employee retention, increased community services, and higher tax revenues (Becker, 1994). A good example of Human Capital Theory is the current nation-wide nursing shortage. Human Capital Theory is used by communities and medical facilities to attract and retain nursing staff through higher wages, better benefits, and improved working conditions, so as to attract a well-educated workforce that improves patient care (Clark & Allison-Jones, 2011). A continuation of this example is the creation of clinical sites at hospitals and other health care facilities, where nursing students can complete graduation requirements while meeting the demand for nurses (Hayami, 2009).

**Middle period.** The Middle Period (from 1966 to 1972) changed the focus of these studies to one using an economic basis. Based on the ROI model, the research shows an inverse relationship between ROI and years of education; the more years of education an individual earns, the greater the costs, thereby reducing the return. One outcome of the Harris and Hurst report (1972) was that student gains in specific knowledge were greater than in general knowledge. During this period, there was
competition for financial resources to invest in both physical capital and human capital. Individuals were interested in talent development through education to enhance career opportunities and to maximize potential income.

**Recent period.** Recent Period (1973 and later) studies on the impact of education on students ushered in a new era that included an accounting for the innate abilities of students as they started their education. These studies controlled for and made adjustments for work and environmental factors that could influence student performance. Studies in this period used student scores on standardized tests to document effective teaching and student learning.

**Academic Readiness Exams**

The Graduate Management Admission Council (GMAC) reports that in 2010, nearly 90% of Master of Business Administration (MBA) and other business-related graduates found employment after graduation (GMAC, 2010). The allure of employment is a factor driving growth in both MBA and undergraduate business programs. The Graduate Management Admission Test (GMAT), administered by GMAC, is an exam used as a screening tool for admission into an MBA program. Historically, student high school GPAs, coupled with Scholastic Assessment Test (SAT) or American College Test (ACT) scores, were good predictors of undergraduate GPA for the first academic year, but were of little value in predicting persistence to graduation (Truell & Woosley, 2008). Similarly, undergraduate GPA and GMAT scores are used to screen applicants and to predict graduation, and are recognized as the standard instrument to assess student academic readiness for MBA programs (Heckman & Schultz, 2005). As a predictor of student performance in a graduate program, the GMAT provides a lens to examine
variables and changes in the four-year undergraduate experience that impact student success in an MBA program. The majority of academic research uses student GPA as the dependent variable in regression studies to measure student success. In addition to objective tests sections, the GMAT includes two analytic, written portions to alleviate concerns about capstone exams. The GMAT also includes both verbal and computer adaptive segments to help further remove the test’s image as a purely objective, multiple-choice assessment test (GMAC, 2010). Research by the University of Florida and the University of Iowa indicate that GMAT scores are the best single predictor of student success in an MBA program (Fisher & Resnick, 1990), even more significant than the undergraduate GPA (Schwartz, Stowe, & Sendall, 2008). Research studies on the GMAT scores and MBA program success have very high validity coefficients (Talento-Miller & Rudner, 2008). Research into the strength of the GMAT exam as a tool to predict future success would make the GMAT exam a useful tool to assess undergraduate student performance.

**Key Research Question Variables**

Key variables within each research question emerged from the literature. This literature review organizes independent variables into blocks that correspond to the research questions for analysis. The blocks include independent variables for precollege attributes, between-college characteristics, and the college environment. The college environment includes the student-student interaction, faculty-student interaction, campus climate, within-college activities, non-college activities, and intermediate college outcomes blocks.
In the first research question -- “What influence, if any, do entering student characteristics have on performance on the GMAT composite score?”—variables that have the most influence on student performance, according to Astin (1970) and House (1999), are high school GPA and SAT, ACT, PSAT, and other standardized test scores. A student’s confidence in his or her academic abilities going into college has also been a topic of research (Laird, 2005; Pryor et al., 2013; Zajacova, Lynch, & Espenshade, 2005).

**Precollege Variable Block**

Variables in this block correspond to the first research question, and represent students’ characteristics, attitudes, and abilities as they enter college. The academic variables that reflect student abilities include SAT and ACT standardized test scores, high school GPA, and class rank.

According to Pike and Saupe (2002), high school grades were strong predictors of performance during the first year of college. In their study, college GPA was the dependent variable, and the ACT composite score and high school class rank emerged as significant predictors of student success.

High school GPA and SAT scores were the top variables in predicting student performance in college, as measured by college GPA (Astin & Oseguera, 2005). Astin and Oseguera found that students with the highest average in high school graduate with a bachelor’s degree at seven times the rate of students who matriculate with a C average.

According to Wolfe and Johnson (1995), high school GPA accounted for about 19% of the variability in student performance in college, while the SAT score accounted for 18% of the variability. When combined, high school GPA and SAT scores accounted for 25% of the differences in student performance in college (Wolfe & Johnson, 1995).
While ACT test scores were not strong predictors of college retention and persistence, high school GPA and class rank strongly influenced college success (Yu, Lin, Chen, & Kaufman, 2012).

Zhao and Kuh (2004) reported that the impact of precollege academic abilities were limited to the first year, and that factors in the college environment had a greater impact on academic performance after the first year. Research conducted by Astin and Oseguera (2005) found that the influence of high school grades on college student performance and graduation has been declining. Bean and Kuh (1984) found that after accounting for precollege academic abilities that none of the other variables had a significant long-term influence on student success.

**Between-College Block**

“What influence, if any, do between-college variables have on performance on the GMAT composite score?” is the second research question. Many researchers (Astin, 1993; Bowen, 1977; Pascarella & Terenzini, 2005; Tinto, 1994) have concluded that variables in the between-college category, including *Selectivity*, religious affiliation, institutional sex, geographic location, and institutional size and control, contribute little to student development. However, Korobova’s (2012) research found that institutions with public control had a positive influence on undergraduate GPA.

According to Astin and Oseguera (2005), the significant differences in graduation rates between public and private institutions—47.4% and 79.6% respectively—is related to the level of preparation of students before entering college. The major difference between the two institutional types is *Selectivity*, which is usually based on student SAT composite scores. SAT admissions cut-off scores are higher for the private colleges and
universities, compared to scores accepted by public institutions. Public institutions are generally required by their state legislatures to be open-enrollment access. Other institutional characteristics, including institutional sex, religious affiliation, geographic location, and size, contribute little to student development, according to Astin (1993).

Pascarella and Terenzini (2005) confirmed Astin’s findings that institutional size, institutional sex, and religious affiliation contribute little to student learning or academic growth. Bowen’s (1977) meta-analysis also found that institutional size, control, institutional sex, religious affiliation had no significant influence on student success. Adelman’s (2006) research found that institutional control, residential or commuter student populations, and institutional size had limited influence or “rarely breaks through as a stand-alone factor” on student success (p. 44).

The third research question is “What influence, if any, do student-student interaction variables have on performance on the GMAT composite score?” According to Astin (1993) and Tinto (1994), peer-interaction variables have the greatest influence on student development. Contact between students in support groups, mentorship activities, and through course and program advising have a positive impact on student retention and academic achievement (Astin, 1993; Kuh, Schuh, Whitt, & Kinzie, 2005; McCollum & Zamboanga, 2008).

**Student-Student Interaction Block**

Student-interaction block variables are a part of Tinto’s (1975) Social Integration model, and a major contributor in students’ matriculation decision and social adjustment and transition while in college. The Social Integration model found that, as students become more socially integrated, they become more committed to the college. This
commitment leads to greater academic persistence and effort on the part of students in achieving their academic goals (Reason, 2003). Pascarella and Terenzini (1991, 2005) found a strong, positive relationship between student interaction and undergraduate GPA. Astin (1993) also found a significant, positive influence of peer-to-peer interaction on GPA and persistence to graduation. Some examples in the Keup (2006) research of the first-year college student experience found a positive relationship in studying with other students, and discussing course material with other students.

**Student-Faculty Interaction Block**

Student-faculty interaction in- and out-of-class is a key contributor to effective education practices and student learning (Strauss & Volkwein, 2002). In addition to its positive academic impact, student-faculty interaction magnifies student effort on assignments and other class activities (Kuh & Hu, 2001). Outcalt and Shewes-Cox (2002) found that being a guest in a faculty home had a significant influence on grades. Tinto (2006) found that involvement or engagement activities in the first year contributed to student retention and success in subsequent years. The link that was most often lacking when examining student departure is faculty interaction in and out of the classroom. Kinzie, Kuh, Pascarella, Schuhm, Terenzini, and Whitt found that prompt feedback on homework and discussing both class assignments and research projects had a positive influence on student performance (Comeaux, 2005). The strongest correlation with measures of student success included collaborative learning, student-faculty interaction, and student-faculty collaboration on coursework and research projects (Carini et al., 2006). Conversely, Bean and Kuh (1984) found that informal student-faculty interaction had no influence on college GPA.
“What influence, if any, do student-faculty interaction variables have on performance on the GMAT composite score?” is the fourth research question. Student-faculty interaction variables have a mixed influence on student development. Comeaux (2005) found that faculty encouragement to pursue advanced degrees had little influence on student success, while Kuh et al. (2005) and Pascarella and Terenzini (2005) found the opposite – that student-faculty interaction and contact had a positive influence on student performance. Other researchers (Astin, 1993; Keup, 2006; Kuh & Hu, 2001; Kuh et al., 2005; Pascarella et al., 1996; Terenzini, Springer, & Pascarella, 1993; Terenzini, Springer, Pascarella, & Nora, 1995) found that a variety of experiences outside the classroom had a positive effect on learning.

The results of regression analysis found a strong positive influence on academic performance in both quality of instruction and the amount of contact with faculty (Keup, 2006). One of the main findings in the conclusion was a need by faculty to design opportunities into their courses to discuss assignments and advise students outside of the classroom. This helped to instill a stronger feeling of satisfaction with the institution overall and, specifically, the course and program of study.

The research by Kuh and Hu (2001) used the College Student Experiences Questionnaire (CSEQ) as a data source to investigate the influence, if any, between students and faculty. The results found that student-faculty interaction had a positive influence on academic gains, and the effort expended by students on assignments. The research also found that small colleges, and specifically small class sizes that allowed a more conducive environment to improving interaction, was a key. A second finding was that the interaction was stronger for upper-class students (juniors and seniors) than under
underclass students (freshman and sophomores). There were two reasons offered for this final point, including smaller class size and the academic abilities are stronger.

The Kuh et al. (2005) research reported an additional result for first-generation students, updating the 2001 research. The more academically prepared first-generation students were more inclined to contact faculty for advice, and were much more satisfied with their courses. This satisfaction was influenced by student confidence on academic work, leading to higher levels of effort and persistence.

The research conducted by Terenzini, Springer, Pascarella, & Nora (1995) used the Collegiate Assessment of Academic Proficiency (CAAP) to test the influence variables in the undergraduate experience had on students’ critical thinking skills. The results of regression analysis found faculty instruction in the classroom, and out-of-classroom experiences, had a significant influence on critical thinking skills. These results confirmed the findings in prior research by Terenzini, Springer, & Pascarella (1993) that in-class and out-of-class experiences accounted for 6% and 17% of the student variability in performance. The out-of-classroom experiences were more significant than the in-class experiences in both studies.

The fifth research question is “What influence, if any, do campus climate variables have on performance on the GMAT composite score?” Harper and Hurtado (2007) found that a warm, friendly, hospitable college climate increases student achievement, while a chilly environment, according to Henry, Fowler, and West (2011), acts as an academic distracter and drives students away.
Campus Climate Variables Block

Peer-to-peer interaction is an important determinant in the decision to stay in college or to leave, and orientation is an ideal forum to encourage student interaction and participation by joining clubs and organizations (Kuh et al., 2005; Tinto, 1975). These linkages lead to positive academic outcomes and persistence to graduation. One of five key benchmarks to effective education is to create a supportive campus environment that meets the needs of students, while helping to smooth the transition to college (Kuh, Gonyea, & Palmer, 2001). Living in residence halls provides opportunities to build social networks and strengthen peer relationships that lead to persistence to graduation (Yu et al., 2012). Yu et al. concluded that the structure and management of a residence hall provides an environment with less distraction from academic activities. Harper and Hurtado (2007) found in their research that a campus climate that is hospitable, warm and friendly increases student achievement, while a chilly or unfriendly environment, according to Henry, Fowler, and West (2011, p. 690), drives students away, and acts as an academic distracter.

Variables in the Involvement in College group, including joining a club, attending study groups, and taking an interdisciplinary course foster student development, according to Astin (1977), Tinto (1994), and Van Der Meer and Scott (2009). In the research conducted by Astin, two-thirds of the outcomes tested were influenced by involvement variables. Further, research by Schreyer-Bennethuma and Albright (2011) proved the lasting value of an interdisciplinary course series on student success as measured by undergraduate GPA. The results from this research will also provide
information for the next research question, “What influence, if any, do involvements in the college experience have on performance on the GMAT composite score?”

