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Academic Library Use and Undergraduate Engagement and Persistence

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Dedication

I dedicate this dissertation, a momentous personal achievement, to
my husband, my sons, and my mother.

To my husband, Scott

Without your encouragement, support, and love I could have never achieved my dream of earning a Ph.D. You were an unending source of encouragement through the many years it took me to accomplish this personal goal, and for that I thank you. You supported me emotionally throughout this journey and happily supported the needs of our sons when I was attending classes, working on my coursework, and writing this dissertation. I have always felt the strength and warmth of your love, and for that I am very grateful. I love you with all my heart.

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Academic Library Use and Undergraduate Engagement and Persistence

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Once considered the “heart of the university,” many academic libraries are facing heightened pressures to prove their relevance and value to administrators, faculty, and students, especially during these times of constrained resources and greater calls for accountability and productivity in higher education. At the same time, colleges and universities are continually striving to understand how their institutional environments affect undergraduate engagement, persistence and, ultimately, degree attainment. As a fundamental co-curricular resource, it is time for academic libraries to start systematically assessing how they affect, either directly or indirectly, their parent institutions’ goals of student engagement and persistence.

This quantitative study investigated the relationship between the use of an academic library, its physical resources and spaces, and student engagement and persistence at a large, public, research university. This unique study combined institutional and library data sources for analysis, including the results from a large-scale student experience survey with over 13,000 respondents, data from the student information system, and library use data from a variety of library data systems. Descriptive statistics as well as correlations, linear regressions, and logistic regressions were conducted to investigate the relationship between the library-use variables and

variables representing sense of belonging and satisfaction, academic engagement, academic disengagement, and persistence. The study found many practically significant, as well as statistically significant, correlations and predictive relationships between the library-use variables and the student outcome variables for engagement and persistence, although most of the effect sizes were small. The small to medium effect sizes represented in the results suggest that there are complex relationships between the variables and indicate the need for further research. This study contributes to an area of the literature that has received little attention from previous researchers and demonstrates one approach to creating a unique student-level dataset by combining student experience survey data with institutional data and library use data in order to investigate how the use of library resources and spaces may affect student success outcomes.

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Chapter One: Introduction

“Academic libraries are in trouble” (Wood, Miller, & Knapp, 2007, p.3). Once considered the heart of the university, many academic libraries are facing heightened pressures to prove their relevance and value to administrators, faculty, and students, especially during these times of constrained resources and greater calls for accountability and productivity in higher education (Oakleaf, 2010; Wood, Miller, & Knapp, 2007). Academic libraries are evolving and transforming, working within an environment of emerging technologies, new digital competitors, fluid publishing modalities, changing educational models, and increasingly diverse student and faculty populations (Wood, Miller, & Knapp, 2007).

Since the dawn of the twenty-first century, academic libraries have experienced inexorable decline in purchasing power, in some cases diminished influence on campus, and (perhaps most troubling) erosion of their fabled status as sole provider or even preferred purveyor of information (Wood, Miller, & Knapp, 2007, p. 4).

Ironically, the very technologies that have improved library resources and services by providing increased access, more robust functionality, and greater convenience are giving users fewer reasons to come to the library and obscuring the library’s role as the source of these services and resources. These technology-driven shifts in how users access and utilize library resources and services have resulted in some questioning the institutional value and relevance of academic libraries themselves (Oakleaf, 2010; Wood, Miller, & Knapp, 2007).

As a core co-curricular resource that provides students with access to scholarly resources, instructs students in the principles of information literacy (a key tenet of critical inquiry), and provides physical and virtual spaces for intellectual exploration, the

academic library must answer these questions of relevance and value by demonstrating its effect, either direct or indirect, on the institution's mission and goals of teaching and learning (Dugan & Herson, 2002; Gratch-Lindauer, 1998; Herson, 2002; Poll & Payne, 2006). Academic libraries have historically focused on assessing and evaluating input measures (e.g., size of collections) and output measures (e.g., circulation of collections) with virtually no attention being paid to outcomes (Wells, 1995), which are defined as "the ways in which library users are changed as a result of their contact with the library's resources and programs" (Association of College and Research Libraries, 1998, para. 13). If an academic library can successfully assess the impact of its resources and services on student success outcomes it can achieve three important goals. First, it can better determine the effectiveness of its resources, services, and physical spaces, thereby providing valuable data for the planning and management of its programs and staff (Rudd, 2002). Second, it can show value and relevance by demonstrating its contribution to the organization's educational mission (Snelson, 2006). Third, it can assist its parent institution's response to the calls for accountability and productivity by helping the institution better understand its co-curricular environment and how it affects student success.

Higher education in the United States is facing increased pressures for accountability and productivity from national and state governments, accrediting agencies, trustees and boards, employers, parents, students and the public, often focused on the outcomes of student persistence and degree attainment (Alexander, 2000; Brown & Malenfant, 2012; Gold & Albert, 2006; Lederman, 2010). When four-and six-year graduation rates are examined it becomes clear that many colleges and universities are struggling with the issue of student persistence, defined as "the desire and action of a student to stay within the system of higher education from beginning year through degree

completion” (Berger, Ramirez, & Lyon, 2005, p. 7). According to a National Center Educational Statistics (NCES) report, for a 2002 cohort the four-year graduation rate for all four-year institutions in the U.S. was only 36.4%, while the six-year graduation rate was slightly better at 57.2% (Knapp, Kelly-Reid, & Ginder, 2010).

Research has shown that numerous factors, including student characteristics, enrollment patterns, and institutional factors, can affect persistence, either positively or negatively (e.g., Adelman, 2006; Astin, 1993; Astin & Oseguera, 2005; Astin, Tsui, & Avalos, 1996; Berkner, He, & Cataldi, 2002; Pascarella & Terenzini, 2005; Robbins, Allen, Casillas, Peterson, & Le, 2006). Although there are factors that may negatively affect persistence that are outside the institutional sphere of influence, many of the integral components of persistence fall directly within an institution’s control (Astin, 1970; Kuh, Kinzie, Buckley, Bridges, & Hayek, 2006; Tinto, 1975, 1987, 1993; Tinto & Pusser, 2006). One such component is student engagement.

Student engagement, as conceptualized by Kuh, Kinzie, Schuh, Whitt, and Associates (2005), has two components, the “time and effort students put into their studies and other activities that lead to the experiences and outcomes that constitute student success” (p. 9) and “the ways the institution allocates resources and organizes learning opportunities and services to induce students to participate in and benefit from such activities” (p. 9). Research has shown that when students engage with an institution’s academic and social opportunities, persistence is positively affected, although the time and effort spent on academic pursuits has more significant effects on student success than the time and effort spent on social activities (Astin, 1977, 1993; Kuh, Kinzie, Buckley, Bridges, & Hayek, 2006; Kuh, Kinzie, Schuh, Whitt, & Associates, 2005; Pascarella & Terenzini, 2005; Tinto, 1975, 1987, 1993). Kuh, Kinzie, Schuh, Whitt, and Associates (2005) stress that in order to facilitate student engagement,

an institution must utilize effective educational practices, including appropriate levels of academic challenge, active and collaborative learning, student–faculty interaction, enriching educational experiences, and a supportive campus environment. Many of these effective educational practices occur in the classroom, but others are supported by the co-curricular activities that take place elsewhere on campus. To fully understand how institutional educational practices affect engagement and persistence, it is essential to examine how co-curricular campus resources, such as the library, support their institution’s mission by contributing to effective educational practices.

BACKGROUND

The Persistence Problem

For the purpose of this study the phenomenon of student departure will be restricted to voluntary departures and will be conceptualized using the term “persistence.” Persistence and retention are similar concepts but differ based on the perspective from which the process of students leaving college is examined. Persistence is a student-based conceptualization and as previously defined, is “the desire and action of a student to stay within the system of higher education from beginning year through degree completion” (Berger, Ramirez, & Lyon, 2005, p. 7). Retention is institution-based and is “the ability of an institution to retain a student from admission to the university through graduation” (Berger, Ramirez, & Lyon, 2005, p. 7). The unit of analysis in this study was the student, and the goal was to examine the relationship between library use and a student’s persistence and engagement. Since persistence covers the period from admission to graduation, a five-year graduation status was used to investigate persistence.

As previously noted, in 2008 the four-year graduation rate for all four-year institutions in the U.S. stood at an unimpressive 36.40% (Knapp, Kelly-Reid, & Ginder,

2010). When the four-year graduation rate is further examined by institution type it breaks down as follows: public institutions, 29.90%; private not-for-profits, 51.00%; private for-profits, 14.20% (Knapp, Kelly-Reid, & Ginder, 2010). According to the Organisation for Economic Co-operation and Development (OECD), this 2008 U.S. four-year graduation rate ranked 15th among the 27 other OECD countries and was below the average graduation rate for all OECD countries (Organisation for Economic Co-operation and Development, 2011a). When six-year graduation rates are examined the picture improves slightly to a 57.20% graduation rate for all institutions, with public institutions graduating 54.40% of their students, private not-for-profits graduating 64.60% of their students, and private for-profits graduating 22.00% of their students (Knapp, Kelly-Reid, & Ginder, 2010). These low graduation rates represent a steadily slipping level of educational attainment for the U.S. when compared to other industrialized countries. According to the OECD, in 1995 the United States ranked second of the 34 OECD countries in the percentage of 25 to 34 year-olds who had attained a tertiary education; by 2011 the United States ranked 15th (Organisation for Economic Co-operation and Development, 2011b). There is one important note with regards to graduation rates from the NCES: the antiquated criteria used by NCES capture less than 50.00% of the U.S. college student population since the data only represent the graduation rates for first-time, full-time freshmen enrolled in a single institution (Schneider, 2010a); it is commonly acknowledged that the NCES data needs to better represent part-time, non-continuous, or multi-institutional student enrollments (American Association of State Colleges and Universities, 2004).

These data show that the United States is falling behind other industrialized countries when it comes to educational attainment. In response to our nation's inadequate completion rates, in February 2009 President Obama launched the American

Graduation Initiative, calling for five million more college graduates by 2020. If successful this initiative would result in the U.S. having the “highest proportion of students graduating from college in the world by 2020” (Obama, 2009, para. 24). In addition to the federal initiative launched by President Obama, there are no fewer than 13 national initiatives aimed at increasing college completion rates, including The College Completion Agenda (The College Board), Complete to Compete (National Governors Association), College Completion Challenge (American Association of Community College), Ensuring America’s Future by Increasing Latino College Completion (Excelencia in Education), Complete College America (numerous partners), and Achieving the Dream (numerous partners) (Russell, 2011). In addition to these numerous national initiatives there are also many regional efforts like the Southern Regional Education Board’s College Completion Initiative and state-level programs including Texas’ Closing the Gaps by 2015, Washington State’s Student Completion Initiative, and Indiana’s Reaching Higher, Achieving More initiative (Russell, 2011).

Implications of the Persistence Problem

Clearly the U.S. slowdown in educational attainment relative to other industrialized countries has garnered attention at the federal, national, regional, and state levels and has spurred the launching of numerous “completion” initiatives. The interest in addressing our persistence and educational attainment shortfalls is motivated by many concerns including global economic competitiveness, social mobility, rising financial costs, and accountability and productivity.

Global Economic Competitiveness

Higher education is increasingly being seen as an “essential component of [the] national economic investment strategy” (Alexander, 2000, p. 412).

Furthermore, in a competitive and global environment, increasing educational investment to produce a highly educated and skilled workforce is a vital element for future economic growth. Without this investment and reliance on education, and especially tertiary education in industrialized societies, the competitive status of a nation will substantially deteriorate in the coming years (Alexander, 2000, p. 412)

As simpler jobs are shipped overseas and rapid technological changes require a more skilled and educated workforce, greater emphasis is being placed on the role higher education must play in increasing the United States' global economic competitiveness (Carnevale, Smith, & Strohl, 2010). According to the Georgetown University Center on Education and the Workforce, the percentage of jobs that require a postsecondary education increased between 1973 and 2008 from 28.00% to 59.00% and it is projected to further increase in the next decade to 63.00% (Carnevale, Smith, & Strohl, 2010). Remaining competitive in the global economy by educating Americans for 21st century jobs is a major force driving the college completion agenda (Obama, 2009; Russell, 2011).

Social Mobility

As the U.S. economy continues to evolve from a post-industrial economy into a global information economy, postsecondary education is becoming the key to social mobility for an entire generation, acting as a “threshold requirement for access to middle class status and earnings” (Carnevale, Smith, & Strohl, 2010, p.3). This phenomenon is obvious when one examines the percentage of the middle socioeconomic class with a postsecondary education; in 1970 it was 26.00%, and by 2007 it was 61.00% (Carnevale, Smith, & Strohl, 2010). It is even more apparent within the upper socioeconomic class; in 1970, 44.00% of the upper class had a postsecondary education, a proportion that grew to 81.00% by 2007 (Carnevale, Smith, & Strohl, 2010). “Given the transformation of workers by economic class, postsecondary education and training is no longer just the

preferred pathway to middle and upper income classes—it is, increasingly, the only pathway” (Carnevale, Smith, & Strohl, 2010, p.4).

Numerous studies have been conducted regarding the value of a college education, with some estimating that a person with a bachelor’s degree will typically earn 66.00% more over a 40 year working life than a high school graduate would earn, resulting in an estimated total gain of \$450,000 in today’s dollars, or approximately \$300,000 after subtracting the costs of college (Barrow & Rouse, 2005; Baum, Ma, & Payea, 2010; Clark, 2008). Other studies estimate that the wage gap between those with a bachelor’s degree and those with a high school diploma has nearly doubled since the early 1980s (Carnevale, Smith, & Strohl, 2010). Even with the recent economic downturn and Great Recession, studies have shown that a bachelor’s degree is valuable when employment and earnings are examined. The 2009 to 2010 unemployment rate for students with a new bachelor’s degree was a high 8.90% (versus 5.00% for new and experienced bachelor’s degree holders) but when compared with a 22.90% unemployment rate for recent high school graduates, or 31.50% for recent high school dropouts, it is obvious that a bachelor’s degree is still valuable in today’s struggling economy (Carnevale, Cheah, & Strohl, 2012).

Rising Financial Costs

U.S. spending on higher education continues to rise; federal and state governments spend billions of dollars each year to fund postsecondary education, while students and their families shoulder a larger portion of the ever-increasing cost of a college education (Thrum, 2012). In 2009, the U.S. spent \$461 billion on postsecondary education (3.30% of the U.S. gross domestic product (GDP)), a 42.00% increase from 2000, after accounting for inflation (Vedder & Denhart, 2011). According to the OECD

(2011b), the U.S. spends more than any other country on postsecondary education, with the cost per student totaling almost \$30,000, twice the expenditure per student of the United Kingdom, Germany, or Japan and three times as much as most other European and Asian industrialized countries.

But this high level of per-student spending may not be money well spent if persistence and degree attainment is not occurring at levels that warrant this investment. In a 2010 report the American Institutes for Research found that from 2003 until 2008 “states appropriated almost \$6.2 billion to colleges and universities to help pay for the education of students who did not return to school for a second year” (Schneider, 2010b, p.5). In addition to these appropriations there were grants to students who did not persist to their second year; these awards totaled \$1.4 billion at the state level and \$1.5 billion at the federal level (Schneider, 2010b). Between 2003 and 2008, in total over \$9 billion of federal and state funding was spent on students that did not make it past the first year in college.

Not only has the investment in postsecondary education been a sizable and ever-increasing federal and state cost, students and their families have seen the costs of a college education rise dramatically, outpacing their growth in income. From 1982 to 2007, families have seen college tuition and fees increase 439.00%, while median family income rose 147.00% (National Center for Public Policy and Higher Education, 2008). In order to pay the upwardly spiraling costs of a college education more students are assuming debt. In 1993 fewer than half of the students receiving a bachelor’s degree graduated with debt, but by 2008 two-thirds of bachelor’s degree recipients had taken out at least one loan to pay for their education (Lewin, 2008). In 2010 the average student debt load was \$24,000, with the total amount of student debt over one trillion dollars, outpacing credit card debt for the first time (Lewin, 2008).

Accountability and Productivity

It is no surprise, considering the high level of governmental and personal spending on postsecondary education, that there have been increased calls for accountability and productivity as the parties footing the bill demand assurance that their substantial investments are being well-spent. Since the 1990s “dramatic changes have emerged in the way governments interact with colleges and universities” (Alexander, 2000, p. 411). The economic motivation to maintain global competitiveness, combined with a large investment of publicly-generated resources and rising costs of a postsecondary education, has led state and federal governments to redefine their relationship with higher education institutions, calling for greater accountability and productivity (i.e., performance relative to funding) (Alexander, 2000). In addition to governmental interest in accountability and productivity, regional accreditation boards, parents, and students are looking for demonstrated evidence that colleges and universities are achieving their educational mission and goals (Dugan & Hernon, 2002).

Burke and Associates (2005) note that the goals of accountability in higher education have “shifted over time from system efficiency, to educational quality, to organizational productivity, and to external responsiveness to public priorities or market demands” (p. 4). It is also important to note that according to Burke and Associates (2005), “accountability approaches in the United States focus almost exclusively on undergraduate education” (p. xiii). Therefore, the undergraduate emphasis combined with the press for productivity and responsiveness to market demands places the focus of the accountability agenda on undergraduate outcomes including persistence and graduation rates.

In conjunction with this outcomes-based approach to accountability and productivity, there has also been a reignited interest in performance-based funding

models by state legislatures across the country (Harnisch, 2011). Performance-based funding models tie state funding of public colleges and universities to institutional performance. One category of institutional performance measures that is often used includes student success measures like course completion and graduation rates (Harnisch, 2011).

Colleges and universities are increasingly being held accountable, from a political, policy, or financial perspective, for their student success outcomes, including persistence and graduation rates. As a result, it is imperative that they understand their institutional environment, and how various aspects of that environment affect success.

Academic Libraries and Student Outcomes

As a core co-curricular campus resource, it is essential for academic libraries to investigate their contribution to effective educational practices and how they support the larger institutional mission by contributing to student engagement and persistence. The library literature has numerous examples of how public libraries have measured their contribution to their local communities (e.g., Aabo & Audunson, 2002; Debono, 2002; Lance, 2002), school libraries have measured their contribution to student learning (e.g., Hamilton-Pennell, Lance, Rodney, & Hainer, 2000; Krashen, 2001), and special libraries have measured their contribution to their organizations (e.g., Aaron, 2009; Strouse, 2003), but academic libraries have been less successful in assessing their impact and communicating their contribution and value to the educational mission of their institutions (Snelson, 2006).

Library assessment and evaluation in academic libraries has been slowly evolving, moving past simply measuring inputs and outputs to focusing on measuring outcomes as a way to show impact and value within the context of the higher education

institution. When one examines the literature on library performance measures, which dates back to the 1970s, it becomes clear that academic libraries have a long tradition of measuring inputs and outputs, rather than outcomes (Wells, 1995). The Association of College and Research Libraries, the largest division of the American Library Association with more than 12,000 members which assists academic libraries in their support of the higher education community, defines inputs as the “raw materials of a library program--the money, space, collection, equipment, and staff out of which a program can arise” (1998, para. 20). Poll and Payne (2006) defined outputs as “the amount produced, the results supplied” (p. 2). Outputs can represent work accomplished such as the number of books circulated, the number of reference questions answered, or the number of students who attended library instruction courses.

Library outcomes, on the other hand, are defined by the Association of College and Research Libraries as “the ways in which library users are changed as a result of their contact with the library’s resources and programs” (1998, para. 13). Dugan and Herson (2002) argue that outcomes are individually based, while inputs and outputs are institutionally based. Inputs and outputs are generally seen as useful in order to measure efficiency and effectiveness but are not sufficient for assessing outcomes (Association of College and Research Libraries, 1998; Herson, 2002). Orr (1973) was one of the first in the library literature to argue for evaluating libraries based on outcomes, instead of merely inputs and outputs. He proposed assessing the library using a dual concept of goodness, “how good is the service?” and “how much good does it do?” (p. 317), suggesting that quality (determination of goodness) and impact (determination of how much good it does) are equally important when assessing a library.

In most of the library literature the concepts of outcomes assessment and impact assessment are seen as synonymous (Poll & Payne, 2006); however, the two concepts are

not identical. Outcomes assessment is defined as measurement of “a change in behavior, skills, knowledge, perceptions, or attitudes resulting from contact with library programs, training sessions, workshops, or services” (Hernon, 2002, p. 54) while impact can be measured by observing “what the users are actually doing and what they are producing as a result” (Everest & Payne, 2001, p. 19). Since outcomes/impact assessment is focused on changes in the user as a result of interaction with the library, it is important that the assessment be user-centered, not institution-centered, and it should be integrated with campus assessment efforts (Association of College and Research Libraries, 1998; Nitecki & Franklin, 1999). It is through the process of outcomes/impact assessment that academic libraries can show the “direct effects the library has on institutional outcomes, or if more indirect, the enabling effects that contribute to these outcomes” (Gratch-Lindauer, 1998, p. 550). When academic libraries focus on outcomes and impact, rather than quality of inputs and outputs, they shift the focus away from assessment of the internal and towards assessment of the external, thereby embracing what Ralph Wolff describes as a culture of evidence (Gratch-Lindauer, 1998) in which the library is able to clearly demonstrate its contribution to the institution’s mission and goals of teaching, learning and research (Dugan & Hernon, 2002; Hernon, 2002; Poll & Payne, 2006).

In the 2010 report, *The Value of Academic Libraries*, Oakleaf argues that libraries should focus on defining their value within the context of the institution. The report highlights five ways, both internally-focused (use, financial value, and production of a commodity) and externally-focused (competing alternatives and library impact), through which libraries can define their value. According to the report, the internally-focused determinants can be problematic because they are based on valuation by the supplier, not valuation by the user. Furthermore, use is a metric that libraries often try to equate with value, but it is often not viewed as a compelling source of value by institutional decision

makers and stakeholders external to the institution. In addition, the financial value and production of a commodity are purely economic models and are seen by many to be incompatible with the goals and philosophy of higher education. With regards to the two externally-focused ways an academic library can determine value, competing alternatives involves creating a user perception that the academic library is more valuable than its competitors. Library impact is characterized as one of the most important ways of showing value since it examines how library service and resources affect the users, but the report notes that it can be hard to measure, so many libraries avoid doing so.