**Involvements in College Activity Block**

Participation in an interdisciplinary course provides a pathway for at-risk students to improve confidence in academic work, by building on their existing knowledge base and prior course work (Carini et al., 2006; Zhao & Kuh, 2004).

According to Tinto (1975), grades strongly impact student social integration, while at the same time influence a student’s decision to persist or to quit school. Bean (1980) equates the role grades have on a student’s persistence to graduate to the influence wages have on an employee’s decision to remain with or depart from an employer. In addition to grades, taking an interdisciplinary course, working on group projects in class, and completing extra work for a course also emerged as significant influences on student success. Variables that negatively impact student success include feeling bored in class, and not completing homework on time (Outcalt & Skewes-Cox, 2002). Students involved in college and course-related activities during their first year have a significant advantage on GPA, retention, and persistence to graduation, compared to students not similarly engaged (Van Der Meer & Scott, 2009). Astin (1977) found that involvement variables influenced two-thirds of the outcomes variables he tested.

The Spady sociological model focuses on why students leave college, and his research indicated that the driving factor was student grades (1970). Spady’s model paralleled Durkheim’s suicide theory: Lacking a strong social foundation and integration with the college, a student eventually quits attending (Spady, 1970). Tinto’s model
extended Spady’s theory by focusing on the academic and sociological aspects of a student’s relationship with an institution (Seidman, 2012).

The seventh research question is “What influence, if any, do involvements in non-college activities have on performance on the GMAT composite score?” Variables in the Non-College activities block distract students and have a negative influence on achievement and degree completion. According to Astin (1993) and Tinto (1994), key variables in this block include working off campus, getting married, commuting, and being bored in class. Squire (2003) investigated the impact of video games on student success, yet another non-college activity, and how this activity impacted student performance in a positive manner. Variables in this block tend to take time away from a student’s studies and, by extension, academic achievement (Bohra, 2009).

Non-College Activity Block

Working more than 15 hours a week negatively impacts student persistence, and students who work more than 15 hours a week are less likely to graduate than are students who work less than 15 hours a week (Choy, 1999). Employment distracts students from coursework, and lessens their ability to engage in college-sponsored activities. Working off campus is also a distraction, according to Hutto (2002), and negatively impacts both GPA and degree completion. The more time a student spends away from the college, its social network, and student contact, the more likely he or she will withdraw.

Intermediate Educational Outcomes Block

The last research question is “What influence, if any, do intermediate educational variables have on performance on the GMAT composite score?” Intermediate
Educational Outcomes include variables that represent activities occurring late in a student’s program, such as career counseling, interest in graduate school, and job placement services. These variables have mixed results on student performance, according to research conducted by Pascarella and Terenzini (2005). The literature suggests that these variables may have different influences, based on the student’s major.

This category focuses on variables that impact students after the first year, when most students have successfully transitioned to college. Research on the influence of these variables on student performance is mixed. As graduation approaches, student interest is more focused on career, and less on academics and graduate school. Faculty encouragement to pursue an advanced degree has little influence (Comeaux, 2005).

Service learning has a positive influence on student self-confidence and increases academic performance and persistence in college (Astin & Sax, 1998). Service learning projects increase in self-confidence and grades for participants, and a decrease in these outcomes for non-participants.

**Conclusion**

The review of research in the literature on the issue of precollege academic ability mainly focused on the variables GPA, ACT scores, and class rank. The recent research indicates that the ACT scores were limited in predicting success in college. Better predictors of student success were the undergraduate GPA and class rank. The high school GPA emerged from many studies as the top variable in predicting success in the first year of college, and students with higher school grades graduated at a higher rate than students with lower high school grades. The combination of two precollege variables, GPA and SAT, accounted for 25% of the differences in students at graduation.
The research reveals that the influence of high school GPA as a predictor has been declining. The influence of between-college variables reported in the research reports reviewed indicated that institutional size, control, selectivity, religious affiliation, and sex contributed very little to academic success. The strongest variables after matriculation in the research reviewed include student-faculty interaction in and out of the classroom. The faculty factor had a significant influence in student effort on class assignments, persistence, and academic performance. The student-student interaction emerged as a significant factor in studying and discussing course material. Social interaction was a strong positive influence on student persistence. The student-student interaction was also a key to building a student-friendly campus environment. The research indicates that a hostile environment causes students to leave and a friendly environment creates an atmosphere favorable to student success and persistence without distractors. Student involvement in college, including academic activities, had significantly higher GPAs, higher rates of retention, and persisted to graduation more often. The non-college-related activities acted as distractors, and negatively impacted academic achievement and persistence to graduation.

This chapter has been a literature review of the major topics supporting the research for this dissertation: the development of methods to ensure student educational outcomes, Astin’s involvement theory, studies analyzing various factors that influence student success, and how these factors will be addressed by this study’s research questions.

In his theory of student involvement, Astin (1977) proposed that an academic environment that encourages student involvement in the learning process will result in
greater student success. One way in which success can be measured is performance on a national standardized test.

Chapter Three describes the methodology used in this study on the influences undergraduate experiences have on student performance on the GMAT. Included in this chapter are descriptors of the participants used, the data source, and the approach used to identify input and environment factors influencing the dependent variable – GMAT composite exam scores.
Chapter Three

Methodology

Introduction

This chapter identifies the procedures used to assess the variables in the undergraduate environment that influence student academic achievement, as measured by performance on the Graduate Management Admission Test (GMAT). The major sections of this chapter include methodological approach, theoretical framework, participants, data selection, data collection, data representation, data analysis, and summary.

The research questions that are the focus of this study are:

1. What influence, if any, do entering student characteristics have on performance on the GMAT composite score?
2. What influence, if any, do between-college variables have on performance on the GMAT composite score?
3. What influence, if any, do student-student interaction variables have on performance on the GMAT composite score?
4. What influence, if any, do student-faculty interaction variables have on performance on the GMAT composite score?
5. What influence, if any, do campus multicultural variables have on performance on the GMAT composite score?
6. What influence, if any, do involvements in the college experience have on performance on the GMAT composite score?
7. What influence, if any, do involvements in non-college activities have on performance on the GMAT composite score?
8. What influence, if any, do intermediate educational variables have on performance on the GMAT composite score?

Data Acquisition

The request for access to the HERI database was completed in June, 2012 and reviewed by the committee in July, 2012. The committee denied the researcher’s original and subsequent data requests, giving the following explanation:

The committee did not feel that all of the variables in your originally proposed variable list were necessary given your research questions. The committee’s approved variable list is attached. (Dr. Kevin Eagan, personal communication, September 19, 2012)

On October 18, 2012, the data set arrived from HERI. After inspection, the data records contained major errors in the dependent variable, GMAT composite score. Of the 750 records received, 573 cases had data values for the GMAT score ranging from 8 to 80 compared to the expected range of values extending from 200 through 800, according to the Educational Testing Service (ETS). On October 21, 2012, the researcher brought this problem to HERI’s attention and requested assistance. HERI investigated the problem and, on October 24, 2012, provided a revised data set, having determined that the original file was corrupt. The second data set received was also determined to be corrupt. Removing the flawed data records from the original four-year cohort resulted in many fewer cases. The director of research at HERI then made the suggestion that the study years be increased to provide a sample of adequate size to use as a foundation for this study. To obtain an adequate sample, data from the Freshman Survey were increased to include the years 1998, 1999, and 2000 and merged with corresponding student records in the CSS for the years 2002, 2003, and 2004.
The final data set extracted from the CIRP database yielded 645 cases or data records. Some records were missing SAT math and verbal scores. The missing data for these records were replaced by data extracted from a concordance table converting the known ACT composite score into the missing SAT math and verbal score values. Thirty records did not have an ACT composite or SAT math or verbal scores and were removed from the database. Five cases did not have valid GMAT scores and were discarded, providing 640 observations or cases for this research.

The HERI Research Committee also determined the data fields they would approve to be released, based upon the dissertation study parameters, and granted an approved variable list. The data set included 107 variables that covered the three four-year cohorts of matching data from the TFS and CSS surveys.

**Methodological Approach**

In lieu of conducting a randomized experiment, this study used regression analysis to answer the research questions (Creswell, 2007). Pascarella (1997) noted that several studies have identified a link between student involvement and successful outcomes, such as persistence, graduation, and grade point average (GPA). Regression and correlation have been the preferred analysis tools, according to the literature review (Agliata & Renk, 2009; Culpepper & Davenport, 2009; Horn & McCoy, 2009; Jones-White, Radcliffe, Huesman, Jr., & Kellogg, 2010; Nonis & Hudson, 2010; Robbins, Allen, Casillas, Peterson, & Le, 2006; Strayhorn, 2009; Ullah & Wilson, 2007; Williams & Luo, 2010; Woosley & Miller, 2009). This research used the Statistical Package for Social Sciences (SPSS) software package, version 17, to perform the regression and correlational analyses.
The complexities of the transformation of students as they move through their college experience make it likely that results represent the cumulative effect a combination of variables have on student success. The first task is to determine which variables, if any, have a significant influence on student performance. To identify variables in the undergraduate experience that influence student academic achievement involves using correlation and regression analysis. The large number of variables in the data set used in this study required a prescreening process to identify variables to be used in the final analysis. The first step in the prescreening process was to use SPSS to perform multivariate correlation analysis with the GMAT composite exam score as the dependent criterion variable (DV), and the remaining variables as independent predictor variables (IVs). During this phase of analysis, variables with a correlation of .3 or greater and an alpha value of .05 or lower were selected for additional analysis. The second step was to use the regression analysis utility in SPSS to perform stepwise regression. The stepwise regression began by using variables from the input block to control for the influence of those variables representing the students’ abilities prior to entering college. This allowed for analysis and identification of the incremental influence of other variables, which represented the impact of the college environment. The process of entering the input variables is referred to as partialling out or controlling for base-line student abilities and allowed the researcher to make less biased, causal inferences about the influence of environment variables on the DV.

For this analysis, two sources of data provided information on student experiences and academic performance. The Higher Education Research Institute (HERI) at the University of California, Los Angeles (UCLA) created the Cooperative Institutional
Research Program (CIRP) to survey student expectations and experiences in college. The CSS, administered as the College Student Survey until 1994, provides information on a student’s academic and campus experiences at the end of the college career. CIRP’s TFS collects data from students entering college. This research used merged data from CIRP’s TFS and CSS surveys, including GMAT composite scores, for analysis. GMAT scores provide a uniform scale as the DV from which to perform correlation and regression analyses.

There are several reasons for using the GMAT exam as the DV in this research, instead of a more traditional measure of academic achievement, such as the undergraduate GPA or class rank. First, there are concerns that the undergraduate GPA is an inconsistent scale within any given institution and between institutions, and that the GPA introduces some variability and distortion into the research (Astin, 1991, 1993). Part of this distortion is due to grade inflation that has occurred over the last several decades, and the relative stability and lack of inflation in standardized test scores (Wongsurawat, 2009). Secondly, stakeholders place a great deal of confidence in the results of an externally prepared assessment test, as it represents a measure of both the effectiveness and quality of educational programs (Barilla, Jackson, & Mooney, 2008). Validity studies conducted independently at the University of Iowa and the University of Central Florida indicate the GMAT score is a better predictor of student academic achievement than had previously been determined by the Graduate Management Admission Council (GMAC, 2009) and that it more accurately predicts student performance when entering an MBA program than undergraduate GPA (Ahmadi, Raiszadeh, & Helms, 1997; Siegert, 2008). Finally, MBA admissions officers have been
able to more accurately predict student academic achievement when using an admissions selection model that includes GMAT scores (Bieker, 1996). The strength and accuracy of the GMAT compared to undergraduate GPA in predicting student academic achievement in an MBA program forms the justification for using the test as the DV in a regression analysis to assess the impact of environment variables on undergraduate academic achievement (Talento-Miller & Rudner, 2008).

Theoretical Framework

Astin’s (1991) Input-Environment-Outcomes (I-E-O) data analysis framework (see Figure 1) and student involvement theory (1977, 1984) were used to guide this research.

![Astin’s Input-Environment-Outcomes data analysis framework](image)

*Figure 3. Astin’s Input-Environment-Outcomes data analysis framework.*

The I-E-O data analysis framework consists of three categories of variables or characteristics that have an influence on students. Outcomes variables are measures of student academic achievement and are used to assess the impact of the other variables in the input and environment categories. The input category includes characteristics or abilities students have as they enter college. Examples include measures of high school academic preparation and performance, as measured by GPA, and scores on the SAT,
ACT, PSAT, or other standardized tests. Environment variables include two major categories, within-college and between-college. Examples in the within-college variable category include campus climate, faculty-student interaction, student-student interaction, student involvement in the college experience, non-college involvements, and intermediate educational outcomes. Between-college variables are characteristics that distinguish institutions, such as institutional selectivity, religious affiliation, institutional sex, regional location, and institutional size.

The I-E-O data analysis framework has three different combinations or pathways that connect input, environment, and outcomes variables. The first is the input-outcomes (I-O) path or the relationship between input and outcomes variables. Examples in this area include high school GPA and SAT, PSAT, ACT, or other standardized scores that represent a student’s academic abilities as he or she enters college, and the influence these scores have on the GMAT composite score. The second is the input-environment-outcomes (I-E-O) path, which indicates what influence, if any, both input and environment variables have on student outcomes. Finally, the environment-outcomes (E-O) pathway indicates the influence of environment variables upon student outcomes, after partialling out or controlling for the impact of input variables.

Astin’s student involvement theory postulates that student academic achievement is directly affected, or is a function of, a student’s social, physical, and psychological involvement in college. The same elements that Astin posits propel students to success was found missing from Tinto’s research (1994) of students who leave college. The variables in this research were organized into three broad categories, referred to as the input block, the between-college block, and the within-college block. Variables in the
input block represented the characteristics, abilities, and attitudes students have upon entering college, and are reflected in their responses on the CIRP TFS. As explained in Chapter Two, these variables have confounded previous research, because many studies made no attempt to partial out or control for the impact of student abilities as they entered college, so that the net effects of college environment variables could be more accurately assessed.

Input block variables can act as predictors of potential student success, but this study specifically targeted variables in the environment block, including between-college and within-college factors and their influence on student performance on the GMAT exam. The between-college category of variables included such factors as academic expenditures per student, ratio of students to faculty, tuition rates, and the ratio of terminal degree-qualified faculty as examples (Pascarella & Terenzini, 2005). The within-college variables included the efforts and interactions of the student, including organizational memberships, participation in sports, and interaction with faculty, among others.

Figure 2 depicts the I-E-O data analysis framework and includes examples of variables in each block. The first task of this research was to isolate the interrelationships of the IVs to the DV by using correlation analysis, and then to proceed with stepwise regression.

**Multicollinearity and Singularity**

In lieu of conducting an experiment that allows a researcher to collect data on one independent and one dependent variable while holding other variables constant, analysts use regression and correlation analyses. The benefits of these tools to identify IVs that
have a significant impact on a DV introduce potential problems of multicollinearity and singularity. When analyzing the relationship between two or more variables, researchers use Pearson’s R value to determine the strength of the relationship between the predictor IVs and the criterion DV.

Multicollinearity may exist when the value of the correlation coefficient $R$ between two IVs is .90 or greater (Tabachnick & Fidel, 2001). According to Tabachnick and Fidel (2001), this is the result of two IVs that essentially “measure the same thing” (p. 83). The solution is to remove one of the two variables from the correlation analysis.

Singularity is an extreme case of multicollinearity. It occurs when there is redundancy with two or more IVs having the same impact on a DV, also referred to as
being perfectly correlated (Abrams, 2002). In either the case of multicollinearity or singularity, the solution is to remove the variable causing the specific problem. The coefficients with multicollinearity present are unreliable and, if singularity exists, it is impossible to compute the coefficients.

**Participants**

The criteria used to select data from the HERI database were students who had completed the GMAT and the CIRP TFS and CSS surveys. CIRP databases include data collected since 1966 from more than 15 million students across more than 1,900 higher education institutions. HERI policies stipulate that a request by researchers for any four-year cohort data set will exclude records collected from the most recent three years. The request for data from HERI was for a four-year cohort for the academic years 2004-05 through 2007-08.

**Data Collection**

HERI created CIRP to facilitate research through the collection of data from students through instruments like the TFS and CSS surveys. A random sample of data were selected by CIRP from the HERI database repository. The TFS contains 359 variables, and the CSS contains 221 variables that were merged by HERI to create a composite record for each student. Variables from TFS were matched with corresponding variables in the CSS.

**Data representation.** Independent variables are measured on a continuous, categorical, or dichotomous scale. Some of the variable data represented student characteristics and abilities as they began college, and needed to be partialled out in the analysis to allow for a less biased estimate of the influence of college environment
variables on the DV. The dichotomous variables are represented by one of two conditions where the statement or question response is either yes/no or true/false. The DV for the analysis is the composite GMAT score. The GMAT composite score is measured on a discrete scale, with scores ranging from 200 to 800.

An experiment would be the best method by which to answer the research questions posed in this study. In lieu of an experiment with random data collection and a control group, regression and correlation are appropriate statistical analysis alternatives. Correlational analysis will be able to identify the strength of a relationship or association between two variables, but correlation does not demonstrate causation.

Data analysis. The research database contained the original 359 variables from CIRP’s TFS and the 221 variables from its CSS for a total of 580 variables. This research used SPSS to run a correlation analysis as a prescreening tool to reduce the number of variables ultimately used in this study’s regression analysis. The correlation screening process identified IVs with a correlation with the DV of .3 or higher and a level of .05 or lower for the level of significance. This study used correlation and regression analyses to determine if multicollinearity and singularity exists. A stepwise regression analysis used the remaining variables after the correlation prescreening of the IVs and the composite GMAT score as the DV.

Blocked Variables

The variables were organized into the following groups, referred to as the Input and Environment Blocks. Research summarized by Astin in *Four Critical Years* and *What Matters in College: Four Critical Years, Revisited* were the most cited references pertaining to research on undergraduate education (Budd, 1990). Astin indicated that
while some variables may influence student academic performance, other variables provide insight into persistence, retention, and other research interests.

**Input Block**

The input block was subdivided into pre-college test scores and other variable categories that include demographic and student perception data. The pretest category input block included the abilities of students as they entered college, including SAT, ACT, PSAT, and other test scores from high school as significant predictors of degree completion (House, 1999). All other variables, including high school GPA, were grouped under the other input block (Anaya, 1999). The input block was critically important to this research because, without identifying the impact of a student’s abilities and other profile information prior to entering college, it would have been impossible to identify the true value-added impact the college experience has upon student academic achievement (Astin, 1970). Astin points out that uncontrolled student input characteristics may have been the underlying causal factor(s) leading to student success and or degree attainment, confounding the research that identifies other factors.

**Environment Block**

The results of prior research in this category indicate that faculty and peers have a greater influence on student academic achievement than variables in the between-college block. Each block provides insight into which variables, if any, affect student academic achievement during college.

**Between-college block.** Some examples of characteristics that differentiate institutions include religious affiliation, institutional sex, geographic location,
institutional size and control, and institutional type. These institutional characteristics, according to Astin, contribute relatively little to student development (Astin, 1993).

In general terms, studies of more than 3,000 institutions of varying size and type cast doubt on the claim that institutional size and quality make a difference in student learning and growth (Pascarella & Terenzini, 2005), which is consistent with the review conducted by Bowen (1977). Essentially, none of the variables in the between-college block had a consistent impact on any of the outcome measures, with the exception of career and income. In studies conducted from the 1970s on, the impact of between-college variables is complicated by student swirling, wherein students attend more than one institution to accumulate college credits (Borden, 2004). Using a four-year cohort of data, studies revealed that more than half of all students studied had attended two colleges, and 40% had attended three or more colleges, making it difficult to identify the influence of between-college variables (Borden, 2004).

**Student-student interaction block.** In research conducted by Astin and others, peer influence had the greatest impact on student development, attending college, and leaving college (Astin, 1993). The peer-effect, including support groups, mentoring, and advising, has the greatest single impact on student development in transitioning to college (Kuh et al., 2005). Research conducted at Smith College indicated that academic achievement, as measured by standardized tests, is impacted by both faculty and peer relations (McCollum & Zamboanga, 2008).

Based upon the research conducted by Astin (1993), student-student block variables, such as group projects, participation in study groups, peer tutoring, and course-material discussions, show a positive influence on undergraduate GPA. Research
conducted by Pascarella and Terenzini (1991, 2005) indicated that peer influence had a significant positive effect on student academic achievement and that persistence and academic performance were strongly influenced by peer relationships and involvement in college activities.

**Student-faculty block.** In a recent study (Comeaux, 2005), faculty influence on students’ GPA was contingent upon how the faculty advised students on academic matters and the career guidance and advice students received to reach professional goals. Faculty encouragement to continue on to graduate school was not viewed as important as academic and career advice. Providing prompt feedback on homework, discussing assignments and research projects, establishing career goals, and general accessibility demonstrate faculty interest and concern for students, and act as a student motivator (Kuh et al., 2005).

Research conducted by Pascarella and Terenzini (1978) echoed results reported in studies by Astin, that student-faculty interaction was a significant contributor to student academic performance. Pascarella and Terenzini’s study used student GPA as the DV, and controlled for input characteristics of students. They found that student-faculty interaction, measured by frequency of contact or nature of contact (i.e., course-related, college-related, social, other), had a significant influence on persistence, retention, and satisfaction (Cotton & Wilson, 2006). Pascarella and Terenzini (2005) found that faculty interaction, both in the classroom and socially in a context beyond the course content, were some of the strongest influences on student performance on standardized tests.

**Campus climate block.** Campus climate is important in establishing a learning environment that fosters trust and openness between faculty and students alike. Campus
climate variables create a diverse, multicultural climate and develop a community among faculty and students. Factors that contribute positively to campus climate can be described as “behaviors within a workplace or learning environment, ranging from subtle to cumulative to dramatic that can influence whether an individual feels personally safe, listened to, valued, and treated fairly and with respect” (Henry et al., 2011, p. 690). The many facets of diversity, including ethnic, lesbian, gay, bisexual, transgendered (LGBT), and gender, need to be addressed on college campuses so that individuals feel comfortable in pursuing educational goals. When the environment is unfriendly, inhospitable, and hostile, the environment is referred to as chilly. The mixed-method research conducted by Henry, Fowler, and West (2011) indicated that an open and pleasant campus climate may help retain students, while a hostile or chilly climate interferes with education and leads some students to succumb to distractions and to leave college altogether. Research on campus climate and the impact on student academic achievement during college and after graduation indicate that, when conflict is reduced, student academic achievement is improved (Harper & Hurtado, 2007).

Astin’s 1993 report of analysis of the CIRP data from 1985 to 1989 determined that an institutional emphasis on diversity had a significant, positive impact on student performance on the Graduate Record Examination (GRE). Key variables in the CIRP database include developing a multicultural appreciation, and creating a multicultural environment.

**Involvements in college experience block.** Student retention is one aspect of student academic achievement that is directly related to engagement in campus activities during college (Van Der Meer & Scott, 2009). Joining clubs, attending study groups,
being a member of a team, working on a research project, or completing homework are examples of active engagement and involvement in college. Educational effectiveness and student learning are based upon the engagement and involvement of students and faculty in learning activities (Tinto, 1994).

Research conducted by Astin (1991) revealed that two-thirds of the outcome measures were positively impacted by the amount of student physical and psychological involvement in college. The direct relationship between involvements in college activities and student performance was greatest for students who were highly involved (Huang & Change, 2004).

**Involvement in non-college activity block.** This block or category represents activities that generally negatively affect student performance, either by distracting students from their academic pursuits, or by causing students to exhibit dissatisfaction with aspects of their education. Examples of variables in this block include working off-campus, getting married, commuting, becoming bored, and desiring a broader selection of classes. Individuals are affected by a broad range of environmental disturbances that act in combination, making it difficult to identify which distraction has the greatest negative impact (Tinto, 1994).

There is an inverse relationship to working full-time and GPA and a negative correlation with off-campus part-time employment (Astin, 1993). Getting married, commuting to campus, and watching television were activities in Astin’s research that had strong negative correlations with student academic performance.

**Intermediate educational outcomes block.** The focus of this block is on variables that reflect the student environment after the freshman year, when students have
successfully transitioned to college. The satisfaction variables from the CIRP CSS that may have the greatest influence, if any, on student performance on the GMAT include academic advising, career counseling, contact with faculty and career advice, interest in graduate school, and job placement services. According to Pascarella and Terenzini (2005), the research is mixed on the influence these variables have upon academic achievement.

**Summary**

This chapter detailed the methods used to identify variables that have the greatest influence on student academic achievement, as measured by student performance on the GMAT, controlling for input variables, determining their influence, and testing for multicollinearity. The major sections included the methodological approach, theoretical framework, data selection, collection, representation, and analysis.

The source of data was purchased from HERI and randomly retrieved from the CIRP TFS and CSS databases. The data from the survey records was merged on a student identifier so that each complete record reflected information at the onset and conclusion of a student’s college experience.