PROBLEM STATEMENT

Our nation's college completion problem has such serious implications, including loss of global economic competitiveness, limitations on social mobility, and large financial costs that it has garnered presidential attention and spurred numerous completion initiatives at the federal, state, and institutional levels. Persistence to degree attainment has also become the subject of much scrutiny as part of the accountability and productivity agenda pursued by many state and federal governments, accrediting agencies, trustees and boards, employers, and families alike. Therefore, if colleges and universities better understood how their institutional environments encouraged or discouraged student engagement, persistence and ultimately, degree attainment they could not only foster these positive student outcomes but could also more effectively respond to the external calls for accountability and productivity. As an important part of the environment of every institution, academic libraries are a fundamental co-curricular resource on college and university campuses, but little research has been conducted investigating the relationship between library use and student engagement and persistence. If academic libraries wish to remain relevant in today's challenging

economic and political climate, they must develop methodologies for assessing their effect, either direct or indirect, on the institution's mission and goals of teaching, learning, and research.

PURPOSE OF THE STUDY

The purpose of this study was to investigate how use of the academic library's physical resources and spaces was related to student persistence and engagement at a large public research university. Since persistence is defined as "the desire and action of a student to stay within the system of higher education from beginning year through degree completion" (Berger, Ramirez, & Lyon, 2005, p. 7), student persistence was investigated using five-year graduation status (i.e. have they graduated or not). Student engagement was investigated using the sub factors for sense of belonging and satisfaction, academic engagement, and academic disengagement (an inverted scale) from the Student Experience in the Research University (SERU) survey. This study examined the following six research questions:

Research Question #1: Is there a relationship between the use of an academic library's physical resources or spaces and undergraduate student engagement?

Research Question #2: Is there a predictive relationship between the type of academic library use (use of physical resources or use of spaces) and undergraduate student engagement?

Research Question #3: Is there a predictive relationship between the use of an academic library's physical resources or spaces, and undergraduate student engagement based on a student's gender, ethnicity, parental income level, SAT score, cumulative GPA, college discipline, or year in college?

Research Question #4: Is there a relationship between the use of an academic library's physical resources or spaces and undergraduate student persistence?

Research Question #5: Is there a predictive relationship between the type of academic library use (use of physical resources or use of spaces) and undergraduate student persistence?

Research Question #6: Is there a predictive relationship between the use of an academic library's physical resources or spaces, and undergraduate student persistence based on a student's gender, ethnicity, parental income level, SAT score, cumulative GPA, college discipline, or year in college?

BRIEF OVERVIEW OF THE LITERATURE REVIEW

The literature review examines the research related to the persistence of students in higher education institutions, how the engagement of students in higher education institutions is related to persistence, and the previous studies investigating the relationship between academic library use and student persistence and engagement. Student persistence in higher education was elucidated by reviewing the theoretical models developed by Spady (1970), Astin (1970), Tinto (1975, 1987, 1993) and Bean (1980) and through the summation of empirical research investigating its relationship to student characteristics, enrollment patterns, and institutional factors. Student engagement and its relationship to persistence was explored using Pace's (1980) theory of quality of effort, Astin's (1984) theory of involvement, and Kuh's (1991, 2005, 2006) model of engagement and theories of effective educational practices and high-impact educational activities. Research from previous studies on the relationship of academic library use and student outcomes, namely persistence, engagement, student achievement, and gains in critical thinking, are also summarized. The last section of the literature review describes

the importance of the conceptual framework for this study, Astin's (1970) input-environment-outcome (I-E-O) model, and how it provided the theoretical lens for the creation of the research questions and the interpretations of the study findings.

BRIEF OVERVIEW OF THE METHODOLOGY

This quantitative study used Astin's (1970) input-environment-outcome (I-E-O) model as an analytic framework as it combined and analyzed three types of data (library-use data, institutional data, and student experience data) in order to examine the relationship between academic library use and undergraduate student engagement and persistence at a large public research university; how that relationship differed based on the type of library use as well as certain student characteristics was also explored. This study attempted to capture the multidimensional nature of library use by examining independent variables that represented the use of physical resources (material checkout records and interlibrary loan requests) and spaces (logons to computer workstations and reservations of study rooms) in its analyses. Student demographics – including gender, ethnicity, parental income, SAT score, year in college, discipline, and cumulative GPA – were used as independent and control variables in the analyses as well. Engagement was treated as both an outcome variable and an intermediate variable in the analyses and was investigated using a sense of belonging and engagement subfactor, an academic engagement subfactor, and an academic disengagement factor from the 2011 administration of the Student Experience in the Research University (SERU) survey ($n = 13,120$). Persistence was examined using institutional data that determined if a student persisted to graduation within five years of enrollment. Descriptive and inferential statistical techniques, including correlations, Chi Square, linear regressions, and logistic regressions, were used to analyze the data.

SIGNIFICANCE OF THE STUDY

This study examined the relationship between academic library use and student engagement and persistence, an undertaking that is significant for both academic libraries and the institutions they serve.

This study is important to academic libraries because it provides a model for combining library and institutional data in order to investigate how library resources and spaces may be related to student success outcomes. Academic libraries must be able to communicate to their constituencies how their resources and spaces serve the greater institutional mission of teaching and learning in order to justify funding during times of scarce financial resources and to demonstrate proper use of funding when faced with questions of accountability (Oakleaf, 2010; Rudd, 2002). This issue of impact and value is so important to the academic library community that the Association of College and Research Libraries launched a multiyear project, ACRL's Value of Academic Libraries Initiative, in 2010 in order to highlight the importance of researching academic library impact and value, and to jumpstart discussions regarding the establishment of a research agenda. Regardless of the outcome of the analyses with this particular dataset for this institution, the undertaking of this study furthers the research agenda and contributes knowledge to an under-examined but important area of concern.

This study is also significant because it applies a new methodological approach to an area that has received little attention from researchers. After reviewing the library literature it is clear that very few studies have been conducted that examine the relationship between library use and student persistence or engagement; only seven studies have investigated student persistence since 1965 and only three studies have explored student engagement since 2003. Six of those seven studies that examined student persistence only explored one dimension of library use, operationalized as

borrowing of physical resources, participation in library instruction, or use of physical facilities. In contrast, this study examined library use by including two dimensions, use of physical resources and use of physical spaces. This multidimensional approach recognizes the fact that students interact with the library in different ways; some may use the resources, some may use the spaces, and some students may interact with both dimensions of the library to meet academic or social needs. Conceptualizing the library with the two dimensions of physical resources and spaces also facilitates investigating whether certain types of use are more related to positive student outcomes and whether there is also any relationship between the dimensions and certain student demographics including ethnicity, parental income, gender, SAT score, year in college, cumulative GPA, or discipline.

Undertaking a study of this nature is also valuable to colleges and universities because it adds to the literature investigating how the co-curricular environment affects student outcomes. The results of this study further illuminated how institutional factors affect student engagement and persistence, which advance the discussion on how colleges and universities can effectively utilize co-curricular resources in order to maximize the use of effective educational practices on their campuses. If a relationship between library use and student engagement or persistence is established it could certainly have pedagogical, policy, and even resource allocation implications for academic libraries and their parent institutions.

Finally, this study is meaningful since it seeks to address the growing persistence imperative that has gained prominence from the national to the institutional level. As previously described, there are numerous deleterious outcomes when students fail to complete college including reduced national economic competitiveness, loss of individual social mobility, and wasted financial resources by the federal government, state, and

student. Any research that helps institutions shed light on this issue is valuable in this current environment of heightened awareness and concern regarding completion accountability.

DEFINITION OF KEY TERMS

Academic library – a library that “is attached to academic institutions above the secondary level, serving the teaching and research needs of students and staff.” (Hoare, 2003, p. 3).

Co-curricular – “being outside of but usually complementing the regular curriculum” (Merriam-Webster.com).

Engagement – is defined as “the amount of time and effort students put into their studies and other activities that lead to the experiences and outcomes that constitute student success coupled with the ways in which the institution allocates resources and organizes learning opportunities and services to induce students to participate in and benefit from such activities” (Kuh, Kinzie, Schuh, Whitt, & Associates, 2005, p.9).

Persistence – “the desire and action of a student to stay within the system of higher education from beginning year through degree completion” (Berger, Ramirez, & Lyon, 2005, p. 7).

Retention – “the ability of an institution to retain a student from admission to the university through graduation” (Berger, Ramirez, & Lyon, 2005, p. 7).

Chapter Two: Literature Review

Boote and Beile (2005) describe the critical role a literature review plays in conducting quality research, stating a “substantive, thorough, sophisticated literature review is a precondition for doing substantive, thorough, sophisticated research [...] A researcher cannot perform significant research without first understanding the literature of the field. Not understanding the prior research clearly puts a researcher at a disadvantage” (p. 3). Since understanding the previous scholarship is a prerequisite for conducting “substantive” and high quality research, this chapter examines the relevant literature of student persistence, student engagement and how library use may affect these outcomes. The first section of the literature review focuses on the pertinent theoretical models and empirical research on persistence of undergraduate students in higher education institutions. The persistence literature is explored first in order to provide the foundational theories and research on student persistence, thereby elucidating the complexity of the problem. The second section of the literature review examines select theories and empirical research on the topic of student engagement and high-impact educational practices in higher education institutions. The student engagement literature is reviewed after the persistence literature since it is important to understand the underlying problem of persistence before examining the ameliorating effects of environmental factors such as engagement and high-impact educational practices. After the student outcomes of persistence and engagement are explored, the third and final section reviews the literature that examines previous studies relating to academic library use and student outcomes, specifically persistence, engagement, academic achievement, and gains in critical thinking skills.

A synthesis of the research reviewed in each of the three broad topic areas is provided at the end of each section; these summaries highlight the research conclusions as well as identify gaps in the literature base. In addition, this chapter concludes with a review of the conceptual framework that has been chosen to guide this research study.

STUDENT PERSISTENCE IN HIGHER EDUCATION

As the number of students who attend college has increased due to legislation such as the Morrill Act, the GI Bill, the Civil Rights Act of 1964, and successful educational and financial-aid policies, student populations in colleges and universities have grown and diversified, making persistence issues more important and more complex (Berger, Ramirez, & Lyon, 2005). This complexity arises from the numerous components of the educational experience including the student, the campus environment, educational roles, socioeconomic contexts, policies, and interventions (Berger, Ramirez, & Lyon, 2005).

The modern examination of the phenomenon of voluntary departure by college students, originally termed student mortality, began in the 1930s, but did not adopt a systematic and empirical approach until the late 1960s, when such students were characterized as “dropouts” in the work of Feldman and Newcomb (1969), Spady (1970), and Astin (1970). Upon examination of the research, it becomes clear that the way in which this lack of persistence has been conceptualized has changed over time, and its evolution is reflected in many of the model and theory names. Mortality, dropout, attrition, withdrawal, stopout, retention, and persistence are all terms that have been used to describe the process of students leaving college.

Theoretical Models of Student Persistence

There are numerous theories and models related to student persistence; these theories and models can be viewed from a variety of perspectives including a sociological perspective (e.g., Astin, 1970; Bean, 1980; Bean & Metzner, 1985; Spady, 1970; Tinto, 1975, 1987, 1993), an organizational perspective (e.g., Bean, 1983; Berger, 2000; Berger, 2001-2002; Berger, 2002; Berger & Braxton, 1998; Berger & Milem, 2000), a psychological perspective (e.g., Bean & Eaton, 2000), a cultural perspective (e.g., Attinasi, 1989, 1992; Kuh & Love, 2000; Tierney, 1992; Torres, 2003), or an economic perspective (e.g., Braxton, 2003; Cabrera, Nora, & Castaneda, 1992). This literature review concentrates on the two seminal sociological models from Spady (1970) and Tinto (1975, 1987, 1993), and an organizational model from Bean (1980), since these models focus on the interaction of the student with the college environment. In addition to these three models, Astin's (1970) input-environment-outcome model is reviewed in the conceptual framework section of this chapter. These sociological and organizational models are the most pertinent to this study because the unit of analysis was the student and the research questions that were investigated focused on the interaction between student behavior (i.e., use) and the environment (i.e., the academic library's resources and spaces).

There are also persistence theories that focus on certain populations of students including nontraditional students (e.g., Bean & Metzner, 1985; Braxton, Hirschy, & McClendon, 2004), minority students (e.g., Cabrera, Nora, Terenzini, Pascarella, & Hagedorn, 1999; Carter, 2006), and first-generation students (e.g., Terenzini, Springer, Yeager, Pascarella, & Nora, 1996). Although these theories make important contributions to the persistence literature, this literature review focused on the theories most related to the proposed research study. The undergraduate population at the

university site where this study was conducted is primarily composed of traditional students; therefore this literature review focused on the theories of traditional students. Likewise, the ethnicity or first-generation status of the students in the study is not of primary concern for the analysis of the data and therefore the theories related to these sub-populations were not reviewed. Research findings for non-traditional, underrepresented, and first-generation students are briefly discussed in the section that summarizes empirical research on student persistence.

Since the late 1960s researchers have been systematically developing models and empirically testing theories to explain why some students remain enrolled in higher education institutions and why some leave. Student attrition theories in the 1960s mainly focused on the academic abilities or psychosocial attributes of students as the reason for voluntary departure from higher education institutions (e.g., Rose & Elton, 1966; Summerskill, 1962). Spady's model of the student dropout process (1970) was the first theory that considered the interaction of the student with the college environment when attempting to explain the lack of student persistence.

Spady's Model of the Student Dropout Process

Spady's model of the student dropout process (1970) was based on Durkheim's (1951) theory of suicide that posited, in its most simplistic interpretation, that extremely low levels of social integration lead to suicide. Spady's model was the first to take an interactive and interdisciplinary approach, arguing that the dropout process is best examined as interactions "between the individual student and his particular college environment in which his attributes (i.e. dispositions, interests, attitudes, and skills) are exposed to influences, expectations and demands from a variety of sources" (p. 77) and it is through these interactions that students integrate into the academic and social systems

of the institution. If the rewards in either the academic or social system are deemed inadequate, the student may choose to withdraw from the higher education institution. The more integrated a student is in the academic and social systems of college, thereby experiencing greater rewards from those systems, the less likely the student is to leave. Within the academic system, Spady identified grades and intellectual development as rewards. Normative congruence (attitudes, interests, and dispositions that are compatible with the environment) and friendship support (establishment of close relationships with others) are the rewards within the social system. Despite its innovative sociological underpinnings, Bean (1980) criticized Spady's model on methodological principles, arguing it did not adequately discern between the determinants of student attrition (analytic variables) and the correlates of student attrition (demographic variables).

Tinto's Theory of Student Departure

Tinto's theory of student departure (1975, 1987, 1993) is a longitudinal model that aims to explain the interaction between the student and the institution that results in individuals dropping out and to identify the factors that result in different types of dropout behavior. Like Spady's model of the student dropout process (1970) this interactionist model is primarily a sociological model with roots in Durkheim's theory of suicide. But Tinto also utilized the theoretical framework of rites of passage from Dutch anthropologist Van Gennep (1960) to describe how individuals move from membership in one group to another, especially during the transitional period from youth to adulthood. This movement occurs in three stages: separation, transition, and incorporation. Tinto's use of Van Gennep's theoretical framework suggests that college persistence is related to the successful movement through the three stages, resulting in

incorporation, while departure is related to unsuccessful movement resulting in a lack of incorporation.

Tinto's (1975, 1987, 1993) theory suggests that colleges and universities are comprised of both an academic system and a social system. The academic system refers to the formal education of students, i.e., what occurs in the classroom. The social system encompasses the interactions between students, faculty, and administrators that occur outside of the classroom. The academic and social systems are interwoven, with events in one domain influencing events in the other domain. Within this interactional model, Tinto (1975) theorizes that the dropout process is a longitudinal process of formal and informal interactions

between the individual and the academic and social systems of the college during which a person's experiences in those systems (as measured by his normative and structural integration) continually modify his goal and institutional commitments in ways which lead to persistence and/or varying forms of dropout (p. 94).

As Figure 2.1 below visually conceptualizes, pre-entry attributes (family background, personal attributes, skills, dispositions, and educational experience and achievements) interact with a student's goals and commitments (student aspirations and institutional goals), which in turn interact with institutional experiences (academics, faculty interaction, co-curricular involvement, and peer group interaction), resulting in varying levels of academic and social integration. The level of academic integration directly impacts the goal commitment (commitment to completing college) and the level of social integration directly impacts institutional commitment (commitment to his/her respective college or university).

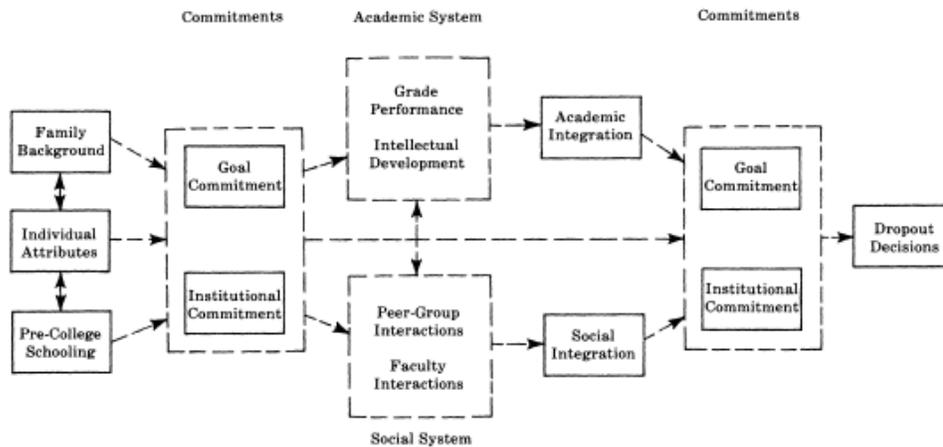


Figure 2.1: Theory of Student Departure
Source: Tinto (1975, p. 95)

Positive integration into the two systems increases the likelihood of persistence, while negative integration into one or both systems increases the likelihood of departure from the institution. Even though this model is an intra-institutional model, Tinto (1975, 1987, 1993) acknowledges that students experience events external to the institution that influence their decisions regarding persistence or departure and therefore the model is situated within the broader context of the larger external community. In order to reflect this, Tinto revised his original theory and added financial resources to the pre-entry attributes and external forces in order to acknowledge the influence of external pressures and communities on students' departure decisions (1987, 1993).

Tinto's (1975, 1987, 1993) model has been extremely influential in the area of student persistence in higher education and has served as the conceptual framework for countless studies and is often cited within the literature (Metz, 2004-2005). The validity of Tinto's theory of student departure has been tested by numerous researchers.

Terenzini and Pascarella (1980) published the aggregate findings of six previous studies, concluding that Tinto's theory of student departure is a conceptually useful model for examining the constructs and processes involved with college student attrition. Terenzini and Pascarella also found that the variables used to operationalize academic and social integration had a statistically reliable association with persistence, even when pre-college characteristics were controlled for, although these pre-college characteristics themselves were not significant factors in persistence. Pascarella and Chapman (1983) also tested the validity of Tinto's model in three different institutional settings: a four-year residential institution, a four-year commuter institution, and a two-year commuter institution. Using discriminant and path analysis, Pascarella and Chapman found the amount of variance in persistence that the model accounted for was low, ranging from 13.00% to 17.00%, but that the results still generally supported the predictive validity of the model.

Although Tinto's theory of student departure (1975, 1987, 1993) is widely viewed as one of the seminal models of student persistence, it is not without its critics. Criticisms of the model have included its empirical validity and overall adequacy, its lack of applicability to nontraditional students, its sociological foundations and requirement of "normative congruence" to a dominant college culture, and its lack of external factors.

Some researchers have argued that Tinto's model (1975, 1987, 1993) is not empirically robust enough to fully explain student attrition. Cabrera, Nora, and Castañeda (1992) combined Tinto's model with Bean's model of student attrition (1980); their findings indicated that although neither model adequately explained the student departure puzzle, integrating the two models provided a better understanding of the complex interaction between the individual, environment, and institutional factors. Although Terenzini and Pascarella (1980) and Pascarella and Chapman (1983) found

empirical support for Tinto's model, there have been other researchers who have found only partial empirical support of it. For example, Braxton, Sullivan, and Johnson (1997) appraised Tinto's theory and in single-institutional tests found only moderate empirical support, with only 5 of the 13 constructs being supported as relevant factors by the empirical data. In addition, Braxton, Sullivan, and Johnson (1997) only found empirical support for 2 of Tinto's 13 propositions when tested in commuter colleges and universities, adding support to the critiques of Tinto's model for its lack of applicability to nontraditional students or students not attending a four-year residential institution.

Tierney's (1992) criticisms of Tinto's model focused primarily on the sociological foundations it employed. Tierney claims Tinto (1975, 1987, 1993) misrepresented the work of Van Gennep (1960) and his rites of passage construct, arguing it was not meant to describe the ritual of one culture as it initiates a member from another, as it is reflected in Tinto's integrationist departure model, but rather the rites of passage construct only reflects an individual's progression within his/her own culture. Tierney also argued that rites of passage do not involve choice and, therefore, members of the culture simply participate, unlike Tinto's model in which students make conscious decisions to join or leave the college community. In addition, Tierney, along with Hurtado (2007), Harper and Quaye (2009), and Rendón, Jalomo, and Nora (2000), criticized the integrative nature of Tinto's model. The model maintains that student persistence is partially predicated on "normative congruence," whereby a student must successfully assimilate into the dominant college culture, a notion that ignores the fact that integration into predominantly White environments may be difficult or deleterious for students from racially and ethnically diverse groups.

Another criticism of Tinto's model was the lack of external factors that it incorporated, including finances, parental involvement, and support systems, and how

they affect perceptions, commitment, and goals (Bean, 1980; Cabrera, Castaneda, Nora, & Hengstler, 1992). Tinto responded to these criticisms by adding financial resources and external communities to later versions of his theory (1987, 1993).

Tinto's model of student departure (1975, 1987, 1993) was reviewed in detail since it is one of the seminal theories on student persistence, making it well known and often cited (Metz, 2004-2005). But its predominant focus on academic and social integration makes it less useful for this proposed study which is focused on the interaction, not integration, of the student with the collegiate environment, specifically the academic library.

Bean's Causal Model of Student Attrition

Bean's causal model of student attrition (1980) was created based on a sample of traditional students (under 22 years of age, White, non-Hispanic, single, first semester, first-time students at a Midwestern university) and is based on the literature of organizational turnover and models of attitude-behavior interactions. Bean draws from Price's (1977) theory of employee turnover in the workplace as well as from the theoretical models of Spady (1970), Astin (1970), and Tinto (1975, 1987, 1993) (Metz, 2004-2005). The model examines students' pre-college characteristics, organizational determinants, and the intervening variables of institutional commitment and satisfaction. Similar to Tinto's model, Bean's causal model of student attrition is a longitudinal model theorizing that pre-college characteristics can affect adjustment to college and that persistence is impacted by the fit between the student and the institution. While Tinto (1975, 1987, 1993) emphasizes the importance of academic and social integration for both institutional and goal commitment, Bean focuses on the influence of organizational factors on institutional commitment. Unlike Tinto's (1975) earlier version of the theory

of student departure model, Bean emphasized the impact of external factors and variables in his model.

As illustrated in Figure 2.2, pre-college characteristics, including prior academic achievement, socioeconomic status, residence, distance to parental home, and size of hometown, were included in the model in order to capture their influence on the interaction with the institution. The organizational determinants used in the model were routinization (i.e., the repetitive nature of student life), development, practical value, institutional quality, integration, university GPA, goal commitment, communication, distributive justice (i.e., fair distribution of rewards and punishments), centralization, advisor, staff/faculty relationship, campus job, major, housing, campus organization, and opportunity. The intervening variables of satisfaction and institutional commitment were utilized in the model based on the premise that the organizational determinants should affect satisfaction, which would, in turn, affect institutional commitment.

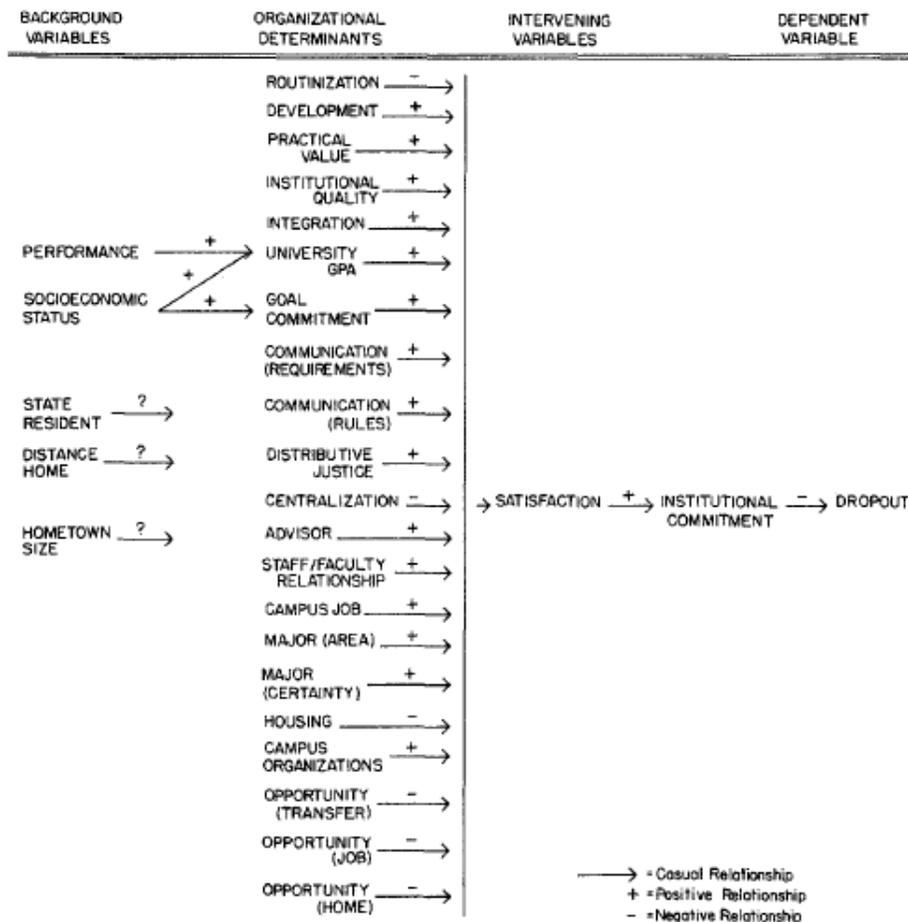


Figure 2.2: Causal Model of Student Attrition
 Source: Bean (1980, p. 158)

Bean's model (1980) employed multiple regression and path analyses, and, based on these analyses, he concluded that institutional commitment was the organizational determinant that was most associated with dropout. In addition, institutional quality and opportunity (transfer), defined as "the degree to which alternative roles (as a student, employee or dependent) exist in the external environment," (p. 160) were determined to be the two most influential variables on institutional commitment. The model also revealed gender differences with regards to the variables associated with departure.

Males left the university even when satisfied, as opposed to females who, if satisfied, were more committed to the institution and stayed.

Summary of Theories on Student Persistence

As evidenced by the persistence theories reviewed above, the issues surrounding student persistence at postsecondary educational institutions are complex because of the numerous components of the educational experience. The theories from Spady (1970), Tinto (1975, 1987, 1993), and Bean (1980) were included in this literature review because they focus on how student interaction with the college environment affects persistence, which aligns with the theoretical approach of this study since it examined whether student interaction with a co-curricular resource in the college environment (the library) affects persistence. Specifically, Bean's model of student attrition stresses the influence of organizational factors on students' commitment to college while Spady's model stresses the importance of social integration and Tinto's theory emphasizes both academic and social integration. Another reason for including Spady's and Tinto's models is the importance placed on integration, which is closely related to the theory of engagement, another student outcome that was researched in this study and is described in the next section of this literature review.

While the theories of Spady (1970), Tinto (1975, 1987, 1993), and Bean (1980) all provide valuable insights into the issue of student persistence, they all take a deficit view of persistence, primarily focusing on what makes students leave. The deficit approach is obvious even in their nomenclature: the model of student dropout (Spady), the theory of student departure (Tinto), and the model of student attrition (Bean). Since this study was interested in exploring whether the use of an academic library might promote undergraduate engagement and persistence, the theoretical framework that

served as a scaffold for this research was Astin's input-environment-outcome model (1970), since it is an interactional framework that does not employ a deficit orientation. The final section of this chapter describes Astin's I-E-O theory in more detail and describes the rationale behind using it as the conceptual lens for this study.

Empirical Research on Student Persistence

As outlined in the previous section, there are numerous models and theories that have been developed to better understand the puzzle of voluntary college student departure. In addition to these theories, much empirical research has been conducted in order to further elucidate this phenomenon by testing the various theoretical frameworks and models. Through this empirical research a substantial amount has been learned about the ways in which student characteristics, institutional factors, and enrollment patterns are linked to voluntary departure from postsecondary institutions, some highlights of which are summarized in this section.

Understanding how student characteristics, enrollment patterns, and institutional factors may positively or negatively affect persistence is vital to any study that examines persistence since these characteristics affect the student, as well as the environment, and should therefore be considered when designing any research study. For example, this study analyzed input variables, including student demographics such as gender, ethnicity, and parental income while controlling for other characteristics such as SAT score; therefore it was important to be familiar with the results of previous research on the relationship between student characteristics and persistence so that study results could be accurately interpreted. With regards to enrollment patterns, the majority of undergraduate students (over 92.00%) at the university site for this study were full time students, as a result it was also important to understand the relevant literature regarding the effect

of enrollment status on persistence. In addition to examining the empirical research on student characteristics and enrollment patterns, institutional factors were also considered when conducting this study since the interaction between the student and the environment may affect the outcome of persistence. The university site for this study was a large, public, selective, four-year research institution; it was important to understand how those factors could create institution-level effects within the study.

Student Characteristics

Students come to college with various personal characteristics and life situations, some of which may affect how they experience college, their commitment to college, and ultimately their success or failure. Research has found that there are some characteristics that put students at risk for not persisting, including academic under-preparation for college, age, gender, race/ethnicity, socioeconomic status, and first-generation status.

Not surprisingly, academic preparedness is closely related to persistence. Research has shown that high school grades and SAT scores are equal predictors of college persistence (Robbins, Allen, Casillas, Peterson, & Le, 2006). Astin and Oseguera (2005) found that students with SAT scores in the highest score intervals were three times more likely to graduate from college than students in the lowest test interval. They also found that under preparation for college, and the resulting need for enrollment in developmental or remedial education, is a known risk factor for persistence and graduation (Astin & Oseguera, 2005). Approximately 21.00% of students seeking a bachelor's degree require remedial education, and for those students it impacts their likelihood of graduation, with only about 35.00% of them graduating within six years as compared to approximately 56.00% of students who did not need remediation (Complete College America, 2011). In addition to academic preparedness, research has also shown

that academic achievement in college is positively related to persistence (Astin, 1975; McGrath & Braunstein, 1997; Tinto, 1987, 1993).

Certain demographic factors can also negatively affect a student's likelihood of persisting. Age is a known risk factor for persistence, with students aged 25 years or older less likely to persist than younger, traditional-aged students (U.S. Department of Education, 1997). In addition, gender is associated with persistence, with women being more likely to persist and attain a degree than men (Astin & Oseguera, 2005; Astin, Tsui, & Avalos, 1996). A student's race/ethnicity plays a role in persistence and graduation as well, with White and Asian American students more likely to receive an undergraduate degree than African American, Latino/Hispanic, or Native American students (Astin & Oseguera, 2005; U.S. Department of Education, 1997). Similarly, a student's socioeconomic status is related to persistence, with students from lower income groups less likely to persist than students from higher income groups (Astin, 1993; Pascarella & Terenzini, 1991). In fact, Astin (1993) found socioeconomic status was the best predictor of whether a student would earn a bachelor's degree, after controlling for ability. Like socioeconomic status, first-generation status also affects students' chances of college graduation by negatively affecting college preparation and doubling the likelihood that the student will be enrolled in developmental education (Choy, 2001; Warburton, Bugarin, & Nunez, 2001). First-generation status is also related to race, with underrepresented groups disproportionately represented among this population; 42.00% of Latino students are first generation students, as compared to 18.00% of White students (Swail, Cabrera, Lee, & Williams, 2005).

In addition to demographic factors, certain life situations can also be related to decreased persistence. Being a single parent, caring for children at home, or working while attending school have all been associated with decreased persistence (Community

College Survey of Student Engagement, 2005; Naretto, 1995; U.S. Department of Education, 1997).

There are numerous student characteristics and life situations that have been shown to negatively affect college persistence for many students pursuing a postsecondary education. Familiarity with the research that addresses these risk factors was important for this study since they influenced the design of the methodology and the collection, analysis, and interpretation of data, as well as the conclusions drawn.

Enrollment Patterns

Clearly certain student characteristics and life situations affect the likelihood of a student persisting at a postsecondary institution, but research has also shown that enrollment patterns can hinder persistence to graduation as well. The work of Clifford Adelman (2006) suggests intensity of participation and momentum play important roles in student persistence. Adelman identified a number of key momentum points during college which are closely associated with student success or failure; he linked these momentum points with benchmarks that he found to be strong predictors of postsecondary completion. These benchmarks are as follows: (1) students must earn at least 20 credits by the end of the first calendar year of enrollment; (2) enrollment in summer semesters in which students earn at least 4 credits has a positive relationship to degree completion, especially for African American students; (3) part-time enrollment (defined as fewer than 12 credits per semester) is detrimental to degree completion; (4) continuous enrollment is very important to degree completion, as it increases the probability of success by 43.00%; (5) “swirling,” or wandering from one school to another, was not positively associated with degree completion; (6) students who withdrew from or repeated 20.00% or more of their courses cut their probability of

earning a degree in half; and (7) delaying enrollment in a postsecondary institution after high school completion decreases the likelihood of persistence and degree completion (Adelman, 2006). By identifying these benchmarks, Adelman has provided insight into how the intensity of student interaction with the college environment and the amount of student momentum can be a valuable predictor of persistence.

Institutional Factors

Institutional factors include such variables as sector, size, selectivity, control, type/mission, residential character, and student-faculty ratio. In general, when examining student success outcomes institutional factors have shown little or inconclusive effects, when student variables are controlled for (Pascarella & Terenzini, 2005). Yet institutional factors and their effect on educational attainment are continually studied and certain factors “appear to be consistently related to traditional measures of student success” (Kuh, Kinzie, Buckley, Bridges, & Hayek, 2006, p. 52); therefore, these institutional factors were reviewed.

The sector of the institution, i.e., its status as a two-year or four-year institution, has been shown to be related to educational attainment. Some studies have shown that students who start their bachelor’s education at two-year institutions are less likely to transfer to a four-year institution (e.g., Berkner, He, & Cataldi, 2002), but those who do transfer seem to have similar overall persistence rates to those who started at a four-year institution: 76.00% versus 78.00%, respectively (Pascarella & Terenzini, 2005). In addition, time to degree for a bachelor’s degree is negatively affected by starting at a two-year institution. According to Pascarella and Terenzini (2005), students pursuing a bachelor’s degree who start their educations at two-year institutions but transfer to four-

year institutions are less likely to complete their degree in five years than are students who start at four-year institutions, weighing in at 8.00% versus 57.00% respectively.

Studies on the effect of the size of an institution (defined as the number of students enrolled in the institution) appear to be inconclusive. In one study Astin (1993) found institutional size to be inversely related to educational attainment, and the largest predictor of attainment when pre-college student characteristics and other institutional variables were controlled for, but other research shows no statistically significant relationship with attainment (e.g. Ethington, 1997; Stoecker & Pascarella, 1991). According to Pascarella and Terenzini (2005) the impact of size is small and indirect, since its effect is usually mediated through other variables.

Selectivity of an institution, usually measured by the academic ability of admitted students, has been shown to be related to persistence and graduation rates. Titus (2004) found that level of selectivity has a positive effect on persistence. Graduation rates are higher for more selective institutions and lower for less selective institutions (Pascarella & Terenzini, 2005), and some studies have shown this factor to be statistically significant even when other institutional or student characteristics are controlled for (e.g., Adelman, 1999; Ethington, 1997; Stoecker & Pascarella, 1991).

Numerous studies have been conducted to determine whether the control of an institution (its status as public or private) is related to student persistence. According to Horn (1998), students who attend private institutions have a slightly improved, but statistically significant, first-to-second year persistence rate compared to students at public institutions, at 87.50% versus 82.50% respectively. But when pre-college background characteristics are controlled for, the advantage disappears (Horn, 1998). Likewise, other studies have shown students at private institutions are more likely to graduate than students at public institutions (e.g., Astin, Tsui, & Avalos, 1996; Berkner,

He, & Cataldi, 2002). But when pre-college background characteristics are controlled for with regards to degree attainment, the picture is inconclusive (Pascarella & Terenzini, 2005).

The type or mission of a college or university is often described based on the institution's Carnegie Classification. Data from a 2011 College Board study showed that institutional retention rates are related to institution type, with retention rates rising with the Carnegie classification. For example, research universities with very high research activity have the highest rate of retention for full time students, retaining 89.50% of their students on average, as compared to baccalaureate/associate's colleges, which average about 60.20%.

Campus residency, i.e., students living on campus, has been shown to be related to student persistence (e.g., Astin, 1993; Chickering & Reisser, 1993). Pascarella and Terenzini (2005) argue that this effect is more indirect than direct but that residential students are more satisfied with their college experience due to greater engagement resulting from increased interaction with peers and faculty.

Researchers have attempted to identify the numerous institutional characteristics that affect the environment in which students experience college, many of which may be related to persistence. However, based on the current research, the size of each effect and the directness of its influence appear to be an open question. Regardless, the potential effects of these institutional factors were considered for this study in as much depth as the current literature allows.

Summary of Empirical Research on Student Persistence

In summary, the empirical research outlined above clearly provides evidence that certain student characteristics, enrollment patterns, and institutional factors affect

undergraduate student persistence, and therefore their effects were considered during the research design and data interpretation phases of this study. With regards to student characteristics, academic preparedness, age, ethnicity, gender, socioeconomic status, first generation status, parental status, and employment status have all been shown to be related to persistence, as well. Research on enrollment patterns shows that intensity and momentum also affect persistence. However, when considering the environment, the evidence is less clear, but in some studies persistence has been linked to the institutional characteristics of size, sector, selectivity, control, mission, and residency.

Summary of Student Persistence in Higher Education

This section of the literature review focused on three persistence theories from Spady (1970), Tinto (1975, 1987, 1993), and Bean (1980) as well as previous research regarding the effects of student characteristics, enrollment patterns, and institutional factors on student persistence. It became readily apparent after the literature was examined that what makes students persist, or not, is the result of a very complex interaction of numerous forces and factors. Becoming familiar with persistence research, both theoretical and applied, provided important foundational knowledge for the study, offered insight for its methodological design, and context for the interpretation of data and subsequent conclusions.

STUDENT ENGAGEMENT IN HIGHER EDUCATION

As outlined in the previous section, numerous theories and models have been developed to elucidate the factors that affect student persistence in an effort to identify what makes undergraduates stay in college and what makes them leave. In addition, there has been much empirical research examining how the various parts of the educational system work together to affect persistence. Studies have examined how

student inputs (characteristics, attributes, and demographics) interact with the environment (enrollment patterns and institutional factors) to either encourage or discourage persistence. The results of these theoretical explorations and empirical research have shown that although there are certain factors that may put students at a disadvantage for persisting, which are outside the control of the institution, there are also ways to encourage persistence that fall directly within an institution's control (Astin, 1970; Kuh, Kinzie, Buckley, Bridges, & Hayek, 2006; Tinto, 1975, 1987, 1993; Tinto & Pusser, 2006). Exploring the effects of student engagement, effective educational practices, and high-impact educational activities is relevant to this study since interaction with a college or university library, through the use of its physical resources and spaces, may be one way in which student persistence is positively affected.

The second section of this literature review focuses on student engagement; in order to assess the current state of engagement theory, this section describes (1) the three seminal theories of student involvement and engagement: Pace's theory of quality of effort (1980), Astin's theory of involvement (1984), and Kuh's theory of engagement (1991); (2) Kuh's effective educational practices (2005) and their relationship to engagement; and (3) Kuh's (2008) high-impact educational activities and how they foster student engagement.

Theoretical Models of Student Involvement/Engagement

The three seminal theories related to student engagement in higher education are Pace's theory of quality of effort (1980), Astin's theory of involvement (1984), and Kuh's theory of engagement (Kuh, Schuh, Whitt, & Associates, 1991; Kuh, 2001). The three theories are similar, and have in many ways built upon each other, but there are some differences (Wolf-Wendel, Ward, & Kinzie, 2009). At the heart of all three

theories is the fundamental idea that the effort put forth by a student combined with the academic and social experiences of college contribute to student involvement and engagement with the institution, translating into positive student outcomes. Research has shown that student engagement and involvement are positively related to persistence rates (e.g., Astin, 1984, 1985; Cabrera, Nora, & Castaneda, 1992; Harper & Quaye, 2009; Pascarella & Terenzini, 2005; Pike, Schroeder, & Berry, 1997; Tinto, 1993), academic gains and gains in critical thinking abilities (e.g. Kuh, Hu, & Vesper, 2000; Pasacarella, et al, 1996), and grades (e.g. Astin, 1977, 1993). It is the interaction of student behavior with the college environment and its effects on institutional engagement, and this engagement's positive effects on persistence, that made exploring the theories of engagement necessary for this research study.

Pace's Theory of Quality of Effort

Pace's theory of quality of effort (1980) is a seminal theory that articulates the powerful concept of student effort and its effect on positive student outcomes. The theory of quality of effort is based on the idea that "what a student gets out of college depends, at least to some extent, on what he or she puts into it" (p. 15). Pace's concept of "quality of effort" is not only based on the amount and scope of effort, it assumes a quality of experience as well. By integrating quality of experience into the theory, Pace argued that some student efforts offer more potential for enhancing learning and development than others. In his 1980 study Pace investigated four student outcomes: academic and intellectual outcomes, general education, personal and interpersonal understanding, and understanding science. The findings of the study found that there was a general increase in all four outcomes as students progress from freshman to seniors and that the increases were related to quality of effort, not background factors. The study also

found that the attainment was tied to effort (“the greater the effort, the greater the gain” (p. 21)), and that effort was the most influential variable on attainment. But Pace also argued that the responsibility for successful student outcomes does not lie solely with the student; he argued that what the institution offers, as well as what students chose to do with those offerings, are the keys to student success.

Astin’s Theory of Involvement

In his theory of quality of effort Pace (1980) argues that the college environment, not simply student effort, plays an important role in positive student outcomes, but in his theory of involvement Astin (1984) elevates the visibility of student involvement by making it the hallmark of effective educational policies and practices, thereby making the characteristic pertinent to this research study. Astin defines involvement as “the amount of physical and psychological energy a student devotes to the academic experience” (1984, p. 518). His theory has five postulates:

involvement refers to the investment of physical and psychological energy in various objects; involvement occurs along a continuum; involvement has both quantitative and qualitative features; the amount of student learning and personal development associated with any educational program is directly proportional to the quality and quantity of student involvement in that program; and the effectiveness of any educational policy or practice is directly related to the capacity of that policy or practice to increase student involvement (p. 519).

For Astin (1984) it is “what the individual does, how he or she behaves, that defines and identifies involvement” (p. 519). The crux of Astin’s theory is that involvement is based on the student being an active participant in the learning process, devoting precious time and energy towards learning and development. The theory of involvement stresses the fact that a student’s time is a “zero-sum” game and that the time students spend on other concerns like family, friends, and work is that much less time they can spend on educational pursuits. Therefore, faculty and administrators should

concentrate less on content or pedagogy, and more on educational effectiveness by facilitating the involvement of the student through practice and policies. Astin has argued that “the effectiveness of any educational practice is directly related to the capacity of that policy or practice to increase involvement” (Wolf-Wendel, Ward, & Kinzie, 2009, p. 298). The more involved students are with the social and academic aspects of college the more successful they are. But research has shown that academic involvement (e.g., hours spent studying and doing homework, asking questions in class, studying with other students, or completing homework assignments) has more significant effects on student success than social involvement (Astin, 1977, 1993). Astin also identified the factors that, in addition to academic involvement, increase the likelihood of student success, including residential status (i.e., living on campus), participation in an honors program, frequent student-faculty interactions, involvement in athletics, and involvement with student government.