Chapter Four covers analysis of the data with findings according to each of the study’s research question.
The purpose of this research was to identify variables in the undergraduate environment that have an effect upon student success as measured by student performance on the Graduate Management Admission Test (GMAT) exam. Criticisms of prior studies have centered on the selection of a dependent variable and not controlling for student abilities prior to entering college. The majority of the previous studies assessing the influence of the undergraduate experience used the undergraduate grade point average (GPA) as the dependent criterion variable in a regression analysis. The undergraduate GPA is not consistent between institutions, and is subject to grade inflation, which may potentially distort results. Controlling for student abilities as they enter college can be accomplished by including student characteristics and data variables reflecting academic performance in the first block of a stepwise regression analysis. Using a blocked form of stepwise regression examines the incremental impact each group of predictor variables has upon the criterion dependent variable.

This study replaced the undergraduate GPA with the GMAT composite score as the dependent or criterion variable, so as to address concerns about grade inflation and GPA inconsistency within and between institutions. The statistical process used in this study began with a prescreening correlation analysis to identify significant variables for continued investigation. Significant predictor variables were then divided into blocking categories. The blocking categories were named Input Pretest, Input Other, Between-College, Faculty-Student Interaction, Student-Student Interaction, Involvement in College Experience, Involvement in Non-College Activities, and Intermediate
Educational Outcomes. A pre-screening process using correlation analysis was performed to identify the predictor variables that were related to the dependent criterion variable. A blocked form of stepwise regression analysis was then performed to determine the independent predictor variables that have a significant influence on the criterion variable, student performance on the GMAT exam. The SPSS software, version 17, was used for all the correlation and blocked form of the regression analysis.

UCLA’s HERI Research Committee provided the researcher access to 107 variables based upon the research parameters. The College Senior Survey (CSS) contained 221 variables, and The Freshman Survey (TFS) contained 359 variables. Data access was initially complicated by corrupted disks received from CIRP. To create a sufficient pool of data with matching records in both databases and valid GMAT scores, data records had to be drawn from three consecutive four-year cohorts. The inclusion of multiple years reduced the number of variables, as not all questions are asked each year. The entire process of retrieving data from CIRP took nearly six months.

In this chapter, results of the statistical analyses conducted to answer the research questions are presented. Research results can inform stakeholders on the key predictor variables to improve understanding of student performance.

The research questions posed in this study are:

1. What influence, if any, do entering student characteristics have on performance on the GMAT composite score?
2. What influence, if any, do between-college variables have on performance on the GMAT composite score?
3. What influence, if any, do student-student interaction variables have on performance on the GMAT composite score?

4. What influence, if any, do student-faculty interaction variables have on performance on the GMAT composite score?

5. What influence, if any, do campus multicultural variables have on performance on the GMAT composite score?

6. What influence, if any, do involvements in the college experience have on performance on the GMAT composite score?

7. What influence, if any, do involvements in non-college activities have on performance on the GMAT composite score?

8. What influence, if any, do intermediate educational variables have on performance on the GMAT composite score?

Data Collection and Response Rates

The CIRP database is the repository of data from more than 15 million student survey responses. A random sample drawn from the CIRP database covering three, four-year cohort periods—1999-2002, 2000-2003, and 2001-2004—created a data set with the demographic characteristics displayed in Table 1.

The data file contained 107 variables and included 610 cases. The variables were re-coded, and selected variables were dummy coded, reflecting a binary state, yielding 94 predictor variables for analysis. Table 2 shows the ten variables that emerged after applying the correlation prescreening and blocked form of stepwise regression analysis.
Table 1

*Demographic Characteristics of Survey Respondents*

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>Number (Frequency)</th>
<th>Percent (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Institutional Type</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>University</td>
<td>180</td>
<td>29.5</td>
</tr>
<tr>
<td>4-Year</td>
<td>430</td>
<td>70.5</td>
</tr>
<tr>
<td><strong>Institutional Control</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Public</td>
<td>68</td>
<td>11.1</td>
</tr>
<tr>
<td>Private</td>
<td>542</td>
<td>88.9</td>
</tr>
<tr>
<td><strong>Institution Sex</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Male</td>
<td>2</td>
<td>.3</td>
</tr>
<tr>
<td>Female</td>
<td>5</td>
<td>.8</td>
</tr>
<tr>
<td>Co-ed</td>
<td>603</td>
<td>98.9</td>
</tr>
<tr>
<td><strong>Undergraduate GPA</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>B-, C+ (2.25 – 2.74)</td>
<td>31</td>
<td>5.1</td>
</tr>
<tr>
<td>B (2.75 – 3.24)</td>
<td>167</td>
<td>27.4</td>
</tr>
<tr>
<td>A-, B+ (3.25 – 3.74)</td>
<td>270</td>
<td>44.3</td>
</tr>
<tr>
<td>A (3.75 – 4.00)</td>
<td>138</td>
<td>22.6</td>
</tr>
<tr>
<td>Missing</td>
<td>4</td>
<td>.7</td>
</tr>
</tbody>
</table>
Table 2

*Significant Predictors by Block*

<table>
<thead>
<tr>
<th>Predictor Variable</th>
<th>Block</th>
<th>Zero $r$</th>
<th>Step $\beta$</th>
<th>$\beta$</th>
<th>Sig.</th>
</tr>
</thead>
<tbody>
<tr>
<td>SAT Math</td>
<td>Input Pretest</td>
<td>.69**</td>
<td>.70**</td>
<td>.35**</td>
<td>.00**</td>
</tr>
<tr>
<td>SAT Verbal</td>
<td>Input Pretest</td>
<td>.66**</td>
<td>.36**</td>
<td>.29**</td>
<td>.00**</td>
</tr>
<tr>
<td>Institution Control – Private</td>
<td>Between-College – Institutional Characteristics</td>
<td>.16**</td>
<td>.12**</td>
<td>.06**</td>
<td>.02**</td>
</tr>
<tr>
<td>Selectivity</td>
<td>Between-College – Institutional Characteristics</td>
<td>.48**</td>
<td>.10**</td>
<td>.13**</td>
<td>.00**</td>
</tr>
<tr>
<td>Act in Past Year: Asked a teacher for advice after class</td>
<td>Faculty – Student Interaction</td>
<td>-.10**</td>
<td>-.09**</td>
<td>-.08**</td>
<td>.00**</td>
</tr>
<tr>
<td>Act: Have been a guest in professor’s home</td>
<td>Faculty – Student Interaction</td>
<td>.22**</td>
<td>.08**</td>
<td>.07**</td>
<td>.01**</td>
</tr>
<tr>
<td>Act: Took interdisciplinary courses</td>
<td>Involvement in College Experience</td>
<td>.30**</td>
<td>.11**</td>
<td>.10**</td>
<td>.00**</td>
</tr>
<tr>
<td>Hours per week: Arcade/video games</td>
<td>Non-College Involvements</td>
<td>.15**</td>
<td>.08**</td>
<td>.07**</td>
<td>.01**</td>
</tr>
<tr>
<td>Self-Rating: Academic ability</td>
<td>Intermediate Educational Outcomes</td>
<td>.30**</td>
<td>.08**</td>
<td>.08**</td>
<td>.02**</td>
</tr>
<tr>
<td>Act in Part Year: Felt overwhelmed by all I had to do</td>
<td>Intermediate Educational Outcomes</td>
<td>-.13**</td>
<td>-.06**</td>
<td>-.06**</td>
<td>.03**</td>
</tr>
</tbody>
</table>

*Note.* $n = 610$, $R^2 = .633$, Adjusted $R^2 = .621$, * $p < .05$, ** $p < .01$
Table 3 shows, in descending rank order of final step β (Beta weight values), the 10 variables that emerged in the final model of the blocked stepwise regression analysis. For each unit increase in the predictor variable, there is a corresponding change in the dependent variable by the amount of the final step β (Beta weight value).

Table 3

*Predictor Variables Ranked by Final Step β (Beta weight values)*

<table>
<thead>
<tr>
<th>Rank</th>
<th>Predictor Variable</th>
<th>Final Step β</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>SAT math</td>
<td>0.35**</td>
</tr>
<tr>
<td>2</td>
<td>SAT verbal</td>
<td>0.29**</td>
</tr>
<tr>
<td>3</td>
<td>Selectivity</td>
<td>0.13**</td>
</tr>
<tr>
<td>4</td>
<td>Act: Took interdisciplinary courses</td>
<td>0.10**</td>
</tr>
<tr>
<td>5</td>
<td>Self-Rating: Academic ability</td>
<td>0.08**</td>
</tr>
<tr>
<td>6</td>
<td>Act: Have been a guest in professor’s home</td>
<td>0.07**</td>
</tr>
<tr>
<td>7</td>
<td>Institution control – private</td>
<td>0.06**</td>
</tr>
<tr>
<td>8</td>
<td>Hours per week: Arcade/video games</td>
<td>0.07**</td>
</tr>
<tr>
<td>9</td>
<td>Act in Past Year: Felt overwhelmed by all I had to do</td>
<td>-0.06**</td>
</tr>
<tr>
<td>10</td>
<td>Act in Past Year: Asked a teacher for advice after class</td>
<td>-0.08**</td>
</tr>
</tbody>
</table>

*Note.* n = 610, R² = .633, Adjusted R² = .621, * P < .05, ** p<.01

**Block one: Input pretest.** Two variables emerged from the regression analysis, *Scholastic Assessment Test (SAT) math* (β = .35, p < .01) and *SAT verbal* (β = .29, p < .01) test scores, as having a significant positive influence on student performance on the GMAT composite score. These two predictor variables from the CIRP Freshman Survey
(TFS) had the highest and second highest influence on the dependent variable, with Pearson Product-Moment Correlation R values of .69 and .66 respectively. These two measures of student Academic ability from the TFS had a significant influence on the GMAT exam reported on the CIRP Senior Survey (CSS) four years later. The influence of SAT external test results endured over a four-year period and was the two strongest predictors of student performance on the GMAT exam. An increase of one point on the SAT math score would translate into a .35 increase in the GMAT composite score. Similarly, a one-point increase in the SAT verbal score would translate into a .29 increase in the GMAT composite score. These two variables give us insight in answering the first research question, “What influence, if any, do entering student characteristics have on performance on the GMAT composite score?”

**Block two: Other input variables.** The Freshman Survey variable Asked a teacher for advice after class emerged as significant with a Beta (β) value of -.08. The negative β value indicates that an increase in the independent variable causes a decrease of .08 in the GMAT composite score. Students who asked the instructor for advice were more likely to perform poorly on the GMAT exam than students who did not ask for advice.

**Block three: Between-college variables.** Institutional control – private (β = .06, p <.02) and Selectivity (β = .13, p < .01) were both positive and significant in predicting student performance on the GMAT exam. These two variables address the second research question in identifying the influence of between-college variables on student performance on the GMAT exam. Institutional Selectivity and the combined SAT math and verbal scores are used in the admissions process. The identification of Selectivity as
a significant positive predictor is consistent with the results of the influence of individual
*SAT math* and verbal scores reported in block one. Students who attended a more
selective university or college were more likely to perform well on the GMAT exam than
students who did not attend a selective institution.

*Institutional control – private* had a positive influence on student performance,
while public institutional control exhibited a negative influence on the GMAT composite
score. Students who attended a private university or college were more likely to perform
well on the GMAT exam than were students who attend a public college or university.

**Block four: Faculty-student interaction.** The CSS variable *Have been a guest
in professor’s home* (β = .06, p < .01) provides information to answer the third research
question about the influence faculty-student interaction has on student performance on
the GMAT exam. A positive influence indicates that a one-point increase in the predictor
variable causes an increase in the criterion variable by the amount of the coefficient.
Similarly, a negative influence would indicate that, for each unit increase in the predictor
variable, there would be a decrease in the criterion variable. Students who have been a
guest in a professor’s home were more likely to perform well on the GMAT exam than
students who have not been a guest in a professor’s home.

**Block five: Student-student interaction.** Five variables were identified after the
correlation analysis was completed. No variables assigned to this block were significant
following the blocked form of stepwise regression analysis. The percentage of students
commuting in this sample was in excess of 60%, and the percentage of students working
for pay was in excess of 70%. These intervening factors may reduce the ability of
students to participate in opportunities that foster student-student interaction.
Block six: Involvement in the college experience. The variable *took interdisciplinary courses* ($\beta = .10, p < .01$) was identified as a significant positive predictor of student success. This variable provides insight to answer the question as to how involvement in the college experience provides a positive influence on student performance. Interdisciplinary course work broadens a student’s education and experiences and positively impacts GMAT exam results. Students who took interdisciplinary courses were more likely to perform well on the GMAT exam than students who did not take such courses.