Astin’s theory of involvement (1984) seeks to elucidate student college development in a simple way that allows for the incorporation of different theoretical perspectives such as the psychological, educational, and sociological, to name a few. Astin argues that the theory of involvement is useful to researchers, higher education administrators, and faculty since it can be used to help create an optimal educational environment for students. It should be noted that the theory of involvement is related to, but distinct from, Astin’s input-environment-outcome (I-E-O) model (1970). The theory of involvement explains “the dynamics of how students change or develop” (Pascarella & Terenzini, 2005, p. 53) while the I-E-O model provides a “conceptual and methodological guide to the study of college effects” (Pascarella & Terenzini, 2005, p. 53). The theory of involvement can be simply stated as “students learn by becoming involved” (Astin, 1985, p. 133 as cited in Pascarella & Terenzini, 2005) while the I-E-O

model seeks to provide a framework for how the three elements of inputs, environment, and outcomes interact to impact and affect students. As previously noted the I-E-O model was the conceptual framework used for this study and is described in more detail in the last section of this chapter.

Kuh's Theory of Engagement

According to Wolf-Wendel, Ward, and Kinzie (2009), Kuh's theory of engagement (1991, 2001, 2005) has its origins in the theories of quality of effort (Pace, 1980), involvement (Astin, 1984), and the seven good practices of undergraduate education (Chickering & Gamson, 1987). The seven good practices of undergraduate education include student-faculty contact, cooperation among students, active learning, prompt feedback, time on task, high expectations, and respect for diverse talents and ways of learning (Chickering & Gamson, 1987). Research has shown that the best predictor of student learning and development is the time and energy spent on educationally purposeful activities. "Individual effort or engagement is the critical determinant of the impact of college, then it is important to focus on the ways in which an institution can shape its academic, interpersonal, and extracurricular offering to encourage student engagement" (Pascarella & Terenzini, 2005, p. 602). These concepts of student time and energy, and educationally purposeful activities, form the common foundations of the various theories of student engagement (e.g., Astin, 1993; Pace, 1980; Pascarella & Terenzini, 2005). Student engagement has two main components that are related to student success.

The first is the amount of time and effort students put into their studies and other activities that lead to the experiences and outcomes that constitute student success. The second is the ways the institution allocates resources and organizes learning opportunities and services to induce students to participate in and benefit from such activities (Kuh, Kinzie, Schuh, Whitt, & Associates, 2005, p. 9)

What Matters to Student Success

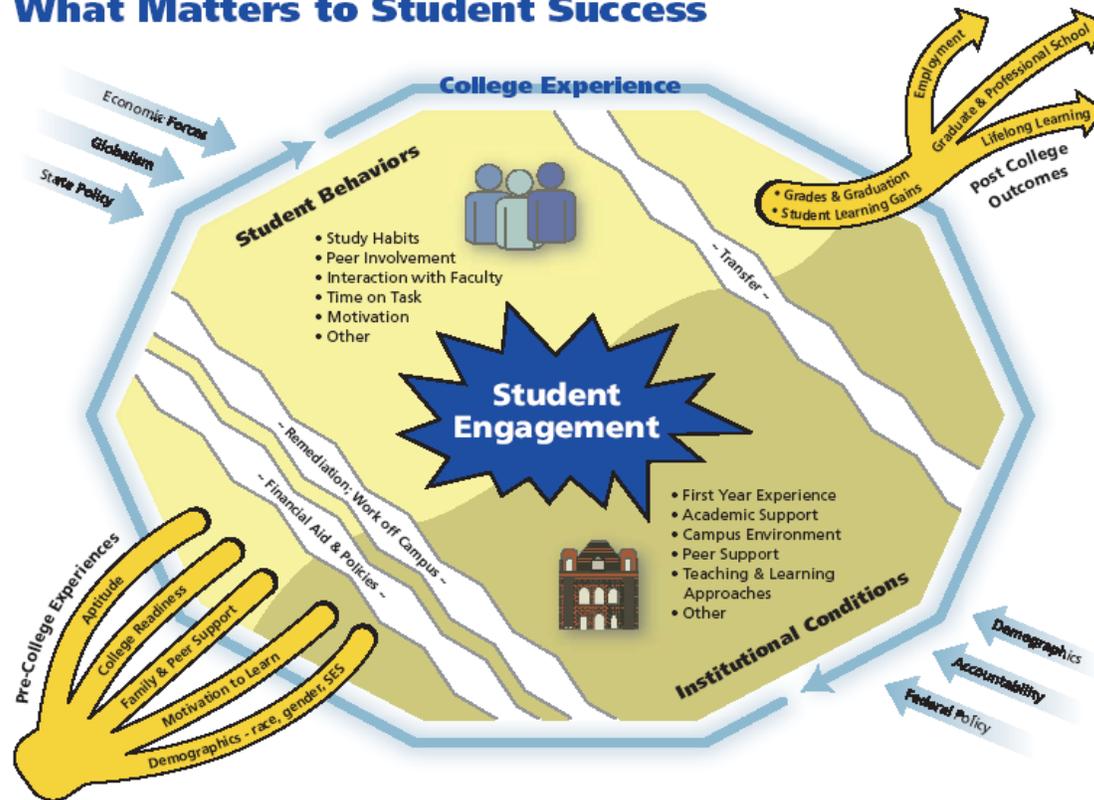


Figure 2.3: What Matters to Student Success
 Source: Kuh, Kinzie, Buckley, Bridges, & Hayek (2006, p. 8)

As depicted in Figure 2.3, engagement is the intersection of student behaviors and institutional conditions, a place where both the student and the institution need to optimize the educational experience in order to maximize student success (Kuh, Kinzie, Buckley, Bridges, & Hayek, 2006). Kuh, et al. view engagement as an expression of involvement, but engagement also links involved student behaviors with effective educational policies and practices that an institution undertakes (Wolf-Wendel, Ward, & Kinzie, 2006). The linking of engagement to institutional conditions puts the onus on colleges and universities to create an environment that provides ample opportunities for

engagement (Wolf-Wendel, Ward, & Kinzie, 2009). This notion of institutions taking responsibility for creating educationally effective environments that promote student engagement is important since research has shown that a student's pre-college characteristics or attributes only account for 1.00% to 5.00% of the variance in levels of engagement (e.g. Pike, 1999; Pike & Killian, 2001).

Five Benchmarks of Effective Educational Practice

Since pre-college characteristics have very little effect on engagement yet high levels of engagement are necessary for student success, Kuh, Kinzie, Schuh, Whitt, and Associates (2005) have outlined five benchmarks of effective educational practice that can help institutions create environments that promote student engagement; these benchmarks include: level of academic challenge, active and collaborative learning, student–faculty interaction, enriching educational experiences, and supportive campus environment. These benchmarks of effective educational practice are important since they speak to the optimization of college environments for engagement. College and university libraries are fundamental co-curricular resources in the academic environment, and how they can contribute to effective educational practices should be considered when investigating the positive outcome of student engagement.

Level of academic challenge refers to “nature and amount of assigned academic work [...], the complexity of cognitive tasks presented to students, [...] and the standards faculty members use to evaluate student performance” (Kuh, Kinzie, Schuh, Whitt, & Associates, 2005, p. 11). An institution that embraces academic challenge would create an environment that would require students to engage in high levels of reading and writing in their coursework, use higher-order thinking skills, and work harder than expected to meet faculty standards (Kuh, Kinzie, Schuh, Whitt, & Associates, 2005). It

seems that an academic library would be uniquely suited to support a curriculum that required significant writing and use of higher-order thinking skills from its students though its provision of scholarly resources, instruction, and assistance with the development of information literacy skills that include the ability to identify, locate, evaluate, and effectively use information resources in academic work.

Active and collaborative learning is based on the idea that “students learn more when they are intensely involved in their education and have opportunities to think about and apply what they are learning in different settings” (Kuh, Kinzie, Schuh, Whitt, & Associates, 2005, p. 11). Active and collaborative learning has students discussing ideas in and out of class, working with other students in and out of class on projects and assignments, and tutoring and teaching each other (Kuh, Kinzie, Schuh, Whitt, & Associates, 2005). Libraries could support this benchmark by providing active and collaborative learning spaces in their buildings (e.g., group study rooms, collaborative study floors) and providing “learning commons” spaces where students can receive formal or informal tutoring and assistance.

Student-faculty interaction refers to the fact that “the more contact students have with their teachers the better” (Kuh, Kinzie, Schuh, Whitt, & Associates, 2005, p. 12) because it lets the students “see first-hand how experts identify and solve practical problems” (Kuh, Kinzie, Schuh, Whitt, & Associates, 2005, p. 12). These student-faculty interactions can involve students discussing assignments, ideas from class, or career plans with faculty. It can also involve working with faculty outside of class on research projects or on other non-academic projects like committees or student activities (Kuh, Kinzie, Schuh, Whitt, & Associates, 2005). Libraries have less they can do to support this directly, but indirectly they can provide access to the resources that both faculty, and students working with faculty, may need for research projects.

An institution that provides *enriching educational experiences* will “offer many different opportunities inside and outside the classroom that complement the goals of the academic program” (Kuh, Kinzie, Schuh, Whitt, & Associates, 2005, p. 12). Exposure to diversity, whether it be cultural, religious, political, racial, economic, or social, enriches the educational environment by providing opportunities for students to learn about themselves and others. Use of technology can also be enriching if it is used to facilitate collaboration and engagement. Other examples of enriching educational experiences include “internships or field experiences, community service or volunteer work, foreign language coursework, study abroad, independent study or self-designed major, co-curricular activities, and a culminating senior experience” (Kuh, Kinzie, Schuh, Whitt, & Associates, 2005, p. 13). As a core co-curricular resource, the mission of most academic libraries is to support and complement the educational experience inside and outside the classroom. Libraries accomplish their mission through the provision of resources, services, and spaces that support students as they pursue enriching educational experiences.

A *supportive campus environment* is critical because “students perform better and are more satisfied at colleges that are committed to their success and cultivate positive working and social relations among different groups on campus” (Kuh, Kinzie, Schuh, Whitt, & Associates, 2005, p. 13). A supportive campus environment helps students succeed academically and socially while coping with nonacademic responsibilities, and promotes good relations between students, faculty, and staff (Kuh, Kinzie, Schuh, Whitt, & Associates, 2005). Library staff can help provide a supportive campus environment by offering services that assist students as they access and use library resources and spaces.

The five benchmarks of good educational practice outlined above are assessed annually by the National Survey of Student Engagement (NSSE). NSSE is a survey

administered to students to find out if they “are participating in educational practices that are strongly associated with high levels of learning and personal development” (Kuh, 2001, p. 12). The survey was launched nationally in spring 2000 and in 2012 it used twenty-eight questions that are grouped conceptually to assess the five benchmarks of good educational practice. Since its launch in 2000, NSSE has quickly become the most popular engagement assessment tool with approximately 3.2 million students having completed the survey to date. In 2011 alone 546,719 students completed NSSE (National Survey of Student Engagement, 2012). Although this study will not be using results from the NSSE survey, the engagement factors captured by the SERU survey that were used in this study align well with the five benchmarks of effective educational practice outlined above and measured by NSSE.

High-Impact Educational Activities

In addition to the educational benchmarks identified and assessed with NSSE, Kuh has also focused on certain high-impact activities that engage students in multiple ways that lead to student success outcomes such as persistence (Kuh & Schneider, 2008). These educational activities are also related to deep and integrative learning, defined as the acquisition of knowledge while understanding the underlying meaning and experiencing personal and practical gains (Kuh & Schneider, 2008). These high-impact activities include “first-year seminars, common intellectual experiences, learning communities, service learning, undergraduate research, study abroad, and other experiences with diversity, internships, and capstone courses and projects” (Kuh & Schneider, 2008, p.14). These activities are especially effective because they require an investment of considerable time and effort, demand sustained contact with faculty and peers, increase the likelihood of experiencing diversity, provide students with frequent

performance feedback, and provide opportunities for students to integrate, synthesize, and apply knowledge (Kuh & Schneider, 2008). One important note about these high-impact activities is that although research has shown them to be beneficial for all students who undertake them, they have a compensatory effect for underserved students with regards to both first-year GPA and probability of returning for a second year (Kuh & Schneider, 2008).

One of the recommendations that Kuh, Kinzie, Schuh, Whitt, and Associates (2005) make to institutions that want to foster educationally effective practices and high-impact activities is to “encourage collaboration across functional lines,” (p. 311) and to “harness the expertise of other resources” (p. 312). The authors go on to encourage the tapping of librarian expertise, stating some of the DEEP (Documenting Effective Educational Practice) schools have librarians contribute to first-year seminars, orientations, advising, faculty research activities, and capstone seminars (Kuh, Kinzie, Schuh, Whitt, & Associates, 2005). Like the DEEP schools, most institutions could use the resources and services offered by their academic libraries to improve their performance on the five benchmarks of good educational practices.

Summary of Student Engagement in Higher Education

The preceding section of this literature review focused on the seminal theories and best practices regarding student engagement in higher education. Pace’s theory of quality of effort (1980), Astin’s theory of involvement (1984), and Kuh’s theory of engagement (Kuh, Schuh, Whitt, & Associates, 1991; Kuh, 2001) were all reviewed with the common thread between the theories being that student engagement occurs when student effort, defined both by its amount and quality, is connected with an educational environment ripe with effective academic and social opportunities. The educational environment can

be optimized for engagement by adhering to the five benchmarks of effective educational practice and through the use of high-impact educational activities.

Examining student engagement was important for this study, since as outlined above, an academic library is a fundamental co-curricular resource that supports many of the effective and high-impact educational practices, and is therefore in a prime position to help increase student engagement, and ultimately student persistence. This study used student engagement as an outcome variable and an intervening variable when the analysis of the data was conducted. It was used as an outcome variable in order to determine if students who used the library more are more engaged; since engagement is highly correlated with persistence it was also used as an intervening variable when the data was analyzed to determine if students who use the library more, persist at higher rates than students who use the library less. Engagement data came from the results of the SERU survey and provided invaluable insights into how student interaction with an academic library can affect the campus-level outcomes of student involvement and persistence.

ACADEMIC LIBRARY USE AND STUDENT OUTCOMES

The library literature has numerous examples of how public libraries have measured their contribution to their local communities (e.g., Aabo & Audunson, 2002; Debono, 2002, Lance, 2002), school libraries have measured their contribution to student learning (e.g., Hamilton-Pennell, Lance, Rodney, & Hainer, 2000; Krashen, 2001), and special libraries have measured their contribution to their organizations (e.g., Aaron, 2009; Strouse, 2003), but academic libraries have been less successful in measuring and communicating their contribution and value to the educational mission of their institutions (Snelson, 2006). This study examined the relationship between use of an academic library and undergraduate student engagement and persistence; therefore it was

necessary to review previous studies conducted on this topic in order to learn from the prior research and to determine the gaps in the literature which this study hoped to fill. After reviewing the literature it was discovered that few studies have investigated the impact of the academic library on persistence and engagement, so in order to have a larger base of literature to draw from when designing the proposed study the previous research on academic library use and academic achievement was also reviewed; the student outcome of academic achievement was selected since academic achievement is positively related to persistence (Astin, 1975; McGrath & Braunstein, 1997; Tinto, 1987, 1993) and engagement (Kuh, Cruce, Shoup, Kinzie, & Gonyea, 2008).

This review of previous research on the relationship between academic library use and student outcomes is divided into three sections. The first section summarizes the literature investigating the relationship between the use of academic libraries and student persistence. The second section reviews the scholarship examining the effect of academic library use on student engagement. And finally, the third section summarizes the previous research findings related to the effect of academic library use on academic achievement.

Academic Library Use and Student Persistence

As previously stated, there is a paucity of research on the subject of the relationship between academic library use and student outcomes, even less of which investigates persistence. There have been only seven studies investigating the relationship between academic library use and student persistence since 1968. Two of the seven studies are multi-institutional (both public and private institutions) using sample sizes of 99 colleges and universities and 13,782 students. Five of the studies were at individual institutions (all public) and the sample sizes ranged from 207 to 4,661. The

literature reviewed below conceptualizes academic libraries using variables related to use of their physical and electronic resources, services, and facilities. Persistence was examined using a variety of variables including freshman to sophomore persistence, semester-to-semester retention, fall-to-fall retention rates, single-semester (beginning to end) retention, and undergraduate graduation rate. Since there have been so few studies that have researched this relationship, each study will be described in detail; the research setting, variables used, conceptual frameworks employed, and findings of each are all highly relevant to the present research study.

Use of Materials and Services

Kramer and Kramer (1968) examined the library use (operationalized as book borrowing) and persistence of 742 students at California State Polytechnic College, Pomona. Interestingly, this study of persistence rates at the college was sparked by a series of critical discussions regarding attrition that were occurring in the state legislature. The study found a correlation between library use and freshman to sophomore persistence. Seventy-four percent of the students who borrowed materials from the library persisted after the first year of college, as compared with only 57.00% of the students who did not borrow items from the library. In addition to the persistence findings the study also found a statistically significant difference in grade point average between students who borrowed items and those who did not, with library users having on average a 2.22 GPA as compared to a 2.00 GPA for non-library users. When the data were disaggregated by discipline, the GPA advantage for library users was not found for engineering and science majors. One potential shortcoming of this study was that it did not control for background student characteristics, such as SAT score, and, therefore, it is

hard to distinguish whether the persistence was related to pre-college characteristics or library use.

Haddow and Joseph (2010) conducted a study exploring the relationship between library use and retention of 4,661 undergraduate students at Curtin University in Australia. The researchers investigated library use three times during a semester by examining the number of items borrowed, the number of logins to library workstations, and the number of logins to library resources such as databases and catalogs through the library's website. Students were then classified as no use, low use (1 to 7 instances), medium use (8 to 14 instances) or high use (15 or more instances). Retention data from the beginning to the end of Semester 1 in 2010 were retrieved from the university's student information system. Other demographic data including student ID number, postcode (which was used to determine socioeconomic status), permanent country address, and mature age data (whether the student was over the age of 21) were also used in the analyses.

Observations about general library use were made by Haddow and Joseph based on the results of the study. Overall, only 35.00% of the total sample checked out an item from the library during the semester; this low borrowing rate was slightly higher, approximately 39.00%, for mature students. Not surprisingly, use of electronic resources was much higher with 75.00% of the sample having logged on to a library workstation during the semester and 80.00% of the sample having accessed library resources via the library's website. In addition, over the course of the semester no difference in library use was found between low, medium, and high socioeconomic status students, although the data showed that early in the semester library workstation use was significantly higher for low socioeconomic status students.

With regards to library use and retention, the study found statistically significant evidence of higher library use over the course of the semester by retained students, which logically makes sense, because withdrawn students would no longer have access to library resources. But the researchers felt their most interesting finding was that students who were ultimately retained had a significantly higher use of library workstations and other library resources early in the semester than did students who ultimately withdrew from the university. One potential limitation of this study was that the researchers did not control for student background characteristics, such as ability, so they could not conclusively determine whether the retention was associated with library use or other student attributes.

Emmons and Wilkinson (2011) investigated whether there was a relationship between the academic library, specifically library staff, collections, use, and services, and fall-to-fall student retention and graduation rates. The multi-institutional study included 99 U.S. libraries that are members of the Association of Research Libraries (ARL), the professional organization that represents academic libraries at 125 comprehensive, research-extensive institutions in the US and Canada (Association of Research Libraries, 2012). The researchers used library data from the Association of Research Libraries' 2005-2006 Annual Survey of ARL Statistics in their analyses. The staff library variables included total expenditures for wages and number of professional staff per student. The collections variables were total volumes held, volumes added in the previous year, and total expenditures on collections. The use variable was total initial circulations and the service variables included number of reference questions answered and percent of students receiving library instruction. Data from the Integrated Postsecondary Education Data System (IPEDS) provided the 2005 first-to-second year persistence rate (fall to fall) and six-year graduation rate for the 2000 cohort as well as control variables of gender,

race/ethnicity, and percent of students receiving financial aid (which was used as a proxy for socioeconomic status).

The findings suggest that the level of professional staffing in the library is positively related to retention rates. Through linear regression modeling, the researchers discovered that a 10.00% increase in the ratio of professional library staff to full-time students resulted in an increase of 0.72% in retention and a 1.55% increase in the six-year graduation rate. Regardless of the results of the regression modeling, Emmons and Wilkinson did not conclude that libraries have a direct impact on student outcomes, due to the rejection of a fitted model. They believe that the effect is indirect because there are other campus factors that are collinear with the ratio of professional library staff to full-time students. In support of their conclusion they cite previous literature regarding student success at elite colleges and universities, which typically have higher faculty-to-student ratios, spend more per student, and have more resources. This high level of support offered to students by the institution typically increases engagement, which is related to retention and graduation. They did not rule out the possibility that their data indicated a correlation between library resources and retention rates.

Participation in Library Instruction

Breivik (1977) conducted a controlled experiment at Brooklyn College, City University of New York that examined the impact of a library instruction program on the course completion and semester-to-semester retention of “educationally disadvantaged” students. The experiment involved exposing students, enrolled in different sections of a developmental English course, to two different library instruction interventions. One of the interventions involved weekly sessions in which the students were taught about library resources and “information-handling” skills that were pertinent to their English

course. The second library instruction intervention was more traditional: a library tour and a lecture on the use of the card catalog and indexes to periodicals. There was also a control group for the experiment that did not receive any library instruction.

The results of the experiment showed that both of the groups exposed to a library instruction intervention completed the developmental English course at higher rates than the students in the control group; 79.00% of the students in the weekly library instruction sessions completed the course requirements, compared to 70.00% of the students who received the tour and lecture, and 63.00% of the students who received no library instruction. An even more important outcome of the experiment was the data on semester-to-semester retention. According to Breivik, a common attendance pattern for educationally disadvantaged students at Brooklyn College was to start attending classes at the beginning of the semester but never finish the semester or enroll in the subsequent semester; therefore, any intervention that helped to counter this lack of semester-to-semester persistence was seen as valuable.

The findings showed that the students involved in the two library instruction interventions completed coursework the semester following their participation in the experiment at higher rates than the control group, with completion rates of 77.00% for the students who participated in the weekly library instruction session and 71.00% of the students who received the tour and lecture, as compared to 68.75% of students in the control group. Unfortunately, since the sample sizes of the two experimental groups and the control group were not included with the findings it is hard to make conclusions about the statistical validity or generalizability of the results.

Selegan, Thomas, and Richman (1983) published the findings of their study investigating the impact of a for-credit library instruction course on student performance, persistence, and graduation rate. The study examined the long-range effectiveness of the

“Biblio Strategy” library instruction course for 234 undergraduate students enrolled at the University of California-Irvine between 1975 and 1979. The outcome variables in the study included grade point average, persistence (in quarters of attendance after the course), and graduation rates (a dichotomous variable indicating whether the student had graduated by 1982). The researchers created a pairwise matching of students who had taken the Biblio Strategy course and those who had not, based on major, class level, and SAT scores, and conducted the analyses using a t-test and chi-square analysis. The results showed a significant difference between the groups on grade point average and persistence, but no difference was found with regards to graduation rate for those students that persisted over the period of the study. As opposed to many of the other studies summarized in this literature review, this study, through the use of matched pair analysis, controlled for pre-existing academic abilities as well as differences across disciplines and class levels. Unfortunately, the relatively small sample size of only 234 students impacts the generalizability of the findings.

Use of Physical Spaces

Reynolds (2007) researched the impact of various campus facilities on the recruitment and retention of college students. The study sample included 13,782 students from 46 public and private institutions across 27 states in the U.S. The results indicated that the library as a physical space is important, with 54.00% of respondents indicating that the library facility was extremely or very important in their selection decision process. The library was second only to the facilities for their major; 74.00% of respondents indicated that major-related facilities were extremely or very important in their enrollment decision.

In order to investigate the issue of retention, the study looked at respondent satisfaction with, and the level of importance ascribed to, facilities after enrollment. In his sample, Reynolds found that the academic library was a facility of relative importance (0.60 on a scale from -0.80 to 1.20) with the highest satisfaction score (over 1.00 on a scale from -0.40 to 1.20). Women expressed more satisfaction with their academic library than men, and students at public institutions were more satisfied than students at private institutions. A major flaw of this study was the author's representation of satisfaction data as retention data. The author does not provide any theory or evidence in support of the notion that satisfaction with campus facilities is related to student retention and, therefore, drew inaccurate conclusions by using satisfaction data as a proxy for retention.

Mallinckrodt and Sedlacek (2009) examined whether student use of a variety of campus facilities, including libraries, residence halls, student unions, gymnasias, and dining halls, was related to student retention. The study used a 24-item survey administered to a stratified random sample of 207 second-semester freshmen at the University of Maryland. Of the six significant predictors of retention for all students in the sample, the only ones related to the use of an academic facility were the four associated with the use of academic libraries. These predictors were 1) studying in the undergraduate library, 2) using the campus library for research, 3) hours spent in the main campus library per week, and 4) hours spent in the undergraduate library per week.

For African American students in the sample, of the three significant predictors of retention, the only one related to the use of an academic facility was studying in the undergraduate library. Mallinckrodt and Sedlacek concluded from their results that students who use the library more are more likely to persist, but a clear limitation of this study was that the researchers did not attempt to control for background characteristics

and prior ability, thereby making it difficult to conclude whether use of the facility or student characteristics was the main determinant of retention.

Library Expenditures

Although they did not specifically focus on library use and student persistence, four additional studies examined the relationship between institutional expenditures on academic support, including expenditures on library services, and student persistence. These studies have been included in this literature review to ensure that other institutional factors that may include the academic library as a component are not inadvertently excluded; since there have been so few studies that have specifically investigated the relationship between academic libraries and the outcome of student persistence, the scope of this review has been expanded to include research that may not be directly related but nevertheless supplements the results of the other studies documented here.

Mezick (2007) investigated the relationship between library expenditures and fall-to-fall retention rates. Library expenditures were measured by the variables of total expenditures, total expenditures on library materials, expenditures on monographs, expenditures on serials, and expenditures on professional salaries, which were obtained from the Association of Research Libraries' Statistics and the Association of College & Research Libraries' Academic Library Trends and Statistics; fall-to-fall retention rates were obtained from IPEDS data. The multi-institution sample consisted of 586 public and private U.S. colleges and universities representing the four Carnegie classifications. The results of the study found a moderate relationship between total library expenditures (26.00% of retention variance explained), total library materials (32.00% of retention variance explained), expenditures on serials (36.00% of retention variance explained), and student retention at baccalaureate colleges. At doctoral institutions expenditures on

professional salaries predicted 29.00% of the variance in student retention. One criticism of this study was that Meznick did not control for non-library factors (Emmons & Wilkinson, 2011), thereby weakening the results of the analyses.

The following three studies examined the relationship between institutional expenditures on academic support services (which include libraries) and retention and graduation rates. Unlike the Meznick study, these studies do not focus solely on expenditures for library services; rather the library expenditures are included in the total expenditures for all academic support services, which also include academic administration and curriculum development, audio/visual services, and information technology. Despite the fact that the effect of library expenditures is not distinctly identified, the studies are still valuable since they show a relationship between libraries and persistence, albeit a less direct relationship than can be shown when using only library expenditures data.

Hamrick, Schuh, and Shelley (2004) investigated how institutional characteristics and resource allocation predict undergraduate graduation rates. This multi-institutional study included 444 public higher education institutions and used enrollment information, financial information, and graduation rates available primarily from IPEDS in full, independent bivariate and hierarchical multiple regression models. The enrollment variables analyzed included Carnegie Classification, U.S. region, degree of urbanization, presence of a medical, dental, veterinary, or related program, selectivity, and institutional financial aid. The financial variables included number of dollars allocated to the following categories: student affairs, instruction, library, physical plant, institutional support, academics (minus library), total education, and general. The dependent variable was undergraduate graduation rates. The findings showed that instructional expenditures, library expenditures, and various institutional variables were significant predictors of

graduation rates. In fact, library expenditures were robustly and significantly related to graduation rates, explaining 34.00% of the variance in graduation rates. The study also concluded that higher library allocations and instructional expenditures are strongly associated with higher graduation rates. Specifically, the regression equation showed every additional \$36.05 spent per student headcount resulted in, on average, a 1.77% increase in the graduation rate. There are several limitations of the study described by Hamrick, Schuh, and Shelley; for one, the data are at an aggregate level and, therefore, do not inform student-level experience. Also, spending for both undergraduate and graduate programs is included in the expenditure data even though only undergraduate graduation rates were analyzed. Finally, the study lacks longitudinal data.

Like Hamrick, Schuh, and Shelley, Ryan (2004) also conducted a study exploring the effect of institutional expenditures on degree attainment. The sample included 363 Carnegie-classified Baccalaureate I and II institutions, both public and private. Ryan used IPEDS data for the following expenditure variables (calculated per full-time equivalent student): instruction expenditures, academic support service expenditures (including libraries, academic administration and curriculum development, audio/visual services, and technology support for instruction), student services expenditures, and administrative function expenditures. IPEDS also provided the institutional variables including FTE enrollments, religious affiliation, private or public status, percent of freshman class that was female, and historically black college or university (HBCU) status. College Board data were used for SAT scores, percent of freshman class that was a minority, average age of freshman class, and percent of freshman class living on campus. The results of the ordinary least-squares (OLS) regression methodology employed by Ryan (2004) suggested that institutional expenditures on instructional and academic support (including libraries) had a significant and positive effect on graduation

rates, even after controlling for other retention variables. In contrast, his findings concluded that student service expenditures and institutional support expenditures do not have a positive or significant effect on graduation rates. The institutional characteristics that were shown to have a positive effect on graduation rates were the percentage living on campus, size, and HBCU status. Although expenditures on libraries were aggregated with other academic support expenditures, this study still provides important insights into the impact of financial support of academic libraries on student persistence to graduation. One potential limitation of this study is that the sample only included Baccalaureate institutions, thereby reducing the generalizability of the findings.

Gansemer-Topf and Schuh (2006) researched how institutional selectivity and institutional expenditures contributed to retention and graduation rates using the conceptual framework of Berger's (2001-2002) organizational theory of student persistence. Specifically, they examined whether expenditures for instruction (faculty and teaching), academic support (libraries and academic computing), student services (admission, registrar, and student development office), institutional support (administrative, legal and executive expenditures), and institutional grants (student financial aid) would predict retention and graduation rates. Their sample contained 466 private Baccalaureate Liberal and General colleges and universities. The findings of the study suggest that, in general, the more expenditures an institution funnels into a specific function the higher the retention and graduation rates. The two exceptions to these findings at highly selective institutions were that the percentage of expenditures on institutional grants and the spending on student services did not have a significant effect on graduation rates. At low selectivity institutions, the findings showed no direct effect between institutional support expenditures and graduation rates. This study is valuable in making the connection between resource allocation and retention, but it is less valuable

for ascertaining the true impact of the academic library since the academic support variable also includes data for academic computing. In addition, the findings have reduced generalizability since the sample for the study was made up entirely of private institutions.

Summary of Academic Library Use and Student Persistence

In summary, all eleven of the studies found some positive relationship between the academic library and student persistence or retention, although to varying degrees. The strength of the conclusions made by some of the studies was compromised by methodological weaknesses including small sample sizes (Breivik, 1977; Mallinckrodt & Sedlacek, 2009), not considering or controlling for background and non-library variables (Breivik, 1977; Haddow & Joseph, 2010; Kramer, 1968; Mallinckrodt & Sedlacek, 2009; Mezick, 2007), and conceptual problems with variables (Reynolds, 2007). In addition, establishing a direct relationship between an academic library and student outcomes within the institutional context was difficult when data used in the studies were not specific to the library and contained institution-wide data (Gansemer-Topf & Schuh, 2006; Hamrick, Schuh, & Shelley, 2004; Ryan 2004) or were an aggregate of data from multiple institutions (Emmons & Wilkinson, 2011; Gansemer-Topf & Schuh, 2006; Hamrick, Schuh, & Shelley, 2004; Mezick, 2007; Reynolds, 2007; Ryan 2004). These are all methodological or conceptual issues with the studies themselves; reviewing the studies as a group, it seems possible that a properly-designed and executed research study might be able to investigate the relationship between the use of an academic library and student outcomes.

Academic Library Use and Student Engagement

Although there have been a scant seven studies that have examined the relationship between academic library use and student persistence, there have been even fewer studies that have examined the relationship between the academic library and student engagement. There have only been three studies that investigated this relationship since 2003. Kuh's theory of engagement (1991, 2001, 2005), including his work with the National Survey of Student Engagement (NSSE), first appeared in the literature in 2000, which may account for a lack of research until 2003. The library literature was also searched for preceding, yet related, theories such as Astin's theory of involvement (1984), with no results found. The four studies that have been conducted have investigated the relationship between academic libraries and student engagement in different ways, including academic libraries' contribution to educational gains and college satisfaction, the relationship between the use of information technology (including use of the academic library) and student engagement, the relationship between information literacy and engagement, and the relationship between expenditures on academic support services (including libraries) and student engagement. The four studies that have been conducted all used data derived from CSEQ or NSSE and were multi-institutional (including both public and private institutions), with sample sizes ranging from 2 to 300 institutions.

Use of Materials and Services

Kuh and Gonyea (2003) examined how the academic library contributes to students' gains in information literacy, overall gains in college, and overall satisfaction with college. The study analyzed data from over 300,000 students who completed the College Student Experiences Questionnaire (CSEQ) from 1984 to 2002. The regression analyses conducted for this study controlled for student characteristics, including gender,

major, race/ethnicity, and class level, as well as institutional characteristics, including institutional type (i.e., Carnegie classification), institutional selectivity, and institutional control (i.e., public or private).

In this study Kuh and Gonyea first examined how student use of the library had changed from 1984 to 2002, identifying several significant trends including: 1) more students using indexes and databases to find information, 2) fewer students using library facilities, most likely due to the availability of remote access to resources and the availability of other campus facilities such as computer labs, student centers, study lounges, etc., 3) slight increases in the number of students seeking assistance from library staff, 4) increased library use by students who lacked access to a computer at home or at work, 5) greater rates of use of the library and its resources by Latino and African American students as compared to White students, 6) higher library usage by students majoring in the humanities or social sciences than by students in other disciplines, and 7) higher library usage by students who attended baccalaureate colleges than by students attending doctoral/research-extensive institutions. In addition, at the institutional level, Kuh and Gonyea also found that academic rigor was associated with library use. With regards to the library's contribution towards information literacy, Kuh and Gonyea found that library activities did not have a substantial influence on gains in information literacy, although they admitted that the information literacy scale created from the College Student Experiences Questionnaire may not be a valid proxy for the variables associated with educational gains. Likewise, the findings showed no relationship between the library and the overall impact of the college experience, or in satisfaction with the college experience, although the findings did show a relationship between use of the library and participation in educationally valuable activities like use of computing and information technology resources and interaction with faculty members. As previously mentioned,

one potential limitation of this study is the validity of the CSEQ information literacy scale.

Laird and Kuh (2005) conducted a study to examine the relationship between the use of information technology and student engagement. Data from the 2003 administration of NSSE, which included approximately 350,000 students (first year and seniors) from 437 colleges and universities, were used in the study. The research undertaken by Laird and Kuh is relevant to the proposed study since one NSSE question used to examine the use of information technology asks students about their use of the library's website to obtain resources for academic work. Factor analysis and correlations were conducted in order to determine if there was a relationship between use of information technology and the five NSSE benchmarks, while controlling for student background characteristics (e.g., gender, ethnicity, and parental education) and some aspects of their collegiate experience (e.g., transfer status, fraternity or sorority membership). The results of the analyses showed that of the students who frequently used the library's website, 77.00% reported that their courses emphasized the synthesis of information and ideas and 43.00% reported discussing career plans with faculty members frequently. By contrast, these numbers were 62.00% and 27.00%, respectively, for the students who infrequently used the library's website. Based on the findings Laird and Kuh concluded that

the relative strength of the positive relationships between academic uses of IT and engagement, particularly academic challenge, student-faculty interaction and active and collaborative learning suggest that, at the very least, engagement in one area often goes hand-in-hand with engagement in other areas (p. 230).

One potential limitation of this study is the fact that only one question was used to represent the totality of the effect of the library with regards to information technology use of the students in the sample.

Participation in Library Instruction

Mark and Boruff-Jones (2003) investigated the relationship between student engagement and information literacy by mapping a select set of questions from NSSE to the applicable information literacy competencies outlined by the Association of College and Research Libraries (ACRL) in their Information Literacy Competency Standard for Higher Education. Mark and Boruff-Jones focused on one of the five NSSE benchmarks, active and collaborative learning, arguing that that particular benchmark was the most closely related to information literacy; they then selected five of the seven questions from the benchmark to analyze. The questions included 1) asked questions in class or contributed to class discussion, 2) made a class presentation, 3) worked with other students on projects during class, 4) worked with classmates outside of class to prepare class assignments, and 5) discussed ideas from your readings or classes with others outside of class (students, family, members, co-workers). The authors mapped the five NSSE questions to the twelve different ACRL information literacy standards and to Bloom's Taxonomy of Educational Objectives. The study also explored the relationship between student engagement and information literacy by comparing the mean scores (for first-year and senior students) on the five NSSE items from the authors' respective institutions, Indiana University-Purdue University Indianapolis, and University of Mississippi, with peer group mean scores and a national mean score. The authors argued that the mapping of the NSSE items to the information literacy standards and the comparison of the mean scores is a methodology that could be used by institutions to evaluate the effectiveness of their library instruction programs. The linking of student engagement questions from NSSE to information literacy on a conceptual level was interesting, but one major limitation of the study is the authors' use of the term "correlation." The authors state "although the correlation between the NSSE survey

questions and the ACRL standards do not unequivocally demonstrate that the rankings were necessarily enhanced by library instruction, the authors' intent is to correlate NSSE benchmarks with the ACRL standards" (p. 490). But unfortunately no statistical tests were conducted in order to test for correlation, so the use of that term implies a statistical relationship between the benchmarks and the standards that does not exist.

Library Expenditures

Although not specifically examining library use and student engagement, one additional study has examined the effect of institutional expenditures upon student engagement. This study is included in order to supplement the three other studies that have directly investigated the relationship between academic libraries and the outcome of student engagement.

Ryan (2005) examined the relationship between institutional expenditures on academic support services, including libraries, and student engagement by employing a similar methodology to the one he used in his 2004 study that looked at the relationship between institutional expenditures on academic support services and retention and graduation rates. Ryan undertook the study in order to further the understanding of how institutional allocation of funding affects student engagement, with his working hypothesis being that expenditures on instruction, academic support, and student services would prove to have a positive effect on student engagement, while institutional support (i.e., administrative costs) would have a negative impact on it. This multi-institutional sample included 142 colleges and universities and Ryan used an ordinary least squares (OLS) regression method to analyze the data. IPEDS provided the data on student and institutional characteristics, specifically academic preparation and selectivity, gender, race/ethnicity, age, percentage of part-time students, institutional size, public or private

status, and percentage of non-science undergraduate majors. The IPEDS expenditure data (calculated per full-time equivalent student) for instruction, academic support, student services, and institutional support was also included in the regression model. Results from NSSE provided the student engagement data needed for the analysis and the student engagement factor was derived from the following four questions: 1) asked questions in class or contributed to class discussions, 2) discussed ideas from readings or classes with faculty outside of class, 3) received prompt feedback from faculty on academic performance, and 4) the number of papers written in the past year from 5 to 19 pages in length. The resulting model explained 35.70% of the variance in student engagement, although many of the variables did not have a significant relationship with student engagement. Instruction expenditures had a positive, yet insignificant, effect. Academic support and student services expenditures had a negative, yet insignificant, effect. The only significant relationship was between institutional support and student engagement, and that relationship was found to be negative. According to Pike, Smart, Kuh, and Hayek (2006) three limitations of this study are the small number of NSSE questions used to represent engagement, the convenience sampling of institutions, and the fact that dated expenditure data was used.

Summary of Academic Library Use and Student Engagement

In summary, of the four studies conducted only one study (Laird & Kuh, 2005) showed that library use had a positive relationship with engagement. One study showed no relationship (Kuh & Gonyea, 2003) while another established a statistically insignificant negative relationship (Ryan, 2005) between the variables. And the lack of analyses conducted in the fourth study (Mark & Boruff-Jones, 2003) make statistical conclusions impossible. The three studies that conducted statistical analyses (Kuh &

Gonyea, 2003; Laird & Kuh, 2005; Ryan, 2005) all had strong methodologies that controlled for background and/or institutional characteristics or experiences, which strengthened their conclusions.

Academic Library Use and Academic Achievement

It is important to review the literature on academic library use and its relationship to academic achievement since student achievement is related to persistence, with students who perform better in college being more likely to persist (Astin, 1975; Tinto, 1987, 1993). The majority of the studies investigating the relationship between academic library use and student outcomes have examined the student outcome of academic achievement; in total, 15 studies have been conducted since 1965. All 15 of the studies were single institution studies with sample sizes ranging from 64 to 15,000. The variables for library use in these studies have been operationalized in a variety of ways, including use of materials (e.g., book borrowing), use of services and resources (e.g., reserves, library catalog, assistance from library staff, frequency of visits, and time spent in library), and participation in library instruction classes. Student academic achievement has been investigated using grade point averages, assignment quality and grades, course grades, course persistence, graduation with honors, and class rank.

Use of Materials and Services

One of the earliest studies by Barkey (1965) investigated the relationship between book borrowing and the grade point average of 6,814 freshmen at Eastern Illinois University in two similar studies conducted in 1962 and 1963. Barkey was shocked to find that only 37.00% of the student body had actually checked out books from the library, but the findings of the study indicated a positive correlation between the borrowing of library books and the students' grade point averages.

Russell, Sturgeon, Prather, and Greene (1982) conducted a large-scale study of 15,000 students (both undergraduate and graduate) at a large urban nonresidential university using multiple linear regressions to determine if there was a relationship between library use and selected student characteristics. Library use was operationalized in this study using several dependent variables related to the circulation of books including frequency, duration, intensity, and propensity. Twenty-one independent variables were also used in the model including academic status variables (e.g., GPA, hours earned, and graduation), demographic variables (e.g., age, financial aid, and minority status), course context (e.g., type, grade, and class size), and major. Due to the large number of variables in the models there were numerous findings from the study, but the most pertinent finding was that students with higher grade point averages and higher grades for the quarter used the library more. The researchers admit that based on their findings they cannot determine if better students are checking out more books or whether checking out more books makes better students. Some shortcomings of this study include lack of control for background variables (e.g., SAT or grade point average) and the conflation of the undergraduate and graduate student data in the analyses.

Mays (1986) conducted a study of 465 first-year undergraduates at Deakin University to discover if there was a relationship between library use (operationalized as borrowing of materials), student demographics (age and gender), and academic performance (grade point average and course persistence). The findings of the study found no correlation between library book borrowing and academic outcomes.

Hiscock (1986) examined the relationship between self-reported usage of libraries (captured via a questionnaire with 15 questions asking about use of staff and resources) and academic performance (the operational definition was never defined in the study) of 196 students at the South Australian College of Advanced Education. The findings did

not support a strong relationship between the two variables, but did show that the use of the library catalog was related to academic achievement.

Self (1987) investigated the relationship between use of reserve materials and course grades at the University of Virginia. The study examined the course grades for 8,454 students enrolled in courses with at least ten items on reserve at the library to see if there was a correlation between use of reserve items and course grades. Results indicated that almost half of the students in the study did not use any course reserve materials at all. High-use students (eleven or more checkouts) tended to have higher course grades, but the differences in the mean grades between high users and nonusers was small and when the data was examined in the aggregate, the relationship was too weak to be predictive. The study found the level of reserve collection usage was related to overall student GPAs.

Wells (1995) conducted a study with 251 students enrolled in select first-and second-year courses at the University of Western Sydney, Macarthur to determine if there was a relationship between library usage (via a self-reported questionnaire regarding frequency of visits, average time spent, and use of resources and services) and academic achievement. The results showed a positive correlation between the use of library resources and services and academic achievement (operationalized as course grades) and a statistically significant correlation between assistance from library staff and academic achievement. The study showed a positive correlation that was not statistically significant between the time spent in the library or frequency of visits and class grade received.

Donovan (1996) investigated the relationship between borrowing of materials by 2,490 Tulane Law School students and variables of student success, including graduation honors and membership in Tulane Law Review. The study results showed that library

use was an indicator of student success, as determined by graduation honors, but no relationship was found between library use and membership in Tulane Law Review.

de Jager (2001) studied the relationship between library use (operationalized as book borrowing) and academic achievement (operationalized as course grades) of 235 senior undergraduates at the University of Cape Town. These analyses found a correlation between the two variables indicating that students who do well academically borrow more materials than students who do poorly.