Block seven: Non-college involvements. The *Hours per week: Arcade/video games* variable ($\beta = .06, p < .01$) had a significant positive influence on student performance. Students who played arcade/video games were more likely to perform better on the GMAT exam than students who did not play these types of games.

Block eight: Intermediate educational outcomes. Two variables, self-rating of *Academic ability* ($\beta = .08, p < .02$) and *Felt overwhelmed by all I had to do* ($\beta = -.06, p < .03$), emerged as significant predictors of student performance on the GMAT exam. These two variables help to answer the research question “What influence, if any, do intermediate educational variables have on student performance on the GMAT composite score?” The result for the *Felt overwhelmed by all I had to do* variable had a negative $\beta$ value, indicating a negative impact on the GMAT composite score. Students who do not feel overwhelmed were more likely to perform well on the GMAT exam than students who expressed feeling overwhelmed. The self-rating variable, *Academic ability*, had a positive influence on the dependent variable. The positive influence indicates that, for each unit increase in the independent variable, the dependent variable would change by
the amount of the coefficient. Conversely, a negative influence causes a decrease in the dependent criterion variable for each unit increase in the independent predictor variable. Students who expressed confidence in their Academic ability were more likely to perform well on the GMAT than students who did not express the same.

**Summary**

The research started with 107 variables that were prepared by recoding and dummy coding. Ninety-four predictor variables entered the first phase, correlation pre-screening, and 50 predictor variables were identified as significant. These 50 predictor variables entered the final phase of analysis, a blocked form of stepwise regression. Ten predictor variables were identified in the final model as significant predictors. These predictor variables explained 62.1% of the variation in the GMAT composite score.

The final regression model reveals that the two strongest predictors of student success as measured by performance on the GMAT exam are the SAT math and verbal scores. These two predictor variables, representing measures of student Academic ability, account for 56.0% of the total model variation after four years. The other input predictor variable, Asked a teacher for advice after class, increased the R² value by .6%.

The Between-College block increased the amount of variance explained by the model .7% with the addition of the Institutional Control predictor variable, and an additional .3% by adding the Selectivity predictor variable. In the Faculty-Student Involvement block, the predictor variable Have been a guest in professor’s home increased the amount of variance explained by 1.4%.

The Student-Student block had no predictor variables emerge as a significant influence on student performance. This block may be influenced by the percentage of
students who indicated they were working for pay and/or commuting to campus. The Involvement in College Experience Block added the predictor variable *took interdisciplinary courses*, increasing the $R^2$ value by .5%. The Non-College Involvement block added the predictor variable *Hours per week: Arcade/video games*, which increased the $R^2$ value by .6%. Two predictor variables were added to the Intermediate Educational Outcomes block, *Self-rating of Academic ability* and *Felt overwhelmed by all I had to do*, increasing the $R^2$ value by 1.3%.

Table 4, the block comparison of $R^2$ and standard error values, shows the changes in the values as each block of predictor variables were added in the blocked form of stepwise regression. As each block is added in the regression analysis, there is an improvement in the $R^2$ value, representing the amount of variance the independent predictor variables have on the change in the dependent criterion variable. In addition to this improvement in $R^2$, the standard error was reduced as each block was added to the analysis. The final results had an $R^2$ value of .62, indicating that 62% of the variance of the dependent criterion variable was explained by the predictor variables, and the standard error of the estimate was 59.7 points.
Table 4

Block Comparison of $R^2$ and Standard Error

<table>
<thead>
<tr>
<th>Block</th>
<th>Adjusted $R^2$</th>
<th>Standard Error</th>
</tr>
</thead>
<tbody>
<tr>
<td>Input</td>
<td>.56</td>
<td>64.4</td>
</tr>
<tr>
<td>Between-College</td>
<td>.57</td>
<td>63.7</td>
</tr>
<tr>
<td>Faculty-Student Interaction</td>
<td>.59</td>
<td>62.4</td>
</tr>
<tr>
<td>Student-Student Interaction</td>
<td>.59</td>
<td>61.9</td>
</tr>
<tr>
<td>Involvement in College Experience</td>
<td>.60</td>
<td>61.2</td>
</tr>
<tr>
<td>Non-College Involvement</td>
<td>.62</td>
<td>60.3</td>
</tr>
<tr>
<td>Intermediate Educational Outcomes</td>
<td>.62</td>
<td>59.9</td>
</tr>
</tbody>
</table>

*Note.* $n = 610$, $R^2 = .63$, Adjusted $R^2 = .62$, * $p < .05$, ** $p < .01$

The discussion of these findings, policy implications, directions for future research, and closing thoughts and summary of this research will be presented in Chapter Five.
Chapter Five

Discussion, Recommendations, and Conclusions

This chapter reviews the goal of the research and proceeds to the key findings, methodology, and analysis of results by research question. The chapter continues with recommendations for future research and conclusions of this dissertation.

Goal of the Study

The goal of this study was to identify predictor variables in the undergraduate environment that influence student success as measured by performance on the Graduate Management Admission Test (GMAT) composite score. Data used in this study was randomly drawn from CIRP databases maintained by the Higher Education Research Institute (HERI) at the University of California, Los Angeles. The research was guided by Astin’s I-E-O data analysis model and student involvement theory. Historically, a majority of studies have used undergraduate grade point average (GPA) as the dependent criterion variable. Leading researchers question use of the GPA as the dependent criterion variable, due to the impact of grade inflation, institutional grading policies, and differences in academic rigor (Abedi, 1991; Carlan & Byxbe, 2000; Truell & Woosley, 2008; Wongsurawat, 2009). These concerns were factors in selecting the GMAT exam, an external assessment, as the dependent criterion variable.

The I-E-O data analysis model provided the structure and organization to block or categorize independent predictor variables so as to effectively screen and assess their influence on student success, as measured by student performance on the GMAT exam. The study was also guided by Astin’s student involvement theory, which states there is a direct relation between a student’s physical, psychological, and social involvement in
college and a student’s persistence and academic success (Astin, 1993; Pascarella & Terenzini, 1991). This study identified 10 predictor variables that both positively and negatively influence student success, as measured by performance on the GMAT composite score.

The methodology employed in this study allowed the researcher to partial out the impact of predictor variables, which allowed for examination of the incremental influence as each additional block of independent predictor variables entered the analysis. The input predictor variables were subdivided into a pretest category, which included *SAT math* and *SAT verbal* scores, and a category of other input predictor variables, which included high school GPA (HSGPA), need for remediation, and planned living arrangements.

**Key Findings**

The three strongest predictors of student success as measured by student performance on the GMAT exam are the *SAT math* and *SAT verbal* scores, and institutional *Selectivity*. The first research question “What influence, if any, do entering student characteristics have on performance on the GMAT composite score?” was clearly answered with the emergence of the SAT scores. No other predictor variables from this block had a significant influence on the GMAT composite score.

There are several possible explanations for the *Selectivity* predictor variable from the between-college block emerging as a significant predictor. Performance pressure and peer support by students with higher SAT scores may elevate student academic performance. With more capable students, faculties have the ability to introduce more advanced topics, in effect raising the academic bar, which translates into improved
academic performance. The Selectivity predictor variable has an influence as student behavior manifests in both student and faculty interaction. This study considered the effect of selectivity under the student interaction block of predictor variables because of the change in student behavior resulting from increased Selectivity. Peer influence is supported by Kuh and Pascarella’s (2004) research as “being exposed to bright, highly able peers has salutary direct effects” on students (p. 53).

The predictor variable Took interdisciplinary courses from the Involvement in College Experience Block emerged as a significant positive predictor of success. Interdisciplinary courses provide students the opportunity to apply skills from several disciplines in a project- or problem-based course. The breadth and depth of skills required in an interdisciplinary course provide students the ability to apply critical thinking and problem-solving skills to new situations, ultimately increasing performance on the GMAT exam. A study employing a pre- and post-test analysis design using a standardized test, comparing traditional course delivery with interdisciplinary course design, resulted in a 60% gain in scores using the interdisciplinary delivery method. A paired t-test of 36 items demonstrated a significant improvement using the interdisciplinary delivery method (t = -7.31, df= 61, p = .00) (Callahan et al., 2011). In addition to this within-course standardized test, the introduction of a course series employing an interdisciplinary teaching methodology demonstrated student success as measured by undergraduate GPA, with both immediate and lasting results (Schreyer-Bennethuma & Albright, 2011). Schreyer-Bennethuma and Albright compared the results from two student cohorts, one using a traditional lecture format and one participating in an interdisciplinary project-based course. At the conclusion of the course
and one year later, average GPAs were significantly higher for the cohort taught using interdisciplinary methods.

Student-faculty interaction emerged as a strong positive influence on student performance on the GMAT exam, which is consistent with research that shows experiences outside the classroom positively influence cognitive learning (Astin, 1993; Pascarella et al., 1996; Terenzini, et al., 1993; Terenzini et al., 1995). The Cooperative Institutional Research Program (CIRP) Senior Survey (CSS) predictor variable from this study, *Have been a guest in professor’s home*, confirms the findings in the literature.

**Discussion of the Findings**

The data set used in this study contained 107 variables and 610 cases. The data were first examined using Statistical Package for Social Science (SPSS) software, version 17, correlation analysis, which identified 50 predictor variables for additional investigation using a blocked form of stepwise regression. After completing the blocked stepwise regression analysis, 10 predictor variables were identified as having a significant influence on student performance on the GMAT composite score. The data used in this study were organized by block to answer the research questions. Results of the analysis will be presented by block.

**Input variables, pre-test block 1.** The first research question was “What influence, if any, do entering student characteristics have on performance on the GMAT composite score?” Within the Input Block, two predictor variables, *SAT math* and *SAT verbal* scores, emerged as having a significant influence on the GMAT composite score. SAT math and verbal scores had the greatest influence on the GMAT composite, as represented by Beta (β) values of .35 and .29 respectively. The β values are both
positive, indicating that a one-point increase in the SAT math or SAT verbal score will cause an increase of .35 and .29 points respectively on the GMAT composite score. According to Astin (1962), it is critically important that input predictor variables, representing the abilities of students as they enter college, be identified and controlled for, so as to determine the true influence of the remaining predictor variables on the criterion variable. Not accounting for the strength and duration of the influence of student input predictor variables would distort results.

This research confirmed findings from prior studies (Astin & Oseguera, 2005; Pike & Saupe, 2002; Wolfe & Johnson, 1995; Yu et al., 2012): ACT and SAT standardized test scores are good predictors of student success. Deberard et al. (2012) included HSGPA with standardized test scores as good estimators of student college performance. These research results seemed to confirm Zhao and Ku’s (2004) findings that precollege predictor variables have their greatest impact on the first year of college. In this study, HSGPA exhibited no significant influence on the GMAT composite score. This is consistent with the research from a 10-year study reported by Astin and Oseguera (2005), which found that HSGPA has been declining in influence as a measure of academic performance.

**Other input variables, block 2.** The TFS predictor variable *Asked a teacher for advice after class* had a negative β value of -.08 and a level of significance of .00. This predictor variable relates to student academic abilities prior to college. As the predictor variable increased, the GMAT composite score decreased. A CIRP report of student habits found students spend less time studying and taking notes, suggesting they may ask for advice after class as a substitute for proper study skills (Bohra, 2009). Another
explanation emerged when the SPSS correlation analysis utility was performed with the TFS data. Results revealed a significant positive relationship between predictor variables *Asked a teacher for advice after class* and *Have had special tutoring or remedial work* ($r=.13$ and $p<.01$). These results may also provide insight into student academic abilities and lower performance on the GMAT exam.

Academic preparation and inadequate study skills in high school may be the cause of asking faculty for assistance, according to the CIRP report (Bohra, 2009). Another indicator of precollege academic abilities issues is the predictor variable *Have had special tutoring or remedial work* and the positive relation with *Asked a teacher for advice after class*. The need for remediation, tutoring, and asking faculty for assistance would explain why students do not perform well on the GMAT exam, which indicates that special tutoring and remedial needs must be addressed before student academic performance and completion rates can improve.

**Between-college variables, block 3.** The second research question was “What influence, if any, do between-college variables have on performance on the GMAT composite score?” Two predictor variables emerged as significant, *Selectivity* and *Institutional control – private*. Institutional *Selectivity* uses the SAT composite score as a tool in the admissions process and had a positive $\beta$ value of .12 and a level of significance of $p<.01$. This finding is consistent with other studies on the influence of between-college predictor variables on student success (Astin, 1993; Bowen, 1977; Pascarella & Terenzini, 2005; Tinto, 1994). Students attending a highly selective college or university tend to perform better on the GMAT exam than students who attend a school with a lower level of selectivity. Institutional selectivity is more than a proxy measure that
indicates an institution’s quality; it permeates the entire academic environment. Students with peers having high levels of skills contribute to an environment that is “intellectually stimulating and challenging in the classroom and during non-classroom interactions” (Pascarella et al., 2006, p. 252).