In a recent study of 8,701 undergraduate and graduate students at Hong Kong Baptist University, Wong and Webb (2011) investigated the correlation between the number of books and audiovisual materials checked out from the library and cumulative GPAs at time of graduation. The data were divided into sample groups based on discipline in order to account for the discipline-specific criteria used to assign GPA values and the differential uses of the library across disciplines. The results of the Pearson's Correlations found that 31 of the 48 valid sample groups (19 groups of undergraduate students and 12 groups of graduate students), or 65.00%, showed a significantly positive correlation between library use and GPA, while 35.00% had no clear relationship.

Participation in Library Instruction

Joyce (1961) examined the relationship between the score on a library orientation test (following library instruction sessions) and the class rank for 64 elementary education undergraduate students at State Teacher's College at Lowell, Massachusetts in 1957. The results of the study found a significant and positive relationship between performance on the library orientation test and academic rank.

Dodgen, Naper, Palmer, and Rapp (2003) conducted a study to see if sociology students at North Harris College ($n = 294$) who participated in library instruction sessions received higher grades on assignments than students who did not participate in sessions. The results of the t-tests conducted indicated that there was no statistical difference on assignment grades between the students who received bibliographic instruction and those who did not.

Wang (2006) investigated the effect of participation in an elective, one-credit library instruction course at Central Michigan University on student achievement on a written assignment (defined as number of citations, quality of citations, and grade on the assignment) and overall grade in a subsequent subject course. The sample included 120 students, half whom had taken the course and half who had not. The results of the independent samples t-test showed there was a significant increase in the quality of citations, grade on the assignment, and overall course grade for students who had received the library instruction, although there was no difference in the number of citations between library instruction participants and non-participants.

Hurst and Leonard (2007) conducted a study with 184 junior-level students enrolled in an International Business class at a Midwestern university in order to determine if participation in a library instruction session was related to higher achievement on a written assignment (quality of references cited and grade for the assignment) and the overall course grade. The results showed that there was a difference between the test group and the control group with regards to the quality of references cited, but there was no difference in either the grade on the assignment or overall course grade.

Coulter, Clarke, and Scamman (2007) explored the effect of library instruction on course grades for 1,585 students enrolled in select English, business communication, and

criminal justice courses taught at Stephen F. Austin State University. The study compared students enrolled in these courses to determine if there was a difference in course grades between the students enrolled in course sections that received library instruction and those course sections that did not. The results of the study showed no relationship between library instruction and higher course grades.

Wong and Cmor (2011) used a sample of 8,701 students at Hong Kong Baptist University to determine if there was a relationship between the number of library instruction sessions attended and the cumulative GPAs at time of graduation. The data were divided into the same sample groups as in the previous study by Wong and Webb (2011), resulting in 45 valid sample groups for analysis. The Chi-Square Test for Independence was used with results showing 11 of the 45 sample groups (9 groups of undergraduate students and 2 groups of graduate students), or 25.00%, showing a positive relationship, while 75.00% showed no relationship. The results also indicated the strength of the relationship between library instruction and GPA was affected by the number of instruction sessions, with three to four sessions being the point at which positive associations were shown with GPA.

Summary of Academic Library Use and Academic Achievement

When examined in aggregate, four studies showed a positive relationship between library use and academic achievement (Barkey, 1965; de Jager, 2001; Joyce, 1961; Russell, Sturgeon, Prather, & Greene, 1982) while four showed no relationship between the variables (Coulter, Clarke, & Scamman, 2007; Dodgen, Naper, Palmer, & Rapp, 2003; Hiscock, 1986; Mays, 1986). The remaining seven studies had mixed results for their hypotheses regarding library use and academic achievement, with some being supported, while others were not (Donovan, 1996; Hurst & Leonard, 2007; Self, 1987;

Wang, 2006; Wells, 1995; Wong & Cmor, 2011; Wong & Webb, 2011). Even when the results for the aggregate-level achievement outcomes of GPA, course grade, and class rank are examined, thereby removing the intermediate results for such measures as assignment grades, quality of citations, etc., there are five studies showing a positive relationship, five that show no relationship, and three that show mixed results. Clearly the only conclusion that can be drawn from these 15 studies is that the research on the relationship between library use and academic achievement is inconclusive.

Summary of Academic Library Use and Student Outcomes

For this section of the literature review, previous studies examining the effect of academic library use on student persistence (seven studies), engagement (four studies), and academic achievement (15 studies) were reviewed and summarized. All seven studies investigating student persistence found a positive relationship (to varying degrees) between it and library use, but many of these studies suffered from methodological weaknesses, primarily small sample sizes and a lack of considering/controlling for background characteristics. Of the four studies that explored library use and student engagement, only one of them found a positive relationship, but it should be noted that these studies had much stronger methodologies than the persistence studies. Results were mixed in the 15 studies examining library use and academic achievement, with four showing a positive relationship, four showing no relationship, and seven showing mixed results. When all 26 studies on library use and the student outcomes of persistence, engagement, and academic achievement are taken in aggregate, considering their methodologies and results, it would seem that the prior research in this area is inconclusive.

Reviewing the prior research has been invaluable for this study because it has demonstrated that not only have few studies been undertaken which attempt to link library use with positive student outcomes, but the previous results, on balance, appear inconclusive. With increased attention being placed on academic libraries demonstrating relevancy and value this study has an opportunity to make an important contribution to the nascent literature base exploring library use and student outcomes. By employing a solid methodology and using robust datasets, it is hoped that valuable and reliable conclusions can be made that will add insight to the literature in this under-researched area.

CONCEPTUAL FRAMEWORK

The conceptual framework used to guide this study was Astin's input-environment-outcome (I-E-O) college impact model (1970). The I-E-O model, as schematically depicted in Figure 2.4, theorizes that college impact is assessed by examining the effect of three distinct constructs: student inputs, the college environment, and student outputs or outcomes.

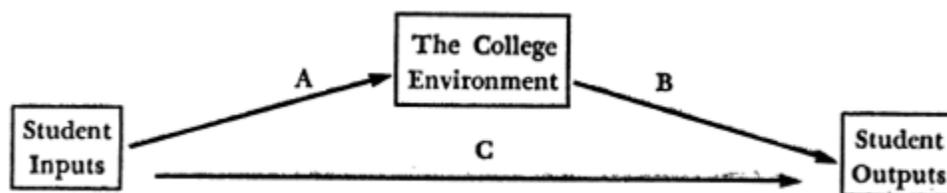


Figure 2.4: Input-Environment-Outcome College Impact Model
Source: Astin (1970, p. 225)

In this model student inputs are defined as the “talents, skills, aspirations, and other potentials for growth and learning that the new student brings with him to college” (p. 225). Inputs are the “raw materials” supplied by students that are used to create the student outputs, either directly or through interactions with the college environment.

These inputs can include such things as gender, ethnicity, career choice, and personal values. The college environment includes all the aspects of the institution that may affect the student, such as policies and practices, curriculum, physical plant and facilities, teaching practices, peer associations, and other characteristics of the campus or institution-at-large. Student outputs are the changes in a student's development that the institution influences or tries to influence. The operational measures of such outputs are "achievements, knowledge, skills, values, attitudes, aspirations, interests, and daily activities" (p. 224).

Astin argues that when examining college impact it is important to determine the effects of the college environment on student outputs (line B), while acknowledging that student outputs are also affected by student inputs (line C). In addition, the college environment is affected by student inputs (e.g., the types of students the institution enrolls) (line A). When investigating college impact, Astin states that not only should researchers be examining the main effects of the college environment within the model (line B), they should also be investigating the interaction effects of student inputs and the college environment. Specifically, researchers should examine the interactive effects of student inputs and the college environment on student outputs (AC in the schematic) and the interactive effects of student inputs on the college environment (AB in schematic), which suggest that the college environment affects different students in different ways, and that the student himself or herself may affect the college environment in turn.

Employing a sociological framework, like the I-E-O model, aligned with the purpose of this study, which was to examine the interaction between the student and the environment and its effect on student outcomes. Astin (1991) stated that "the I-E-O model is specifically designed to enhance our understanding of how outcomes are affected by environmental variables" (p. 301). The I-E-O model also acknowledges that

the college environment affects different students in different ways, which helped to inform the analyses conducted that take into account different demographic variables (e.g., gender, ethnicity, discipline, etc.).

Tinto's theory of student departure (1975, 1987, 1993) was considered as a possible conceptual framework because, as a sociological model, it also seeks to explain the interaction between the student and the institution, but its strong emphasis on integration makes it less appropriate as a framework to guide this study. This study is not focused on the integrative results of the interaction between the student and the library; rather, it is attempting to understand if there is a relationship between use of the academic library and the student outcome of persistence.

Although Bean's model of student attrition (1980) is more of an organizational model than a sociological model, it was also considered since it emphasizes organizational determinants, i.e., environmental factors, in its examination of college student persistence. But since the unit of analysis of this study is the student, and the focus of the research is the interaction between the student and the academic library, not the academic library itself, employing such an organizationally-focused framework as Bean's did not align with the study's intention. Bean's model also emphasizes the impact of external factors and variables and this study did not consider those variables in its analyses.

Astin's I-E-O model (1970) is the appropriate conceptual framework for this study because it does not employ a deficit view of the persistence. Spady (1970), Tinto (1975, 1987, 1993) and Bean (1980), all approach student persistence from a deficit orientation, focusing on why students leave, not why they stay. Their deficit approach is evident in the names of the theories: model of student dropout (Spady), theory of student departure (Tinto), and the model of student attrition (Bean). This study was interested in

exploring the potentially positive effect an academic library has on student engagement and persistence, examining whether it encourages students to stay involved and enrolled at a university.

Another reason that Astin's I-E-O model (1970) is the correct conceptual framework to guide this study is that it can also be used as an analytic framework. The beauty of Astin's model is that it is flexible enough to provide insight into the concepts of input, environment, and outcomes while also providing guidance on the selection and analysis of variables for the quantitative investigation of the relationships between the concepts; this guidance will ensure a solid foundation for the analytical aspects of this study.

Chapter Three: Methodology

INTRODUCTION

This research study was designed to explore whether a relationship exists between academic library use by undergraduate students and the positive student outcomes of engagement and persistence. The research methodology of this study is described in this chapter; the following sections will (1) identify the research questions and hypotheses; (2) discuss the analytic paradigm and framework that was employed; (3) describe the sources of data for the study; (4) detail the research site and sample; (5) identify the dependent and independent variables that were analyzed; (6) detail the data analyses conducted; and (7) outline the research limitations of this study.

RESEARCH QUESTIONS

The purpose of this study was to investigate whether a relationship exists between academic library use, specifically the use of its physical resources or spaces, and undergraduate student engagement and persistence at a large public research university. This study examined the following research questions:

Research Question #1: Is there a relationship between the use of an academic library's physical resources or spaces and undergraduate student engagement?

Null hypothesis (H_o): There is no relationship between the use of an academic library's physical resources or spaces and undergraduate student engagement.

Alternative hypothesis (H_a): There is a relationship between the use of an academic library's physical resources or spaces and undergraduate student engagement.

Research Question #2: Is there a predictive relationship between the type of academic library use (use of physical resources or use of spaces) and undergraduate student engagement?

Null hypothesis (H_0): There is no predictive relationship between the type of academic library use (use of physical resources or use of spaces) and undergraduate student engagement.

Alternative hypothesis (H_a): There is a predictive relationship between the type of academic library use (use of physical resources or use of spaces) and undergraduate student engagement.

Research Question #3: Is there a predictive relationship between the use of an academic library's physical resources or spaces and undergraduate student engagement based on a student's gender, ethnicity, parental income level, SAT score, cumulative GPA, college discipline, or year in college?

Null hypothesis (H_0): There is no predictive relationship between the use of an academic library's physical resources or spaces and undergraduate student engagement based on a student's gender, ethnicity, parental income level, SAT score, cumulative GPA, college discipline, or year in college.

Alternative hypothesis (H_a): There is a predictive relationship between the use of an academic library's physical resources or spaces and undergraduate student engagement based on a student's gender, ethnicity, parental income level, SAT score, cumulative GPA, college discipline, or year in college.

Research Question 4: Is there a relationship between the use of an academic library's physical resources or spaces and undergraduate student persistence?

Null hypothesis (H_o): There is no relationship between the use of an academic library's physical resources or spaces and undergraduate student persistence.

Alternative hypothesis (H_a): There is a relationship between the use of an academic library's physical resources or spaces and undergraduate student persistence.

Research Question #5: Is there a predictive relationship between the type of academic library use (use of physical resources or use of spaces) and undergraduate student persistence?

Null hypothesis (H_o): There is no predictive relationship between the type of academic library use (use of physical resources or use of spaces) and undergraduate student persistence.

Alternative hypothesis (H_a): There is a predictive relationship between the type of academic library use (use of physical resources or use of spaces) and undergraduate student persistence.

Research Question #6: Is there a predictive relationship between the use of an academic library's physical resources or spaces and undergraduate student persistence based on a student's gender, ethnicity, parental income level, SAT score, cumulative GPA, college discipline, year in college, sense of belonging and satisfaction, academic engagement, or academic disengagement?

Null hypothesis (H_o): There is no predictive relationship between the use of an academic library's physical resources or spaces and undergraduate student persistence based on a student's gender, ethnicity, parental income level, SAT score, cumulative GPA, college discipline, or year in college.

Alternative hypothesis (H_a): There is a predictive relationship between the use of an academic library's physical resources or spaces and undergraduate student persistence based on a student's gender, ethnicity, parental income level, SAT score, cumulative GPA, college discipline, or year in college.

ANALYTIC PARADIGM AND FRAMEWORK

This research was conducted from a quantitative or empirical-analytic paradigm, which involves the creation of a hypothesis about the existence of a relationship between two occurrences, with subsequent testing of the hypothesis while the researcher maintains an objective stance (Hathaway, 1995). This research orientation best aligned to the goals and methods of this study.

In addition to providing the conceptual framework for this study, thereby providing insight into the concepts of inputs, environment, and outcomes, Astin's I-E-O model (1970) was employed as the analytic framework. In its capacity as an analytic framework, the I-E-O model guided the identification and analysis of the study variables in order to quantitatively investigate the relationship between inputs, environment, and outcomes. According to Astin (1991), "the basic purpose of the I-E-O design is to allow us to correct or adjust for such input differences in order to get a less biased estimate of the comparative effects of different environments on outputs" (p. 19). In this analytic framework the inputs represent personal characteristics and attributes that the student brings to the educational experience, which in this study included gender, ethnicity, parental income level, and prior academic achievement (as measured by SAT score). These input characteristics were treated as independent or control variables when statistical analyses were conducted. The environment is comprised of the student's

characteristics and experiences while in college, which in this study included year in college, discipline, cumulative GPA, library physical resource use, library physical space use, and sense of belonging and satisfaction, academic engagement, and academic disengagement variables (only for the analyses involving the persistence outcome variable). Like the input variables, the environmental variables in this study were analyzed as independent variables. The outcome, or dependent, variables which represented student engagement were operationalized using variables of sense of belonging and satisfaction, academic engagement, and academic disengagement, while persistence was operationalized using a variable representing student graduation status within five years of enrollment.

SOURCES OF DATA

In order to be able to examine the relationship between academic library use and undergraduate engagement and persistence, multiple datasets were identified and then combined into one dataset. The first dataset was the results of the 2011 administration of the Student Experience in the Research University (SERU) survey. This dataset was used because it was a large and unique dataset that contained hundreds of data points about the student university experience, including many variables about sense of belonging and satisfaction, academic engagement, and academic disengagement. Another dataset used was comprised of student data retrieved from the university's student information system. The student information system was selected since it was the only source for the type of demographic and enrollment data needed for the study. Four other datasets, which contained library-use data including use of physical resources and use of library spaces, were retrieved from the university library data systems for this study. Rather than utilizing self-reported use data, the researcher decided it was preferable to retrieve actual

use data from the library's various data systems because of its increased accuracy. Approval for the use of the data needed for this study was sought from the university site's Institutional Review Board; it was determined by the Board that the study qualified for exempt-status. The multiple datasets used for this study are described in more detail below.

Student Experience in the Research University (SERU) Survey

The SERU survey is an online instrument created and administered by the Studies in Higher Education at the University of California, Berkeley. The SERU survey was originally designed and developed to capture longitudinal data about the experience of students throughout the University of California (UC) System, but beginning in 2008 it was expanded to include other large research universities (Center for Studies in Higher Education, 2010). The SERU survey was administered at the university site used for this study in 2011; it was the second time the survey had been administered. The first administration was in 2010.

The SERU survey contains three modules, of which all students complete the first and second module. The third module is divided into four sections, one of which is a "wildcard" section that contains questions created by the administering university's survey team and are only asked of students enrolled at that specific university. Each student only answers questions in one of the four sections in module three in order to keep the length of the survey as short as possible. A copy of the SERU Survey instrument is available in Appendix A.

The entire population of undergraduate students enrolled at the university site in December 2010 ($N = 36,291$) was invited to complete the 2011 SERU survey online, which was administered between February and April 2011. The survey garnered a

36.20% response rate for a total of 13,120 usable responses, although the number of responses for some questions was lower due to the fact that not all students are asked to complete all modules of the survey, and some students did not complete the entire survey. The respondents who completed the survey were representative of the population of undergraduate students at the university site, especially with regards to class level, ethnicity, and college. The administrators of the SERU survey felt confident in the generalizability of the results to the university population based on the strong representativeness of the respondents.

The dataset that contained the responses from the 2011 administration of the SERU survey served as the primary dataset into which the other data was merged (based on a unique student identifier) in order to create the final dataset. Student information system data had been previously merged with the SERU dataset on the unique identifier, and the library-use data was added to this merged dataset to create the final dataset. The three datasets were merged by the university staff member in charge of administering the SERU survey who then removed all identifiable information prior to the researcher getting access to the combined dataset.

Student Information System Data

Certain student demographic and enrollment data were obtained from the university's student information system by the university's SERU survey administrator, which was then merged with the SERU dataset using the unique student identifier variable. The student data used in this study included gender (male/female), year in college (freshman, sophomore, junior, senior), ethnicity (American Indian-Alaskan Native, African American, Latino, Asian American, White, Unknown, International-Foreign Visa), SAT/ACT score, cumulative GPA, and whether students in the 2007

cohort had graduated within five years of enrollment (by the spring of 2012). As described above, all identifiable student data was subsequently removed from the dataset before it was accessed by the researcher.

Library-Use Data

Library-use data was retrieved from various library data systems and then merged with the SERU dataset using the unique student identifier variable. In order to get a multidimensional representation of library use, four variables were used to capture the use of physical resources and spaces.

Use of physical resources was represented using the number of materials checked out of any campus library and the number of interlibrary loan requests placed. The number of materials checked out (using initial checkouts only, not renewals) was retrieved from the libraries' integrated library system (ILS), which manages the circulation of materials for all library locations. The number of interlibrary loan requests placed was retrieved by querying the library database associated with the interlibrary loan system. The only information that was retrieved for this study was the number of items either checked out or requested through interlibrary loan; these data did not include any information about the materials in order to protect patron privacy.

Use of spaces was captured using the number of user logons to the public workstations located throughout all library locations and the number of reservations made for any of the group study rooms located in university libraries. The university libraries offer access to 320 public workstations throughout 14 library locations on campus. In order to access these computers, students must log on using their unique student identifiers. The university libraries also offer students the opportunity to reserve any of 24 group study rooms at three different library locations using their unique student

identifiers. These computer logons and room reservations are logged, offering some quantitative data about student use associated with these particular spaces. Although they paint in an incomplete picture, these two measures are the only options that were available for identifying users of library spaces. The libraries at this study site are open to anyone during the day, and although access is restricted to students, faculty, and staff at night, the identity of patrons is not logged in any way. Due to the open access nature of the library, patrons are not required to prove their university affiliation so there is no record of who enters and exits the various campus libraries.

As with the library resource use data, no attempt was made to determine the nature of the usage, what students used the computers for, or how they utilized the study rooms, in order to protect patron privacy. The library-use data was retrieved from the various data systems described above by library staff and then given to the university's SERU survey administrator. The library-use data was then combined with the SERU dataset based on the unique student identifier, and as described above all identifiable student data was subsequently removed from the dataset prior to access by the researcher.

RESEARCH SITE AND SAMPLE

The site that was chosen for this study was a large public research university that has an academic library system with numerous campus branch libraries. The site was chosen for the study for the numerous reasons. First, with the site being a public four-year institution the researcher felt that what was learned about the relationship between library use and student outcomes could potentially impact a large number of students since according to the National Center for Education Statistics, in 2009 37.70% of all students enrolled in degree-granting postsecondary institutions are enrolled in four-year public colleges and universities (Snyder & Dillow, 2012a). In addition, there appears to

be a trend towards increased enrollment in public four-year institutions; there has been a 30.90% increase in the enrollment in the last ten years (Snyder & Dillow, 2012b). Second, this research university was chosen because it has a large and robust library presence with decent data systems that could facilitate this type of study. Third, this site was chosen because of the availability and access to the needed sources of data, including, but not limited to, the SERU dataset. This study qualified for an exempt-status IRB review since the researcher did not have contact with any of the participants and the data the researcher analyzed was an existing dataset with no identifying information, so individual privacy was assured.

VARIABLES

The independent and dependent variables used in the statistical analyses were selected from the hundreds of variables contained in the SERU dataset, student information system, and library-use data. The selection of these variables was guided by the conceptual and analytic framework for the study, Astin's I-E-O model, as well as an exhaustive review of the literature which provided theoretical and empirical evidence that these variables comprised the subset required to answer the six research questions previously outlined.

Independent Variables

The independent variables were selected based on the research questions, the dependent variables being examined, and the I-E-O analytic framework. The independent variables for this study were used as input and environment variables within the framework of the I-E-O model. The independent variables representing student background characteristics and pre-college experiences that were used as input variables were: gender, ethnicity, parental income, and SAT Score (see Table 3.1).

Table 3.1: Independent Variables: Student Background Characteristics and Pre-College Experiences

Variable	Scale/Range
Gender	1 = Male 2 = Female
Ethnicity	1 = American Indian-Alaskan Native 2 = African American 3 = Latino 4 = Asian American 5 = White 7 = Unknown 8 = International-Foreign Visa
Parental Income	1 = Less than \$10,000 2 = \$10,000 to \$19,999 3 = \$20,000 to \$34,999 4 = \$35,000 to \$49,999 5 = \$50,000 to \$64,999 6 = \$65,000 to \$79,999 7 = \$80,000 to \$99,999 8 = \$100,000 to \$124,999 9 = \$125,000 to \$149,999 10 = \$150,000 to \$199,999 11 = \$200,000 or more
SAT Score	1 to 2400

The independent variables representing college characteristics and experiences that were used as environmental variables included: year in college, discipline (broadly defined as the school/college enrolled in), cumulative GPA, the number of materials checked out from the library, the number of interlibrary loan requests placed, the number of logons to library computer workstations, and the number of study room reservations for any of the campus libraries (see Table 3.2). In addition, a library satisfaction subfactor from the SERU data set, which includes measures of student satisfaction with educational enrichment programs, availability of library research materials, and accessibility of library staff, was included in the environmental variables as interactions

in the linear and logistic regression models. For more information on this variable see Table 3.3.

Table 3.2: Independent Variables: College Characteristics and Experiences

Variable	Scale/Range
Year in College	1 = Freshman 2 = Sophomore 3 = Junior 4 = Senior
Discipline	2 = Business Administration 3 = Education 4 = Engineering 5 = Fine Arts 9 = Architecture C = Communication E = Natural Sciences J = Geosciences L = Liberal Arts N = Nursing S = Social Work U = Undergraduate Studies
Cumulative GPA	0 to 4.0
Number of Materials Checked Out	0 to 911
Number of Interlibrary Loan Requests	0 to 190
Number of Logons to Library Computers	0 to 2,592
Number of Study Room Reservations	0 to 77

Two of the independent variables listed in the tables above were used in the analyses as control variables: cumulative college GPA and SAT score. These variables were used to control for pre-college achievement ability and college achievement when examining the dependent variables of engagement and persistence since the literature

shows that achievement is related to persistence (Astin, 1975; McGrath & Braunstein, 1997; Tinto, 1987, 1993).

Once the merged dataset was examined it became clear that some of the independent variables needed to be transformed due to non-normal distributions or missing data. The following independent variables were identified as candidates for recoding or transformations, and the processes used to accomplish this are described below.

Parental Income Level

The parental income level of the SERU respondents was determined based on their responses to two questions: 1) “Are you a financially independent student?” and for those who answered “No,” 2) “To the best of your knowledge, which category includes the total annual combined income of your parent(s) before taxes in 2009?” The frequencies of this self-report variable ($n = 8,516$) are available in Table B.1 in Appendix B.

Unfortunately, the parental income variable had 4,604 missing values; however, when the demographics of the missing values were compared to valid values, the frequencies were similar enough that the researcher concluded that there were no systematic biases in the variable and therefore felt confident including it in the analyses (see Table B.2 in Appendix B for the comparison). The parental income variable, with an 11-point scale anchored at “less than \$10,000” and “\$200,000+,” was transformed from a categorical variable into an ordinal variable for use in the linear and logistic regressions. The open-ended category of \$200,000+ was transformed using a logarithmic conversion. Pareto’s curve was used in order to find the midpoint of the open-ended category (\$375,699) and this value was used in order to determine the correct number of bins. The

variable was converted into an ordinal variable by creating a new variable with eight intervals, with the midpoint of each interval being at \$50,000 increments; therefore, an increase in each interval represents a \$50,000 increase in parental income.

SAT Variable

Over 84.00% of the 13,120 cases ($n = 11,103$) in the dataset contain a combined SAT score (Critical Reading, Mathematics and Writing scores), thereby leaving only 2,017 of the cases without a combined SAT score. Of the 2,017 cases missing a combined SAT score, 797 had a combined ACT score. The College Board's ACT and SAT Concordance Tables (2009) were used to convert the available ACT score to an SAT score (see Appendix C for the Concordance Tables). Converting the combined ACT score to a SAT score increased the number of cases with an SAT score to 11,900, thereby leaving only 1,220 cases (9.30%) with missing values for the combined SAT variable. In order to be able to better interpret the results of the regressions, the SAT variable was transformed into a new variable that was centered to the mean of the SAT variable ($M = 1,804$, $SD = 260.13$) and the Z-score was computed.

Number of Materials Checked Out

The data for the number of materials checked out of the library were available from the library data systems as a cumulative number of checkouts associated with a unique student identifier. No specific timeframe was designated for this variable since undergraduate student accounts are not created until a student is enrolled, and the accounts are deactivated upon graduation. Unfortunately, this variable was missing 768 of the 13,120 cases due to changes in the patron status associated with the unique student identifier. This shift in the patron status occurs when a student changes their role in the university's central identification system from undergraduate to another status (e.g.,

graduate student, staff, courtesy borrower, etc.). As a result of the change in patron status, it was impossible to determine whether the checkout activity was associated with the undergraduate status or the “new” status; therefore, these 768 cases were not included in the analyses since the checkouts could have occurred when the student was no longer an undergraduate. The total number of material checkouts for the 12,352 valid cases ranged from 0 to 911 ($M = 18.90$, $SD = 42.80$) and the variable was non-normally distributed, with a skewness value of 6.77 ($SE = 0.02$) and a kurtosis value of 77.26 ($SE = 0.04$).

Number of Interlibrary Loan Requests

The interlibrary loan request data were available from the library data systems as a total number of requests made by each unique student identifier for each semester from fall 2007 until spring 2012 (14 semesters in total). A variable for the total number of interlibrary loan requests was created by adding the total loan requests for each of the 14 semesters. The interlibrary loan request variable was available for all of the 13,120 cases. The total number of interlibrary loan requests ranged from 0 to 190 ($M = .25$, $SD = 3.3$). The total number of interlibrary loan requests variable was non-normally distributed, with a skewness value of 39.80 ($SE = 0.02$) and a kurtosis value of 1992.01 ($SE = 0.04$).

Use of Library Physical Resources

Based on the initial analyses of the two resource usage variables (number of materials checked out and the number of interlibrary loan requests) it was determined that an aggregate level variable should be created for use in the correlations and regressions. This decision was made for two reasons: the non-normal distribution of each individual variable and the fact that the research questions were examining a broad type of use

(resources vs. spaces) rather than a more specific use (materials held vs. interlibrary loan requests). The aggregated use of physical resources variable was computed by adding the total number of materials checked out and the total number of interlibrary loan requests. The use of physical resources variable was missing 768 of the 13,120 cases (these missing cases are associated with the missing cases from the materials checkout variable). The range for the 12,352 valid cases of this variable was from 0 to 911 ($M = 19.13$, $SD = 43.45$). The use of physical resources variable was non-normally distributed, with a skewness value of 6.88 ($SE = 0.02$) and a kurtosis value of 79.64 ($SE = 0.04$). As a result of the non-normal distribution, the variable was transformed into a new variable that was broken into quintiles for use in the analyses. See Table 4.6 in Chapter 4 for the frequency distribution and percentages for this variable.

Number of Logons to Library Computer Workstations

The logons to library computer workstations data were available from the library data systems as a number of logons made by unique student identifier for each semester from spring 2010 until spring 2012 (seven semesters in total). A variable for the total number of logons to library computer workstations was created by adding the logons for each of the seven semesters. The library computer workstations variable was missing 8 of the 13,120 cases. The total number of logons to library computer workstation for the 13,112 valid cases ranged from 0 to 2,592 ($M = 47.38$, $SD = 123.92$). This variable was non-normally distributed, with a skewness value of 7.41 ($SE = 0.02$) and a kurtosis value of 86.28 ($SE = 0.04$).

Number of Study Room Reservations

The number of study room reservations data were available from the library data systems as a number of reservations made by unique student identifier for each semester

from fall 2007 until spring 2012 (14 semesters in total). A variable for the total number of study room reservations was created by adding the logons for each of the 14 semesters. The study room reservations variable was missing 8 of the 13,120 cases. The total number of study room reservations for the 13,112 valid cases ranged from 0 to 77 ($M = 1.18$, $SD = 3.53$). The total number of study room reservations variable was non-normally distributed, with a skewness value of 6.79 ($SE = 0.02$) and a kurtosis value of 73.57 ($SE = 0.04$).

Use of Library Spaces

As with the use of library physical resources variables, it was determined that an aggregate level variable for the two space usage variables (number of logons to library computer workstations and the number of study room reservations) should be created for use in the correlations and regressions. This decision was again made for two reasons: the non-normal distribution of each individual variable and the fact that the research questions were examining the type of use (resources vs. spaces) rather than the specific type of space usage (computers vs. study rooms). The aggregated use of library spaces variable was computed by adding the total number of library computer workstation logons and the total number of study room reservations. The use of library spaces variable was missing 8 of the 13,120 cases (these missing cases are associated with the missing cases from the computer logons and study room reservation variables). The use of library spaces for the 13,112 valid cases ranged from 0 to 2,594 ($M = 48.56$, $SD = 124.26$) and the variable was non-normally distributed, with a skewness value of 7.38 ($SE = 0.02$) and a kurtosis value of 85.83 ($SE = 0.04$). As a result of the non-normal distribution, the variable was transformed into a new variable that was broken into

quintiles for use in the analyses. See Table 4.8 in Chapter 4 for the frequency distribution and percentages for this variable.

Total Library Use

The total library use variable was computed by adding the use of physical resources and the use of library spaces variables. The total library use variable was missing 776 of the 13,120 cases; for the 12,344 valid cases the values ranged from 0 to 2,692 ($M = 67.40$, $SD = 140.34$). The total library use variable was non-normally distributed, with a skewness value of 6.39 ($SE = 0.02$) and a kurtosis value of 66.28 ($SE = 0.04$). As a result of the non-normal distribution, the variable was transformed into a new variable that was broken into quintiles for use in the analyses. See Table 4.10 in Chapter 4 for the frequency distribution and percentages for this variable.

Satisfaction with Library Support Subfactor

The Satisfaction with Library Support subfactor is one of the subfactors that makes up the Satisfaction with Educational Experience SERU factor (see the dependent variable section below for more information on the SERU factors and subfactors). The three questions below in Table 3.3 comprise the subfactor (only the lower and upper values of the question scales are shown; for the full scale for all three variables see Table B.3 in Appendix B). The Cronbach's alpha for this factor was 0.77, which indicates an acceptable level of internal consistency (George & Mallery, 2003). The satisfaction with library support subfactor was not investigated as a main effect in the sense of belonging and satisfaction, academic engagement, and academic disengagement regressions because of multicollinearity issues with the use of library physical resources and use of library spaces variables. The multicollinearity was identified by entering the library satisfaction variable (as the independent variable) with the library-use variables (as dependent

variables) into a general linear model. The library satisfaction variable was statistically significant for both library-use variables, and was therefore not used as a main effect in the full regression model, although it was used as an interactions variable in the models to answer research questions three and six (see Table B.4 Appendix B, for the results of the general linear model).

Table 3.3: Independent Variables: Satisfaction with Library Support Subfactor

Items	Scale
$\alpha = 0.77$	
How satisfied are you with each of the following aspects of your educational experience overall?	
Educational enrichment programs (e.g. study abroad, internships)	1 = Very dissatisfied 6 = Very satisfied
Accessibility of library staff	1 = Very dissatisfied 6 = Very satisfied
Availability of library research materials	1 = Very dissatisfied 6 = Very satisfied

Dependent Variables

The dependent variables selected for use in this study represent the positive student outcomes of engagement and persistence. Sense of belonging and satisfaction, academic engagement, and academic disengagement were analyzed using 33 variables from the SERU dataset that had been structured through factor analysis into two subfactors, 1) sense of belonging and satisfaction and 2) academic involvement and initiative, and one factor, academic disengagement. For a complete list of the variables that comprise these subfactors and factor see Tables B.5, B.6 and B.7 in Appendix B. According to Chatman (2009) the SERU factors and subfactors that were used in the

2011 administration of the survey were created in 2009 using a “varimax orthogonal rotation to determine principal components followed by promax oblique rotation to identify subfactors -- supplemented by collaborative judgment of a research team of faculty, institutional researchers and a graduate student” (p. 1). Each of the three SERU (sub)factors used in this study is described in more detail below.

In addition to the three types of engagement being explored using the SERU subfactors and factor, persistence was investigated as an outcome in this study. Persistence, as defined by Berger, Ramirez, and Lyon (2005) is the “desire and action of a student to stay within the system of higher education from beginning year through degree completion” (p.7). Based on that definition of persistence, this study investigated undergraduate persistence by utilizing a variable provided by the student information system which indicates whether a SERU respondent, who was part of a cohort that the enrolled at the university in 2007, had graduated five years after matriculation. The persistence variable is described in more detail later in this section.

Sense of Belonging and Satisfaction Subfactor

The Sense of Belonging and Satisfaction subfactor is one of the six that comprise the Satisfaction with Educational Experience SERU factor. The other five subfactors include: Quality of Instruction and Courses in the Major, Satisfaction with Access and Availability of Courses in the Major, Satisfaction with Advising and Out of Class Contact, Clarity of Program Requirements, Policies and Practices, and Satisfaction with Library Support. According to Chatman (2009), the Satisfaction with Educational Experience factor

is an exception to the rule that subfactors were formed by promax solution with oblique rotations. In fact, all items in Satisfaction with Educational Experience load heavily on one vector. The subscales offered for Factor 1 were created by a

panel of experts [...]. The subfactor structure is supported by factor analysis but is equally driven by the desire to provide useful composite measures: instruction, availability, belonging, advising, etc. Again, the decisions were not psychometrically arbitrary and the items do tend to have high internal consistency (p. 3).

The Sense of Belonging and Satisfaction subfactor was used as a dependent variable for research questions one, two, and three, which broadly focus on the outcomes of student engagement. When investigating research questions five and six, which focus on the student outcome of persistence, the Sense of Belonging and Satisfaction subfactor was used as an intermediate or environmental variable, in the I-E-O model.

The Sense of Belonging and Satisfaction subfactor was selected when investigating the research questions since the variables that comprise this subfactor examine a student's satisfaction with their educational and social experiences, sense of belongingness, and commitment to the institution (see Table 3.4, only the lower and upper values of the question scales are shown, for the full scale of all six variables see Table B.5 in Appendix B). These concepts of satisfaction with educational and social experiences, sense of belongingness, and commitment to the institution are all related to the theories of engagement and persistence. Pace's theory of quality of effort (1980), Astin's theory of involvement (1984), and Kuh's theory of engagement (Kuh, Kinzie, Schuh, Whitt, & Associates, 2005) all examine how student efforts and experiences (both the amount and quality) within the academic and social environment lead to involvement and engagement. Likewise, theories from Spady (1970), Bean (1980), and Tinto (1975, 1987, 1993) stress the importance of experiences and institutional commitment to persistence. Spady explored the integrating effects of social experiences and its relationship to persistence while Bean examined the role of organizational factors on students' commitment to college and its relationship to persistence, and Tinto explored

how student experiences lead to social and academic integration and ultimately persistence. The Cronbach's alpha for the Sense of Belonging and Satisfaction subfactor was 0.84, which indicates a good level of internal consistency within the subfactor (George & Mallery, 2003).

Table 3.4: Dependent Variable: Sense of Belonging and Satisfaction Subfactor

Items	Scale
	$\alpha = 0.84$
Self-reported college GPA	1 = Very dissatisfied 6 = Very satisfied
Value of your education for the price you are paying	1 = Very dissatisfied 6 = Very satisfied
Overall academic experience	1 = Very dissatisfied 6 = Very satisfied
Overall social experience	1 = Very dissatisfied 6 = Very satisfied
Knowing what I know now, I would still choose to enroll in this campus	1 = Strongly disagree 6 = Strongly agree
I feel that I belong at this campus	1 = Strongly disagree 6 = Strongly agree

Academic Involvement and Initiative Subfactor

The Academic Involvement and Initiative subfactor is one of three that make up the Engagement with Studies factor, with the other two subfactors being Research or Creative Projects Experience and Collaborative Work. According to Chatman (2009) the Engagement with Studies factor “is one of a few factor scores that are similar in meaning and composition to NSSE Benchmarks” (p. 4). Furthermore, it “is a factor that is of

special interest to faculty as it helps to describe students that many faculty, especially in social sciences and humanities, find to be more challenging and engaging for them as faculty” (Chatman, 2009, pg. 4). Not unlike the NSSE Benchmarks, the scores for the Engagement with Studies factor, “tend to favor humanities and social sciences students and to penalize hard science and engineering students” (Chatman, 2009, p.4).

This study utilized the Academic Involvement and Initiative subfactor (referred to as Academic Engagement for this study) because of its alignment with Kuh’s theory of engagement (1991, 2001, 2005) and the NSSE benchmarks of effective educational practice. Most of the five benchmarks (level of academic challenge, active and collaborative learning, student-faculty interaction, enriching educational practice, and a supportive campus environment) are fertile ground for exploration as to how they can be impacted, either directly or indirectly, through the efforts of an academic library, and therefore they needed to be represented in this study. The Academic Involvement and Initiative subfactor is comprised of the eleven variables listed below in Table 3.5 (only the lower and upper values of the question scales are shown, for the full scale of all eleven variables see Table B.6 in Appendix B). The Cronbach’s alpha for the Academic Involvement and Initiative subfactor was 0.90 which indicates the subfactor has a good, bordering on excellent, level of internal consistency (George & Mallery, 2003).

As with the Sense of Belonging and Satisfaction subfactor, the Academic Involvement and Initiative subfactor was used as a dependent variable for research questions one, two, and three, which focus on the outcomes of sense of belonging and satisfaction, academic engagement, and academic disengagement and an intermediate (or environmental) variable when investigating research questions five and six, which focus on the student outcome of persistence.

Table 3.5: Dependent Variables: Academic Involvement and Initiative Subfactor

Items	Scale
	$\alpha = 0.90$
Chosen challenging courses, when possible, even though you might lower your GPA by doing so	1 = Never 6 = Very often
Made a class presentation	1 = Never 6 = Very often
How many professors do you know well enough to ask for a letter of recommendation from?	Zero 4 or more
Communicated with a faculty member by email or in person	1 = Never 6 = Very often
Found a course so interesting that you did more work than was required	1 = Never 6 = Very often
Talked with an instructor outside of class about issues and concepts derived from a course	1 = Never 6 = Very often
Had a class in which the professor knew or learned your name	1 = Never 6 = Very often
Interacted with faculty during lecture class sessions	1 = Never 6 = Very often
Contributed to a class discussion	1 = Never 6 = Very often
Brought up ideas or concepts from different courses during class discussions	1 = Never 6 = Very often
Asked an insightful question in class	1 = Never 6 = Very often

Academic Disengagement Factor

Since academic engagement was examined in this study, the inverse of that construct, academic disengagement, was also explored. The Academic Disengagement factor is comprised of four subfactors: Extracurricular Engagement, Poor Academic Habits, Non-academic Motivations, and Easy Major. According to Chatman (2009),

skipping class, being unprepared, not reading material, partying, and watching TV are all examples of activities that will interfere with academic involvement whether or not they are associated with lower academic performance. A student exhibiting high levels of these behaviors has less time for academic matters (p. 5).

The Academic Disengagement factor, and all its subfactors, are inverted scales, so higher values are related to better outcomes (Chatman, 2009). The Academic Disengagement factor was used in the analyses, not its individual subfactors, since the individual subfactors were too specific and don't align to the goals of this research study. This factor is composed of the sixteen variables listed below in Table 3.6 (only the lower and upper values of the question scales are shown, for the full scale of all sixteen variables see Table B.7 in Appendix B). The Cronbach's alpha for the Academic Disengagement factor was 0.75, indicating an acceptable level of internal consistency for this factor (George & Mallery, 2003).

The Academic Disengagement factor was used in analyses in the same manner as the two previously described SERU subfactors; for the research questions (numbers one, two, and three) focusing on sense of belonging and satisfaction, academic engagement, and academic disengagement the factor was used as a dependent variable while for research questions which focus on student persistence (numbers five and six) it was used as an intermediate (or environmental) variable.

Table 3.6: Dependent Variables: Academic Disengagement Factor

Items	Scale
	$\alpha = 0.75$
Participating in student clubs or organizations	0 More than 30
Participating in physical exercise, recreational sports, or physically active hobbies	0 More than 30
Pursuing a recreational or creative interest (arts/crafts, reading, music, hobbies, etc.)	0 More than 30
Watching TV	0 More than 30
Using the computer for non-academic purposes (games, shopping, email/instant messaging, etc.)	0 More than 30
Attending movies, concerts, sports, or other entertainment events	0 More than 30
Partying	0 More than 30
Socializing with friends	0 More than 30
Turned in a course assignment late	1 = Never 6 = Very often
On average, how much of your assigned course reading have you completed this academic year?	0 - 10% 91 - 100%
Skipped class	1 = Never 6 = Very often
Gone to class without completing assigned reading	1 = Never 6 = Very often

Table 3.6: Dependent Variables: Academic Disengagement Factor - continued

Items	Scale
Gone to class unprepared	1 = Never 6 = Very often
Were easy requirements a factor in deciding major?	Yes No
Was allowing time for other activities a factor in deciding major?	Yes No

Persistence

As previously stated, undergraduate persistence was examined by utilizing a variable provided by the student information system which indicated whether a SERU respondent, who was part of a cohort that enrolled in the university in 2007 ($n = 2,181$), had graduated five years after matriculation. Although a six-year timeframe for examining student graduation is often used, this data was not available since this study was conducted in Fall 2012 and six years had not passed since the students in this cohort had enrolled in 2007; therefore a five-year timeframe was used for the analyses. The frequency distribution and percentages for this variable are in Table 4.14 in Chapter 4.

DATA ANALYSIS

The data analysis for this study was conducted in six phases, one research question per phase. However, in order to investigate the research questions outlined in this study the first level of analysis that was undertaken examined the independent and dependent variables through the use of descriptive statistics, including data distributions, tabulations, and percentages. The results of these analyses are available in the Descriptive Statistics section of Chapter Four. The second level of analysis explored the

relationships between the variables by employing inferential statistical techniques including correlations, Chi Squares, multiple linear regressions, and logistic regressions. For a summary table of the analyses conducted for this study, see Table 3.7.

In examining research question number one – is there a relationship between the use of an academic library’s physical resources or spaces and undergraduate student engagement – the variables representing both types of library use (physical resources and spaces) and the aggregate total use variable were analyzed with the SERU subfactors for sense of belonging and satisfaction, academic engagement, and academic disengagement using Pearson Product Moment Correlation Coefficient (r_{xy}).