The results for the predictor variable Institutional control – private were also significant and had a positive β value of .07. This β value reinforced results from studies that showed institutional control has a limited influence on student development, with a level of significance of p<.02 (Astin, 1993; Bowen, 1977; Pascarella & Terenzini, 2005; Tinto, 1994). In this study, students attending a private college or university tended to perform better on the GMAT exam than students from a public college or university. A study comparing international and American undergraduates showed that Institutional control – public was significant and had a positive β value of .08 on academic success, as measured by undergraduate GPA (Korobova, 2012). The data in this study was evenly distributed between freshman and senior respondents. In contrast, a national survey of freshman students in the CIRP database found academic success as measured by student-reported GPA had a negative β value (-.04) (Keup, 2006). These contradictory findings about the influence of institutional control in the literature are a signal that more research is needed. The β values in the studies reviewed ranged from -.04 to .08, and indicate both a negative and positive influence on student performance. Another aspect of institutional control that bears on student academic performance is that private institutions may have higher admissions standards than public institutions, because some public institutions use admissions criteria mandated by state legislatures, while private institutions do not (Pascarella et al., 2006).
The results from this research corroborate HERI results as reported by Astin and Oseguera (2005) in that there is a significant difference in graduation rates between public and private institutions. This difference can be attributed to the admissions criteria—*Selectivity*—based upon SAT scores. No other predictor variables included in the Between-College Block emerged as having an influence on student performance, which is consistent with findings from Adelman (2006), Astin (2003), Bowen (1977), and Pascarella and Terenzini (2005). Further, as more students take course work at multiple institutions, a process referred to as swirling, and transfer to a home institution, *Selectivity* and Between-College Block predictor variables may become more difficult to assess.

**Faculty-student interaction variables, block 4.** The next research question to be addressed was “What influence, if any, do faculty-student interaction predictor variables have on performance on the GMAT composite score?” The predictor variable *Have been a guest in professor’s home* had a significant, positive influence on student success, with a positive β value of .08. These results are in alignment with previous studies, which found that faculty feedback and interaction with students positively influence student performance (Kuh et al., 2005). Astin (1984) acknowledges that faculty-student interaction positively impacts student persistence, retention, and success. Students who have an opportunity to be a guest in a professor’s home to work on group projects, study sessions, or other activities tend to perform better on the GMAT exam than students who have not been a guest in a professor’s home. Frequent, meaningful faculty-student interaction both inside and outside the classroom positively impacts student academic performance (Kuh & Hu, 2001). This faculty-student interaction is so
important, according to Kuh and Hu, that some colleges authorize stipends to host students in a professor’s home. Contact with faculty has been identified as having one of the highest correlations with cognitive development for new students (Keup, 2006).

Findings on faculty-student interaction are consistent with results reported by Outcalt and Shewes-Cox (2002) and Tinto (2006). Tinto’s research also found that the influence was greatest in the first year of college, and was the variable most often missing in exit interviews of students who had left college. Prompt feedback on homework and discussion of both class assignments and research projects had a positive influence on student performance (Comeaux, 2012; Kuh et al., 2005; Pascarella & Terenzini, 2005). The strongest correlations included active collaborative learning, informal student-faculty interaction, and formal student-faculty interaction concerning coursework (Carini et al., 2006). According to Kuh and Hu (2001), student-faculty interaction had a positive impact on student learning, and increased the effort students put forth on academic activities. Research conducted by Bean and Kuh (1984) found that informal faculty-student interaction had no influence on college GPA.

**Student-student interaction variables, block 5.** No student-student interaction predictor variables, including intramural sports participation, tutoring, studying in groups, socializing with friends, and joining clubs, was found to be significant in the blocked, stepwise regression analysis. Possible explanations of this phenomenon are that more than 36% of students in the sample commuted more than an hour to college, while 57% worked more than 6 to 10 hours per week. This level of participation in Non-College Involvement Block activities is assumed to lessen the opportunities students have for student interaction. This study will consider the influence of **Selectivity** on student
behavior in the Student-Student Interaction Block, because of the influence of students in- and out-of-the-classroom on coursework.

**Involvement in college experience variables, block 6.** The predictor variable *Took interdisciplinary courses* had a positive influence on the GMAT composite score, with a β value of .10. The goal of an interdisciplinary course is to present a problem, the solution to which requires application of skills acquired across several academic fields or through life experiences, and which otherwise could not be addressed in a single course. The breadth and depth of learning by students who take an interdisciplinary course has a positive influence on their performance on the GMAT exam. Students who have taken an interdisciplinary course tend to perform better on the GMAT exam than students who have not taken an interdisciplinary course. One good example would be the creation of a business plan in a capstone course that requires use of accounting, finance, marketing, communication, writing, research, and human resource skills. Participation in an interdisciplinary course provides a pathway for at-risk students to improve confidence in academic work by building on their existing knowledge base and other course work (Carini et al., 2006; Zhao & Kuh, 2004).

**Involvement in activities that are not college related variables, block 7.** The predictor variable *Hours per week: Arcade/video games* had a positive influence on student academic performance as measured by performance on the GMAT exam, with a β value of .07. This predictor variable was identified in prior studies as an academic distracter, based upon research by Astin (1993) and Tinto (1994). However, the online skills associated with arcade/video games may be one reason this predictor variable had a positive β value. One example would be using various human interface devices to
control and manipulate the computer. Searching, downloading, and installing software files from remote locations are actions similar to using a computer to extract information from a remote database for a research paper. The specific activities of completing class assignments, word processing, and library searches have been identified as critical to student success (Pascarella et al., 2006). Beyond these skills, students utilize simulation and collaboration activities that enhance academic performance when playing multi-user domain (MUD) games that are designed to stimulate collaboration and communication skills in solving problems that directly enhance skills necessary for academic success (Squire, 2003).

**Intermediate educational outcomes variables, block 8.** Two predictor variables from the last block emerged as having a significant influence on student success, *Felt overwhelmed by all I had to do* and *Self-rating: Academic ability*. These predictor variables provide insights to answer the research question “What influence, if any, do intermediate educational variables have on performance on the GMAT exam?” The predictor variable *Felt overwhelmed by all I had to do* had a β value of -.06, indicating a negative influence on student success, as measured by performance on the GMAT exam. The predictor variable *Self-rating: Academic ability* had a positive β value of .08, indicating a positive influence on GMAT exam results. Students who felt overwhelmed with all they had to do tend to have lower GMAT scores than students who do not have these same feelings. Students experiencing feelings of being overwhelmed may also experience test anxiety and have difficulties in organizing and prioritizing homework. Students with a strong academic self-concept and confidence in their academic ability tend to perform better on the GMAT than students who do not have a
strong self-rating of academic ability. CIRP reports that this predictor variable has been increasing steadily in value since 1985, and stood at 30.4% for first-year students in 2012 (Pryor et al., 2013). The CIRP report indicates that these feelings act as a student motivator to identify activities to help them become academically successful, including regularly communicating with faculty and seeking tutoring assistance.

**Contributions to the Literature**

This study contributes to the literature from a methodological perspective and the academic influence the environment has upon student performance. Some previous studies did not control for student abilities and characteristics upon entering college. As such, the results were not as reliable because it was unclear which independent predictor variables caused change in student results. First, the methodology used in this study controlled for the influence of student academic abilities upon entering college. This was accomplished by applying a blocked form of stepwise regression analysis to each block of data, controlling for each prior block’s results when analyzing the data. This process allowed for the identification of the incremental influence or value-added component of each successive block of predictor variables as it entered stepwise regression.

A second methodological change was using an external assessment exam instead of the traditional undergraduate GPA to identify factors in the undergraduate experience that influence student success, as measured by performance on the GMAT composite score. This eliminates concerns and criticisms surrounding grade inflation and uniformity issues associated with undergraduate GPA.

This study contributes to the literature by highlighting those factors in the undergraduate environment that influence student success, as measured by performance
on the GMAT. The lasting impact academic preparation in high school has on students as they enter and progress through college is shown by the SAT math and verbal test scores taken during a high school student’s junior or senior year. SAT math and verbal scores had the greatest influence on student success on the GMAT, among all the predictor variables investigated in this study. The GMAT is typically taken four years after a student enters college. The emergence and strength of these two predictor variables reinforces the criticisms of prior research that did not control for student academic abilities as they entered college. That SAT math and verbal scores have a significant influence on the GMAT results four years later indicates a need to control for student academic characteristics when they enter college to identify the true value of the college environment and academic impact. The lasting influence of SAT math and verbal scores also underlines the weakness of the HSGPA as an academic measure.

Institutional selectivity is the third strongest predictor of success, as measured by student performance on the GMAT composite score. The value of this predictor variable is set by private institutions, as part of the criteria for college admission. For public institutions, selectivity may be established as open access by the government (Pascarelli et al., 2006). According to the literature, this predictor variable has a significant impact on student-student interaction in and out of class. Selectivity consists of composite SAT or ACT scores, with the assumption that these scores affect academic activities. The surprising aspect of this predictor variable reported in the literature is the impact the predictor variable has on student-student and faculty-student interactions within the classroom. Institutions can directly influence the learning environment by setting admissions standards, which, in turn, can influence student success. Institutional
Selectivity was considered under the Student-Student Interaction Block, instead of the inter-institution, Between-College Block predictor variable because of the influence occurring between students on academic activities.

The predictor variable Took interdisciplinary courses had a strong influence on student success and has implications for the creation of institutional policies and procedures that can exercise some control by providing or broadening interdisciplinary courses options. Interdisciplinary program options provide opportunities for students to enhance cross-disciplinary skills shown to improve performance on the GMAT. Interdisciplinary courses present problems and exercises that are more complex in scope than those that focus on one discipline alone. The problem resolution requires an understanding and comprehension acquired in prior courses and applied to the problem presented. One explanation of the positive impact interdisciplinary courses have on student performance may be that students enroll in interdisciplinary courses late in their academic programs, generally as capstone courses. The cumulative effect of prior academic experiences and the application of that knowledge to the resolution of a problem may provide students with skills they need to perform better on the GMAT.

The CSS predictor variable Have been a guest in professor’s home confirms research by Astin (1984) and Terenzini et al. (1993), which showed that interaction in and out of the classroom has a positive impact on student performance and persistence to degree completion. This predictor variable emerged as the sixth strongest influence on the GMAT composite score, and is a predictor variable completely under institutional control. Students look to faculty as role models and resources for advice on a variety of issues relating to academic and career topics.
Self-rating: Academic ability emerged as the fifth strongest of the environmental predictor variables to influence the GMAT composite score. Self-assessment mirrors Zajacova et al.’s (2005) findings that self-efficacy has a strong, positive influence on student performance, as measured by undergraduate GPA. Research by Laird (2005) links self-confidence in abilities with academic performance, specifically critical thinking. Self-confidence is a very important issue in retention and progress toward the completion of a degree.

Recommendations for Future Research

This research opened a window to allow a glimpse of how student involvement in various undergraduate activities impacts student success, as measured by performance on the GMAT exam. This research explored the use of an external exam to assess the impact of the undergraduate environment on student performance. Some questions have been answered, but more work needs to be done. Today, stakeholders require more evidence that effective teaching and learning is taking place in higher education, leading to an increase in methods to assess student learning. As assessment of student learning continues to increase, additional external assessment tools will evolve. As these tools become available, researchers will have additional views and insights into how student activities drive success in college.

The data used in this study were drawn from a database of students completing CIRP’s TFS and CSS surveys over a four-year period, a traditional student cohort. However, the undergraduate average time to graduation is closer to six years. As such, future research may investigate the questions posed in this study using a six-year cohort. According to the literature, students receive an undergraduate degree, on average, after
six years (NCHEMS, 2013). Expanding the time frame for data collection to students graduating in a six-year period to include results from non-traditional, part-time student populations would provide researchers a contrasting view with student populations completing in a four-year period.

Future research projects may also investigate non-traditional learners who return to college in preparation for a second career. The transfer student population is another avenue for potential research, using performance after transfer as the success predictor variable. More input predictor variables may address use of the socioeconomic status (SES), family educational background, family income level, and demographic predictor variables. Information about full- and part-time employment, or years of work experience would be useful in determining the influence of work on student success. HERI’s review committee limited the predictor variables used in this study to environmental predictor variables, excluding any SES predictor variables.

Program review, course assessment, and student learning outcomes assessment have increased over the past several years to provide evidence of effective teaching and learning. On the heels of program review and assessment is performance funding, which rewards colleges and universities for student success and graduation rates. The same assessment information is also used to demonstrate to accrediting organizations and stakeholders that an institution is value-added. That they receive a quality education is a key issue for students. Students and stakeholders have a keen interest in external accreditations that demonstrate that courses and programs are effective.

Increasing the number of input predictor variables in a subsequent study using qualitative analysis methods may provide additional insights into the influence the
undergraduate experience has upon student success. Using qualitative analysis by employing a survey using open-ended questions, focus groups, or student interviews would move away from an analysis of existing, historical predictor variables and may develop different hypotheses. A qualitative method of analysis would provide a subjective view of student experiences, and allow researchers to develop hypotheses from the data, in contrast to a quantitative approach of establishing hypotheses and using predictor variables to test research questions.

The National Center for Education Statistics reports that, during their undergraduate career, 45% of students attended two or more institutions, and 12% attend three institutions (McCormick & Carroll, 1997). Future research could compare and contrast the performance of students who transfer, with students who do not, to determine the impact of transfer on student success. The method of analysis for the transfer may employ a mixed-method of analysis, using both qualitative and quantitative techniques to identify undergraduate experiences that influence student success.

The importance of a second career and how prior work experience influences student success and persistence should also be examined. Future researchers could examine differences in performance between students with employment experience and those without employment experience.

**Limitations of this research**

The GMAT as an assessment tool is used in the admission-screening process for graduate business programs and limits the generalizability to students taking the GMAT. Typically, students with business majors in accounting, administration, marketing,
management, and economics take this exam, and descriptive statistical results from SPSS in this study confirm this assumption.

Generalizability may have been difficult due to the sample of cases extracted from the CIRP TFS and CSS databases had it not been for the random selection of data by HERI and its review committee’s recommendation to expand the selection to three consecutive four-year cohorts. The GMAT exam is administered annually to more than 250,000 test takers. There were 610 cases in this study randomly drawn from three years of paired data from 1999 through 2004. The cap on the number of predictor variables approved by HERI for this research limited the investigations into the impact that SES predictor variables have on student academic performance.

I-E-O Data Analysis Model

The I-E-O Data Analysis Model was an invaluable tool in this study, allowing the data to be organized by blocks that logically impact student performance on the GMAT composite score. The I-E-O Data Analysis Model acted as the roadmap to organize predictor variables into blocks that allow for analysis of the influence, by block and by predictor variable, on student performance on the GMAT exam composite score. This data analysis model organizes predictor variables into broad categories of input, environment, and outcomes.

I-E-O Data Analysis Framework

This study utilized a quantitative methodology and identified predictor variables that accounted for 62% of the variability in the GMAT composite score. Two quantitative processes were used in this research to identify the key predictor variables that influence the GMAT composite score. The first step in isolating the key independent
predictor variables was correlation analysis. The second step was to take the predictor variables emerging from the correlation analysis and perform blocked stepwise regression analysis. This second phase identified both the β weight coefficient, indicating the change the predictor variable had on the criterion variable, and its p-value, representing the probability the predictor variable value would occur by chance. Involvement Theory provided a good framework for investigating the undergraduate environment. As suggested, use of a qualitative or mixed-method of analysis to discern additional, significant predictor variables that influence student success could be an avenue for future research.

**Involvement Theory**

Student success, according to Astin (1984), is directly associated with a student’s physical, social, and psychological involvement in college activities. This study found that only the *Took interdisciplinary courses* predictor variable from the Involvement in College Experience Block emerged as a significant predictor variable. Other predictor variables, including *Have been a guest in professor’s home*, *Selectivity*, the interaction of students in and out of class on academic issues, and *Self-rating: Academic ability*, contribute to a student’s social, physical, and psychological involvement in college, according to Astin (1984). The predictor variable *Took interdisciplinary courses*, allows the student to integrate prior knowledge and experiences in conjunction with academic, course-specific concepts to strengthen physical involvement. Social involvement can be demonstrated by the predictor variable *Have been a guest in professor’s home*, increasing the feeling of inclusion. The psychological involvement is an important predictor
variable that may manifest itself in student effort on coursework and persistence in completing a degree.

Discussion

Interest in this study topic was prompted by news articles about success in college, specifically college graduation rates. Emerging from the initial literature review was a need to identify a new criterion or dependent variable, and a definition of undergraduate success in college. The research was conducted to answer the following research questions:

1. What influence, if any, do entering student characteristics have on performance on the GMAT composite score?
2. What influence, if any, do between-college variable categories have on performance on the GMAT composite score?
3. What influence, if any, do student-student interaction variables have on performance on the GMAT composite score?
4. What influence, if any, do student-faculty interaction variables have on performance on the GMAT composite score?
5. What influence, if any, do campus climate variables have on performance on the GMAT composite score?
6. What influence, if any, do involvements in college activity variables have on performance on the GMAT composite score?
7. What influence, if any, do involvements in non-college activity variables have on performance on the GMAT composite score?
8. What influence, if any, do intermediate educational outcomes variables have on performance on the GMAT composite score?

**Findings relating to research question 1.** The research findings relating to question 1 found that *SAT verbal* and *SAT math* scores, in the entering student characteristics variable category, had a significant influence on the GMAT composite score. This data supports the discussions in the literature about research on student experiences in college. The student academic abilities as they enter college need to be controlled for in determining the true influence of other predictor variables selected for analysis. *SAT verbal* and math scores reflect the students’ academic abilities when they enter college and have a lasting influence on the GMAT a student takes four years later. Conversely, the student’s high school GPA did not emerge as having an influence on the GMAT composite score, which is significant because it lacks a long-term influence on student success. This echoes research in the literature that suggests the HSGPA’s influence is generally limited to the first year of college. The fact that no other Input Block predictor variables were identified as having any significant influence on the dependent criterion variable confirms the findings of the research reviewed.

This research indicates the weakness of the HSGPA as a measure of student academic abilities in comparison to the *SAT verbal* and *SAT math* scores, which have a positive impact on student performance on the GMAT. Students with higher SAT scores are more successful, as measured by performance on the GMAT exam, which indicates that students with lower scores are not. Addressing the academic needs of students with lower SAT scores would provide them increased opportunities to improve on the GMAT exam and persist to graduation. Assessing student academic ability and addressing
student skills must be a priority activity to assess on intake to ensure student success in college.

**Findings relating to research question 2.** The between-college predictor variable category included *institutional size, control, religious affiliation, selectivity*, and *geographic location*. The *Selectivity* predictor variable emerged as having a significant influence on student performance on the GMAT composite score. Colleges typically use the SAT composite score as a screening tool during the admissions process. Colleges and universities report that increasing the SAT admissions cutoff increases competition and collaboration among students in the classroom. Because this predictor variable has a strong student-student influence, *Selectivity* will be considered under research question 3. Blurring the impact of between-college variables is the emergence of distance learning coursework and student swirling, acquiring credits from multiple institutions. In this study, *Institutional Control, Institutional Sex*, and *Institutional Type* were not a significant influence on the GMAT composite score.

**Findings relating to research question 3.** Through the correlation process, five student-student interaction predictor variables were identified for additional analysis using the blocked form of stepwise regression, however, none of the five emerged as having a significant influence on the DV. It is interesting that none of the predictor variables in the Student-Student Interaction Block had a significant influence, when compared to the literature on this topic. One explanation for this result is that more than 70% of students in this sample worked during their college career, while the proportion of students commuting was in excess of 60%. The *Selectivity* predictor variable from the Between-College Block, according to the literature review, had a strong, positive
influence on student collaboration and communication and on group projects and classroom activities. Based upon the student impact, the Selectivity predictor variable is considered in the Student-Student Interaction Block. The impact of work, commuting, and family responsibilities upon students and their ability to access higher education and complete degrees indicates that the successful college will be able to provide students with distance learning formats. The availability of DL course options may provide students the opportunity to take and complete courses eliminating the time spent commuting. This time savings could be spent on studying and other course related activities.

**Findings relating to research question 4.** The influence faculty members have on student performance both in and out of the classroom are mixed. Some articles reviewed indicated that a predictor variable, *Having been a guest in the professor’s home*, was a significant contributor to student performance and persistence, while others in the literature felt it was not a contributor to student success. Some research indicated that contact with an instructor outside of the classroom was enough incentive for students to expend extra effort on projects and assignments. Other researchers found these contacts with students were missing on students who left college before completing their degrees.

Students are seeking academic, social, and career guidance in college and receive direction from faculty in many forms, including prompt feedback on graded materials, academic and career advising during office hours, and on other occasions in and out of the classroom. No other employee on a college campus has the amount of contact with students or is in a better position to provide advice to students than faculty. A very high priority in improving student success, as measured by retention, persistence, and
graduation, is to find ways to increase meaningful student-faculty interaction.

Developing a faculty-load model that recognizes the importance of working with students outside the classroom is an important activity in conjunction with teaching.

**Findings relating to research question 5.** Campus climate predictor variables did not emerge as having a significant impact on student performance on the GMAT exam. This study included campus climate variables that included *Faculty Provide: Respect* (treated you like a colleague/peer), *Act in Past Year: Socialized with someone of another racial/ethnic group*, and *Success: Developing close friendships with other students* that would provide insights on the influence on student success. A frequency distribution shows that only 3% of students in the study did not receive respect and 1.9% found it difficult to make close friendships. One explanation for the low percentages may be that students who feel the climate is chilly or inhospitable would leave before they reached the point of graduation. This is consistent with the research that showed social factors influence student persistence in college. It may also be related to the issues of commuting and working that reduces opportunities to make friendships or experience discourteous or disrespectful treatment. Contributing to the lack of student involvement in social activities might also be the proportion of students working and commuting in this sample.

**Findings relating to research question 6.** Research question 6 was “What influence, if any, does involvement in campus activities have on student performance on the GMAT exam?” The results of this research found a positive relationship between taking an interdisciplinary course and student success on the GMAT composite score. According to the literature reviewed, interdisciplinary courses provide students the
opportunity to integrate prior coursework with life experience. Student confidence increases when they have an opportunity to participate by making personal contributions that are meaningful in their lives. This research also found that the undergraduate GPA was not a significant contributor to student performance on the GMAT, confirming the comments and discussions in the literature. A concern is that grade inflation has eroded the value and meaning of the undergraduate GPA. Inflation in the undergraduate GPA is inconsistent with other measures of student academic performance, such as the SAT and ACT test scores. According to the literature, the value of the undergraduate GPA as an academic indicator of student abilities has diminished.

**Findings relating to research question 7.** The non-college activities category had a predictor variable—*Hours per week: Arcade/video games*—emerge as having a significant, positive influence on student performance on the GMAT composite score. The literature reviewed had shown this predictor variable as a negative influence on student academic success, acting as a distracting influence. One possible explanation for this change may be that, with the use of the internet to access digital data, students have acquired computer skills through gaming that enhance academic abilities. The use of a computer to access internet gaming has replaced arcades to access video games and provides a multiple user domain (MUD) environment that may enhance both communication and collaboration skills. It is unclear if student computer usage in playing video games improves academic skills, augments problem-solving skills, or increases communication and collaboration caused by the constant improvement in computers and software. This is an area for further investigation of the influence, if any, that computer usage, including gaming, has on student academic performance.
Findings relating to research question 8. The Intermediate educational outcomes block had two predictors variables emerge—*Felt overwhelmed by all I had to do* and *Self-rating: Academic ability*—as having a significant influence on student success. These predictor variables are related to student self-confidence and, in the research reviewed, confirms that *Self-rating: Academic ability* can influence a student’s attitude and performance in their coursework. Conversely, feelings of being overwhelmed can act as a distracter for students in taking tests, organizing, and prioritizing course-required activities. Faculty members who encourage students with prompt feedback on homework, and who provide direction and guidance on other academic work, may help to eliminate a student feeling overwhelmed and strengthen self-confidence.

Implications for Policy and Practice

This research identified 10 variables that influenced student success as measured by performance on the GMAT exam composite score. Three variables within the Environment domain from Astin’s I-E-O model emerged as having a significant influence on student performance on the GMAT exam. First, the *Selectivity variable* from the Between-College block in this research influenced student-student interactions in the classroom. The *selectivity* measure most often used is the SAT test score, which attracts students with higher scores, raising the academic bar for students in the classroom. An ability to change the admissions criteria is usually not an option for public institutions that are open access by legislation. Second, the variable, *Took interdisciplinary course* increases students’ success on the GMAT exam in contrast to those students that do not complete an interdisciplinary course. An interdisciplinary
course is one that combines materials from several foundational courses, including advanced topics not covered in depth in a single course. Faculty are in control of the curriculum and need to incorporate interdisciplinary learning opportunities in programs. The final variable from the Environment domain is *Has been a guest in a professor’s home*. This variable indicates the strong influence faculty-student interaction has upon student success and provides a strong case for institutions to support faculty-student interaction and activities. This reinforces the research in the literature indicating that peers, parents, and professors are strong influences.

**Conclusions**

This dissertation contributed to the literature by identifying predictor variables in the undergraduate student environment that affect student success, as measured by performance on an external assessment, the GMAT, which served as the dependent, criterion variable. The blocked, stepwise regression analysis methodology used in this research controlled for students’ abilities as they entered college, where some prior research did not control for student abilities. The methodology used in this dissertation allowed for the identification of the true impact environmental predictor variables have on student success, as measured by performance on the GMAT. This quantitative analysis established a foundation for either a qualitative or mixed-method research analysis.

Using a blocked form of stepwise regression, 10 predictor variables emerged that have a significant influence on the GMAT composite score. The combined $R^2$ is 62%, which represents the variance in the GMAT composite score explained by these 10 predictor variables. This also means that 38% of the influences on GMAT composite
scores have yet to be determined. Using the $\beta$ values generated in the analysis, a prediction equation for the GMAT score, represented by $Y$, would be as follows:

$$Y = .35 \times \text{SATMath} + .29 \times \text{SATVerbal} - .08 \times \text{AskedAdvice} - .06 \times \text{FeltOverwhelmed} + .13 \times \text{Selectivity} + .06 \times \text{PrivateControl} + .08 \times \text{SelfRating} + .10 \times \text{InterdisciplinaryCourse} + .07 \times \text{VideoGames} + .07 \times \text{GuestInProfessorsHome}$$

Findings from this research highlight the importance of controlling for the abilities of students as they enter college. The Input Block of predictor variables—SAT math and verbal scores, Asked a teacher for advice after class, and Felt overwhelmed by all I had to do—have positive and negative influences on the GMAT composite score.

Within-College Block predictor variables—Have been a guest in professor’s home, Took interdisciplinary courses, Hours per week: Arcade/video games, and Student-Student interaction based upon the impact or results of institutional Selectivity, and Self-rating: Academic ability—all have positive $\beta$ values with respect to the influence on the GMAT composite score.

Institutional Selectivity traditionally is considered a predictor variable within the Between-College Block. The literature indicates that an increase in selectivity, specifically the SAT score, has a greater impact on students and the material taught within the classroom. The increased academic abilities allow students to share and collaborate on course materials at an increased level, and faculty can present more advanced topics.

The results of this research highlight the importance of using the I-E-O model to identify the abilities of students as they enter college, and the influence the college environment exerts on student success. The results of analysis from an I-E-O model
perspective show that the influence is evenly divided between the Input and Environment model categories. When combining the coefficients from the above prediction equation, the influence of all four input variables on the GMAT composite score is .50. The academic abilities of the student, represented by the SAT scores, had a combined influence of a positive .64, and the remaining pre-college input predictor variables had a - .14 influence on the GMAT composite score. The input block of predictor variables—SAT math and SAT verbal scores, Asked a teacher for advice after class, and Felt overwhelmed by all I had to do—have both positive and negative influences on the GMAT score.

With a combined $\beta$ value of .64, SAT math and SAT verbal scores point to the influence academic abilities have on the GMAT composite score as students enter college. This supports criticisms in the literature of prior research that did not control for student academic abilities when entering college. Students with higher SAT scores perform better on the GMAT exam than students with lower SAT scores. The importance of Self-Rating: Academic ability and its influence on student success, suggests the need for early identification of at-risk students and the need for remediation.

Using the I-E-O model, the focus shifts to the Environment portion to analyze the remaining predictor variables and coefficients from the estimation equation. The Environment predictor variables that emerged include Selectivity, Took interdisciplinary courses, Have been a guest in professor’s home, Institutional control – private, Hours per week: Arcade/video games, and self-rating: Academic ability, and represent half of the influence on student success. Another important finding from the research is that undergraduate GPA did not emerge as a significant influence on student performance on
the GMAT. This reinforces criticisms in the literature about the use of GPA as a dependent predictor variable, and the need to use an alternative measure of student success.

This research provided some answers by identifying predictor variables that have an influence on student success as measured by performance on the GMAT exam. This study provides a foundation for future research to identify other predictor variables and factors that influence student success.
References


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House, J. D. (1999). The effects of entering characteristics and instructional experiences on student satisfaction and degree completion: An application of the input-


## Appendix A

### HERI Authorized Variables

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MAJOR1_66_POLITICAL_SCI
MAJOR1_67_PSYCHOLOGY
MAJOR1_69_SOCIOLOGY
MAJOR1_78_AGRICULTURE
MAJOR1_73_DATAPROCESSING
MAJOR1_70_WOMENS_STUDIES
MAJOR1_79_COMMUNICATIONS
MAJOR1_80_COMPUTER_SCIENCE
MAJOR1_82_KINESIOLOGY
<table>
<thead>
<tr>
<th>ACT14</th>
<th>Act: Discussed course content with students outside of class</th>
</tr>
</thead>
<tbody>
<tr>
<td>ACT16</td>
<td>Act: Failed to complete homework on time</td>
</tr>
<tr>
<td>ACT31</td>
<td>Act: Have been a guest in professor’s home</td>
</tr>
<tr>
<td>ACT32</td>
<td>Act: Felt bored in class</td>
</tr>
<tr>
<td>ACT37</td>
<td>Act: Met with Faculty During Office Hours</td>
</tr>
<tr>
<td>ACT38</td>
<td>Act: Met with Faculty Outside Class or Office Hours</td>
</tr>
<tr>
<td>ACT46</td>
<td>Act: Participated in intramural sports</td>
</tr>
<tr>
<td>ACT55</td>
<td>Act: Studied with other students</td>
</tr>
<tr>
<td>ACT58</td>
<td>Act: Took interdisciplinary courses</td>
</tr>
<tr>
<td>ACT60</td>
<td>Act: Tutored Another College Student</td>
</tr>
<tr>
<td>ACT70</td>
<td>Act: Voted in a student election</td>
</tr>
<tr>
<td>COLACT02_9406</td>
<td>Act in College: Attended racial/cultural awareness workshop</td>
</tr>
<tr>
<td>COLACT07_9406</td>
<td>Act in College: Enrolled in honors or advanced courses</td>
</tr>
<tr>
<td>COLACT08_9406</td>
<td>Act in College: Failed One or More Courses</td>
</tr>
<tr>
<td>COLACT11_9406</td>
<td>Act in College: Had a part-time job off-campus</td>
</tr>
<tr>
<td>COLACT12_9406</td>
<td>Act in College: Had a part-time job on campus</td>
</tr>
<tr>
<td>COLACT13_9406</td>
<td>Act in College: Had a roommate of different race/ethnicity</td>
</tr>
</tbody>
</table>
Act in College: Joined a fraternity or sorority

Act in College: Participated in study abroad program

Act in College: Participated in an ethnic/racial student organization

Act in College: Participated In an internship program

Act in College: Participated in leadership training

Act in College: Participated in student government

Act in College: Taken a remedial course

Act in College: Transferred from a Community College

Hours per Week: Commuting

Hours per Week: Exercising/sports

Hours per Week: Partying

Hours per week: Arcade/video games

Hours per Week: Reading for pleasure

Hours per Week: Socializing with friends

Hours per Week: Student clubs/groups

Hours per Week: Studying/homework

Hours per Week: Using a personal computer
HPW23 Hours per Week: Volunteer work
HPW24 Hours per Week: Watching TV
HPW25 Hours per Week: Working (for pay)
GENACT15 Act in Part Year: Felt depressed
GENACT18 Act in Past Year: Felt lonely or homesick
GENACT19 Act in Part Year: Felt overwhelmed by all I had to do
GENACT21 Act in Past Year: Overslept and missed class or appointment
GENACT22 Act in Part Year: Participated in organized demonstrations
GENACT30 Act in Part Year: Socialized with someone of another racial/ethnic group
RATE01 Self Rating: Academic ability
FACPRV01 Faculty Provide: A letter of recommendation
FACPRV02 Faculty Provide: Advice and guidance about your educational program
FACPRV06 Faculty Provide: An opportunity to work on a research project
FACPRV07 Faculty Provide: Assistance to improve your study skills
FACPRV08 Faculty Provide: Emotional support and encouragement

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<table>
<thead>
<tr>
<th>FACPRV10</th>
<th>Faculty Provide: Encouragement to pursue graduate/professional study</th>
</tr>
</thead>
<tbody>
<tr>
<td>FACPRV13</td>
<td>Faculty Provide: Help in achieving your professional goals</td>
</tr>
<tr>
<td>FACPRV13_REFERENCED</td>
<td>Faculty Provide: Help in achieving your professional goals</td>
</tr>
<tr>
<td>FACPRV16</td>
<td>Faculty Provide: Intellectual challenge and stimulation</td>
</tr>
<tr>
<td>FACPRV18</td>
<td>Faculty Provide: Negative Feedback about your Academic Work</td>
</tr>
<tr>
<td>FACPRV19</td>
<td>Faculty Provide: Respect (treated you like a colleague/peer)</td>
</tr>
<tr>
<td>SUCCSES1</td>
<td>Success: Adjusting to academic demands of college</td>
</tr>
<tr>
<td>SUCCSES2</td>
<td>Success: Developing close friendships with other students</td>
</tr>
<tr>
<td>SUCCSES3</td>
<td>Success: Developing effective study skills</td>
</tr>
<tr>
<td>SUCCSES4</td>
<td>Success: Getting to know faculty</td>
</tr>
<tr>
<td>HADREM1_TFS</td>
<td>English: Have had special tutoring or remedial work</td>
</tr>
<tr>
<td>HADREM2_TFS</td>
<td>Reading: Have had special tutoring or remedial work</td>
</tr>
<tr>
<td>HADREM3_TFS</td>
<td>Mathematics: Have had special tutoring or</td>
</tr>
</tbody>
</table>
remedial work

HADREM4_TFS Social Studies: Have had special tutoring or remedial work

HADREM5_TFS Science: Have had special tutoring or remedial work

HADREM6_TFS Foreign Language: Have had special tutoring or remedial work

NEEDREM1_TFS English: Will need special tutoring or remedial work

NEEDREM2_TFS Reading: Will need special tutoring or remedial work

NEEDREM3_TFS Mathematics: Will need special tutoring or remedial work

NEEDREM4_TFS Social Studies: Will need special tutoring or remedial work

NEEDREM5_TFS Science: Will need special tutoring or remedial work

NEEDREM6_TFS Foreign Language: Will need special tutoring or remedial work

HSGPA_TFS What was your average grade in high school?

SATV_TFS SAT verbal

SATM_TFS SAT math

ACTCOMP_TFS ACT Composite
ACT01_TFS  Act in Past Year: Asked a teacher for advice after class

ACT04_TFS  Act in Past Year: Came late to class

ACT15_TFS  Act in Past Year: Felt overwhelmed by all I had to do

ACT17_TFS  Act in Past Year: Overslept and missed a class or appointment

ACT20_TFS  Act in Past Year: Performed volunteer work

ACT25_TFS  Act in Past Year: Socialized with someone of another racial/ethnic group

ACT27_TFS  Act in Past Year: Tutored another student

ACT32_TFS  Act in Past Year: Was a guest in a teacher's home

ACT33_TFS  Act in Past Year: Was bored in class

HPW01_TFS  Hours per Week: Studying/homework

HPW02_TFS  Hours per Week: Socializing with friends

HPW03_TFS  Hours per Week: Talking with teachers outside of class

HPW04_TFS  Hours per Week: Exercise or sports

HPW05_TFS  Hours per Week: Partying

HPW06_TFS  Hours per Week: Working (for pay)

HPW07_TFS  Hours per Week: Volunteer work

HPW08_TFS  Hours per Week: Student clubs/groups
<table>
<thead>
<tr>
<th>Code</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>HPW09_TFS</td>
<td>Hours per Week: Watching TV</td>
</tr>
<tr>
<td>RATE01_TFS</td>
<td>Self Rating: Academic ability</td>
</tr>
<tr>
<td>RATE11_TFS</td>
<td>Self Rating: Mathematical ability</td>
</tr>
<tr>
<td>RATE14_TFS</td>
<td>Self Rating: Public speaking ability</td>
</tr>
<tr>
<td>RATE20_TFS</td>
<td>Self Rating: Writing ability</td>
</tr>
<tr>
<td>PLANLIVE_TFS</td>
<td>Where do you plan to live during the fall term?</td>
</tr>
<tr>
<td>AID05_TFS</td>
<td>Aid: Part-time job on campus</td>
</tr>
<tr>
<td>AID06_TFS</td>
<td>Aid: Part-time job off campus</td>
</tr>
<tr>
<td>AID07_TFS</td>
<td>Aid: Full-time job while in college</td>
</tr>
</tbody>
</table>