The analysis required to investigate research question number two – is there a predictive relationship between the type of academic library use (use of library physical resources or use of spaces) and undergraduate student engagement (operationalized using the SERU subfactors for sense of belonging and satisfaction, academic engagement, and academic disengagement) – was analyzed using multiple linear regressions. The regression equations for the dependent variables are as follows:

sense of belonging and satisfaction = $a + b_{\text{gender}} + b_{\text{ethnicity}} + b_{\text{parentalincome}} + b_{\text{SATzscore}} + b_{\text{year}} + b_{\text{discipline}} + b_{\text{cumGPA}} + b_{\text{resources}} + b_{\text{spaces}}$;

academic engagement = $a + b_{\text{gender}} + b_{\text{ethnicity}} + b_{\text{parentalincome}} + b_{\text{SATzscore}} + b_{\text{year}} + b_{\text{discipline}} + b_{\text{cumGPA}} + b_{\text{resources}} + b_{\text{spaces}}$; and

academic disengagement = $a + b_{\text{gender}} + b_{\text{ethnicity}} + b_{\text{parentalincome}} + b_{\text{SATzscore}} + b_{\text{year}} + b_{\text{discipline}} + b_{\text{cumGPA}} + b_{\text{resources}} + b_{\text{spaces}}$.

In exploring research question number three – is there a predictive relationship between the use of an academic library’s physical resources or spaces and undergraduate student engagement based on a student’s gender, ethnicity, parental income, SAT score, cumulative GPA, discipline, or year in college – multiple linear regressions were

conducted. As with the previous analyses, engagement was investigated using outcome measures for sense of belonging and satisfaction, academic engagement, and academic disengagement, and the regression equations are as follows:

$$\begin{aligned} \text{sense of belonging and satisfaction} = & a + b_{\text{gender}} + b_{\text{ethnicity}} + b_{\text{parentalincome}} + b_{\text{SATzscore}} + b_{\text{year}} \\ & + b_{\text{discipline}} + b_{\text{cumGPA}} + b_{\text{resources}} + b_{\text{spaces}} + b_{\text{gender*resources}} + b_{\text{ethnicity*resources}} + \\ & b_{\text{parentalincome*resources}} + b_{\text{SATzscore*resources}} + b_{\text{year*resources}} + b_{\text{discipline*resources}} + b_{\text{cumGPA*resources}} + \\ & b_{\text{libattribution*resources}} + b_{\text{gender*spaces}} + b_{\text{ethnicity*spaces}} + b_{\text{parentalincome*spaces}} + b_{\text{SATzscore*spaces}} + \\ & b_{\text{year*spaces}} + b_{\text{discipline*spaces}} + b_{\text{cumGPA*spaces}} + b_{\text{libattribution*spaces}}; \end{aligned}$$

$$\begin{aligned} \text{academic engagement} = & a + b_{\text{gender}} + b_{\text{ethnicity}} + b_{\text{parentalincome}} + b_{\text{SATzscore}} + b_{\text{year}} + b_{\text{discipline}} + \\ & b_{\text{cumGPA}} + b_{\text{resources}} + b_{\text{spaces}} + b_{\text{gender*resources}} + b_{\text{ethnicity*resources}} + b_{\text{parentalincome*resources}} + \\ & b_{\text{SATzscore*resources}} + b_{\text{year*resources}} + b_{\text{discipline*resources}} + b_{\text{cumGPA*resources}} + b_{\text{libattribution*resources}} \\ & b_{\text{gender*spaces}} + b_{\text{ethnicity*spaces}} + b_{\text{parentalincome*spaces}} + b_{\text{SATzscore*spaces}} + b_{\text{year*spaces}} + b_{\text{discipline*spaces}} \\ & + b_{\text{cumGPA*spaces}} + b_{\text{libattribution*spaces}}; \text{ and} \end{aligned}$$

$$\begin{aligned} \text{academic disengagement} = & a + b_{\text{gender}} + b_{\text{ethnicity}} + b_{\text{parentalincome}} + b_{\text{SATzscore}} + b_{\text{year}} + b_{\text{discipline}} \\ & + b_{\text{cumGPA}} + b_{\text{resources}} + b_{\text{spaces}} + b_{\text{gender*resources}} + b_{\text{ethnicity*resources}} + b_{\text{parentalincome*resources}} + \\ & b_{\text{SATzscore*resources}} + b_{\text{year*resources}} + b_{\text{discipline*resources}} + b_{\text{cumGPA*resources}} + b_{\text{libattribution*resources}} \\ & b_{\text{gender*spaces}} + b_{\text{ethnicity*spaces}} + b_{\text{parentalincome*spaces}} + b_{\text{SATzscore*spaces}} + b_{\text{year*spaces}} + b_{\text{discipline*spaces}} \\ & + b_{\text{cumGPA*spaces}} + b_{\text{libattribution*spaces}}. \end{aligned}$$

In investigating research question number four – is there a relationship between the use of an academic library’s physical resources or spaces and undergraduate student persistence – the use of library physical resources, use of library spaces, and total library-use variables were analyzed with the undergraduate persistence variable using a Point-Biserial Correlation Coefficient (r_{pb}).

In examining research question number five – is there a predictive relationship between the type of academic library use (use of physical resources or use of spaces) and

undergraduate student persistence – a logistic regression was conducted. The equation for the logistic regression was:

$$\text{persistence} = a + b_{\text{gender}} + b_{\text{ethnicity}} + b_{\text{parentalincome}} + b_{\text{SATzscore}} + b_{\text{year}} + b_{\text{discipline}} + b_{\text{cumGPA}} + b_{\text{resources}} + b_{\text{spaces}} + b_{\text{overallengage}} + b_{\text{acadengage}} + b_{\text{acaddisengage}} + e.$$

In exploring research question number six – is there a predictive relationship between the use of an academic library’s physical resources or spaces and undergraduate student persistence based on a student’s gender, ethnicity, parental income, SAT score, cumulative GPA, discipline, year in college, sense of belonging and satisfaction, academic engagement, or academic disengagement – a logistic regression was conducted. The equation for this logistic regression is as follows:

$$\begin{aligned} \text{persistence} = & a + b_{\text{gender}} + b_{\text{ethnicity}} + b_{\text{parentalincome}} + b_{\text{SATzscore}} + b_{\text{year}} + b_{\text{discipline}} + b_{\text{cumGPA}} + \\ & b_{\text{resources}} + b_{\text{spaces}} + b_{\text{overallengage}} + b_{\text{acadengage}} + b_{\text{acaddisengage}} + b_{\text{gender*resources}} + b_{\text{ethnicity*resources}} + \\ & b_{\text{parentalincome*resources}} + b_{\text{SATzscore*resources}} + b_{\text{year*resources}} + b_{\text{discipline*resources}} + b_{\text{cumGPA*resources}} + \\ & b_{\text{libatisfaction*resources}} + b_{\text{gender*spaces}} + b_{\text{ethnicity*spaces}} + b_{\text{parentalincome*spaces}} + b_{\text{SATzscore*spaces}} + \\ & b_{\text{year*spaces}} + b_{\text{discipline*spaces}} + b_{\text{cumGPA*spaces}} + b_{\text{libatisfaction*spaces}} + b_{\text{overallengage*resources}} + b_{\text{acadengage}} \\ & * \text{resources} + b_{\text{acaddisengage*resources}} + b_{\text{overallengage*spaces}} + b_{\text{acadengage*spaces}} + b_{\text{acaddisengage*spaces}} + e. \end{aligned}$$

Table 3.7: Summary Table of Analyses Conducted

Phase	Research Question Addressed	Method	Outcome of Interest
Preliminary Phase	Description of sample, relationship among categorical variables.	Distributions Percentages Chi-Square	N/A
Phase One	RQ #1: Relationship between use of academic library's physical resources or spaces and sense of belonging and satisfaction.	Pearson Product Moment Correlation Coefficient	Sense of Belonging and Satisfaction
Phase One	RQ #1: Relationship between use of academic library's physical resources or spaces and academic engagement.	Pearson Product Moment Correlation Coefficient	Academic Engagement
Phase One	RQ #1: Relationship between use of academic library's physical resources or spaces and academic disengagement.	Pearson Product Moment Correlation Coefficient	Academic Disengagement
Phase Two	RQ #2: Predictive relationship between type of use (physical resources or spaces) and sense of belonging and satisfaction.	Multiple Linear Regression	Sense of Belonging and Satisfaction
Phase Two	RQ #2: Predictive relationship between type of use (physical resources or spaces) and academic engagement.	Multiple Linear Regression	Academic Engagement
Phase Two	RQ #2: Predictive relationship between type of use (physical resources or spaces) and academic disengagement.	Multiple Linear Regression	Academic Disengagement

Table 3.7 (continued)

Phase	Research Question Addressed	Method	Outcome of Interest
Phase Three	RQ #3: Predictive relationship between type of use (physical resources or spaces) and sense of belonging and satisfaction based on a student's gender, ethnicity, parental income, SAT score, cumulative GPA, discipline, or year in college.	Multiple Linear Regression	Sense of Belonging and Satisfaction
Phase Three	RQ #3: Predictive relationship between type of use (resources or spaces) and academic engagement based on a student's gender, ethnicity, parental income, SAT score, cumulative GPA, discipline, or year in college.	Multiple Linear Regression	Academic Engagement
Phase Three	RQ #3: Predictive relationship between type of use (resources or spaces) and academic disengagement based on a student's gender, ethnicity, parental income, SAT score, cumulative GPA, discipline, or year in college.	Multiple Linear Regression	Academic Disengagement
Phase Four	RQ #4: Relationship between use of an academic library's physical resources or spaces and undergraduate persistence.	Point-Biserial Correlation Coefficient	Persistence – Graduated within five years
Phase Five	RQ #5: Predictive relationship between type of academic library use (resources or spaces) and persistence.	Logistic Regression	Persistence – Graduated within five years
Phase Six	RQ #6: Predictive relationship between type of academic library use (resources or spaces) and persistence based on a student's gender, ethnicity, parental income, SAT score, cumulative GPA, discipline, year in college, sense of belonging and satisfaction, academic engagement, or academic disengagement.	Logistic Regression	Persistence – Graduated within five years

RESEARCH LIMITATIONS

As with any study, there are limitations that affect the conclusions that can be drawn from this research project. The main limitation associated with this study was that of data availability, which resulted in an inability to fully answer some of the research questions or a lack of clarity in some conclusions. The academic library at the site university, like most libraries, prides itself on protecting the privacy of its patrons. Patrons can enter and exit library buildings without leaving any record of their presence, they can use many services including reference assistance and computer lab assistance anonymously, and they can access materials freely within the library without ever checking them out. These protocols ensure patron privacy, but make collecting data for use in research studies very difficult. As a result, it was impossible to get a complete picture of how patrons use the academic library.

In addition to the broad issues with the collection of usage data, there were some specific limitations with the library-use data used for this study that need to be discussed further. With regards to use of resources, it should be noted that a variable representing use of electronic resources was not available for this study. At this university library site access to electronic resources (such as electronic articles and books) is controlled by IP address for on-campus patrons (they go directly into the resources without having to authenticate themselves further) or by a proxy server for off-campus patrons (patrons authenticate themselves by logging onto the proxy server using their unique university identifier). Because of the manner in which access to electronic resources is authenticated the proxy server is the only authentication route through which any identifying data is collected about the user. Unfortunately, it was discovered that the university library site was only keeping the proxy logs for 30 days before erasing them,

making the data insufficient for this study. The protocol for keeping the proxy logs has since been changed so that data will be available for future studies, but it will still only reflect the use of electronic resources by off-campus patrons. Even having a partial representation of use of electronic resources is important since more and more resources are being accessed electronically by library patrons. For this survey, the results must be understood to only show a portion of the true use of library resources by patrons.

Another limitation with regards to the library-use data has to do with the variables capturing use of library spaces. As previously discussed, students do not have to show university identification in order to enter library facilities, so in order to generate usage data, students must use the building in a way that requires authentication, such as using public workstations or reserving study rooms. Therefore, a clear limitation of the physical space use data was that they are not capturing all aspects of the student use of the library facilities; students who make use of library facilities but use their own computers instead of public ones, as well as students who do not utilize the group study rooms, are not being represented in this data.

Finally, in order to examine the relationship between library instruction services and undergraduate student engagement and persistence, the researcher hoped to use a variable that captured student enrollment in undergraduate signature courses and rhetoric and writing courses that have a library instruction component. Although those data were available from the library identifying which specific classes of the signature and rhetoric writing courses had attended library instruction sessions, student enrollment in these courses could not be accessed from the Registrar due to FERPA restrictions. Therefore, a variable for library instruction participation was not available for use in the analyses.

Chapter Four: Data Results

This study examined the relationship between academic library use and undergraduate engagement and persistence. The primary dataset for this study was the results of the 2011 administration of the Student Experience in the Research University (SERU) survey. As detailed in Chapter 3, numerous variables from two additional data sources were merged into the SERU dataset based on the unique student identifier. Variables representing pre-college student characteristics and experiences (including gender, ethnicity, and SAT score) and college characteristic and experience variables (including year in college, college/school enrolled in, cumulative GPA, and graduation status) were obtained from the Student Information System and added to the SERU dataset. Library-use data (including checkouts, interlibrary loan requests, logons to library computers, and reservation of library study spaces) retrieved from various library data systems were also added to the SERU dataset.

The analyses described in this chapter were conducted in six phases, with each phase examining one research question. Preliminary work, which explored the independent and dependent variables through descriptive and inferential statistics, was conducted before the research questions could be investigated. The first phase of the analyses attempted to answer the first research question, which explored the relationship between academic library use and undergraduate engagement. The second phase investigated research question two, which focused on the predictive relationship between academic library use and undergraduate engagement. The third phase explored research question three, which asked if a predictive relationship between academic library use and undergraduate engagement could be related to student characteristics or experiences. The fourth phase investigated research question four which examined the relationship

between academic library use and undergraduate persistence, while the fifth phase focused on the predictive relationship between the two, the subject of research question five. The sixth and final phase investigated whether a predictive relationship between academic library use and undergraduate persistence could also be related to student characteristics and experiences, thereby answering research question six. The results of the analyses are reported in this chapter, while interpretation of the results in the context of the literature and implications of the findings is discussed in Chapter 5, Conclusions and Implications.

PRELIMINARY PHASE: UNDERSTANDING THE DATA USING DESCRIPTIVE AND INFERENCE STATISTICS

In order to describe the sample that was used in this study, a series of descriptive statistical analyses were conducted and the results are presented in this section. In addition to the descriptive statistics, Chi-square analyses were conducted to better understand how the sample differed from the population.

The administration of the SERU survey resulted in a total of 13,120 responses by undergraduate students enrolled at the university study site, which corresponded to a 36.10% response rate. A comparison of respondent demographic and enrollment characteristics of the sample ($n = 13,120$) to the campus population ($N = 38,420$) is shown in Tables 4.1 and 4.4.

Exploring the Input Variables: Pre-College Characteristics and Experiences

The pre-college characteristics and experiences, which served as inputs in the I-E-O model (Astin, 1991) during the subsequent analyses, were explored first. These independent variables included gender, ethnicity, parental income, and SAT Z-score.

Gender and Ethnicity

The descriptive data for the genders and ethnicities of the SERU sample as compared to the campus population is available in Table 4.1. As the data show, there was an underrepresentation of males in the SERU sample (45.30%) as compared to the campus population (48.70%) and an overrepresentation of females (54.70%) as compared to the campus population (51.30%). There was a statistically significant difference in the genders of the 2011 SERU respondents as compared with the campus population ($\chi^2(1, N = 13,120) = 60.96, p < .001$). Although the Chi-square test showed a significant difference in the genders of the sample and the population (which may be a function of the large sample size), the differences of 3.40% for both genders were not considered practically significant to the study.

The respondents of the 2011 SERU survey also differed from the campus population with regards to ethnicity (as also shown in Table 4.1). These differences were reflected in the underrepresentation of African American students (4.50% in the sample compared to 4.70% in the campus population), American Indian students (0.30% in the sample compared to 0.40% in the campus population), Foreign students (4.20% in the sample compared to 4.50% in the campus population), Latino students (18.30% in the sample compared to 19.60% in the campus population), and White students (48.50% in the sample compared to 52.30% in the campus population). Asian American students were overrepresented (20.00% in the sample compared to 18.10% in the campus population), as were students of unknown ethnicity (4.00% in the sample compared to 0.40% in the campus population). The results of a Chi-square test indicated that there was a statistically significant difference in at least one of the ethnicities of the 2011 SERU respondents as compared with the campus population ($\chi^2(6, N = 13,120) = 4490.34, p < .001$). As with the results of the Chi-square test for the gender variable, the Chi-square

results showed a significant difference in the ethnicities of the sample and the population; however, the differences, which only ranged from 0.10% to 3.80%, were not considered practically significant to the study. Due to the disproportionately small number of American Indian students ($n = 45$) as compared to the other ethnic groups, the subsequent analyses that were conducted for this study did not include this ethnicity. The gender and ethnicity representation of the SERU survey respondents so closely matched the campus population that the researcher felt confident in the generalizability of the sample to campus population.

Table 4.1: Gender and Ethnicity of SERU Respondents and Campus Population

	Frequency		Percentage	
	SERU	Campus	SERU	Campus
SERU Respondents $n = 13,120$				
Campus Population $N = 38,420$				
Gender				
Male	5,942	18,718	45.30%	48.70%
Female	7,178	19,702	54.70%	51.30%
Ethnicity				
African American	592	1,800	4.50%	4.70%
American Indian	45	153	0.30%	0.40%
Asian	2,628	6,869	20.00%	18.10%
Foreign	556	1,724	4.20%	4.50%
Latino	2,406	7,462	18.30%	19.60%
Unknown	531	146	4.00%	0.40%
White	6,362	19,877	48.50%	52.30%

χ^2 for gender (1, $N = 13,120$) = 60.96, $p < .001$

χ^2 for ethnicity (6, $N = 13,120$) = 4490.34, $p < .001$

Parental Income

As described in Chapter Three, the self-reported parental income was transformed from a categorical to an ordinal variable, with the midpoints of the intervals set at \$50,000 increments. This ordinal variable was used as a continuous variable in the

subsequent analyses. As Table 4.2 demonstrates, 57.70% of the respondents reported a parental income between \$0 and \$99,999 and 29.40% reported a parental income between \$100,000 and \$200,000, while the remaining 12.80% reported parental income levels of \$200,000 and above.

Table 4.2: Parental Income of SERU Respondents

	Frequency	Percentage
\$0-\$49,999	2,358	27.70%
\$50,000-99,999	2,557	30.00%
\$100,000-149,999	1,835	21.50%
\$150,000-199,999	672	7.90%
\$200,000+	1,094	12.80%
Total	8,516	100.00%
Missing	4,604	

SAT Z- Scores

As described in Chapter Three, the SAT variable was transformed into a new variable that was centered to the mean of the SAT variable ($M = 1,804$, $SD = 260.13$) and a Z-score was computed. The frequencies of the SAT Z-score variable show that 43.20% of the scores are within two standard deviations above the mean, thereby representing SAT scores between 1,804 and 2,324, while 52.80% of the scores fall within two standard deviations below the mean, representing SAT scores between 1,284 and 1,804. See Table 4.3 for the frequencies.

Table 4.3: SAT Z-Scores of SERU Respondents

	Frequency
>2 SDs above the mean	3.60%
1-2 SDs above the mean	12.20%
0-1 SD above the mean	31.00%
0-1 SD below the mean	37.50%
1-2 SDs below the mean	15.30%
>2 SDs below the mean	0.60%

Exploring the Environment Variables: College Characteristics and Experiences

The next variables explored using descriptive statistics were those that represent a student's college characteristics and experiences. They were used as environment variables in the I-E-O analytic model. These independent variables included year in college, discipline, cumulative GPA, use of library physical resources, use of library spaces, total library use, and the satisfaction with library support subfactor.

Year in College and Discipline

The descriptive data for the year in college and discipline of the SERU sample as compared to the campus population is available in Table 4.4. There was a statistically significant difference in the year in college representation of the 2011 respondents as compared with the campus population ($\chi^2(3, N = 13,120) = 23.99, p < .001$). A lower percentage of freshman and senior students (19.60% and 35.10%, respectively) completed the SERU survey as compared to their campus representation (20.50% and 36.30%, respectively). Meanwhile, the percentage of students in their sophomore and junior years of college who completed the SERU survey (21.70% and 23.50%, respectively) was greater than their campus representation at 20.40% and 22.80%, respectively. Although the Chi-square results indicated a significant difference between the sample and the population with regards to the respondents' year in college, the

difference (which ranged from 0.70% to 1.30%) was not considered practically significant to the study.

Discipline, which refers to the college in which the respondent is enrolled, was also shown to have a statistically significant difference between the 2011 respondents as compared with the campus population ($\chi^2(11, N = 13,120) = 107.39, p < .001$). The following disciplines were overrepresented: Architecture (1.10% in the sample compared to 0.90% in the population), Business (11.40% in the sample compared to 10.50% in the population), Engineering (16.40% in the sample compared to 14.50% in the population), Nursing (2.40% in the sample compared to 2.00% in the population), and Social Work (1.00% in the sample compared to 0.80% in the population). Some disciplines were underrepresented; these included Communication (9.80% in the sample compared to 10.00% in the population), Education (5.00% in the sample compared to 5.60% in the population), Fine Arts (2.90% in the sample compared to 3.10% in the population), Liberal Arts (21.80% in the sample compared to 24.10% in the population), and Undergraduate Studies (3.80% in the sample compared to 4.10% in the population). Two disciplines had the same representation in the sample as in the population: Natural Sciences (23.60%) and Geosciences (0.80%). As with the Chi-square results for gender, ethnicity, and year in college, the significant Chi-square results for discipline were deemed not practically significant since the differences in the sample and campus population ranged from 0.20% to 2.30%. See Table 4.4 for frequencies and percentages. As with the results of the gender and ethnicity analyses, the year in college and discipline representation of the SERU survey respondents so closely matched the campus population that the researcher felt confident in the generalizability of the sample to the campus population.

Table 4.4: Year in College and Discipline of SERU Respondents and Campus Population

SERU Respondents $n = 13,120$ Campus Population $N = 38,420$				
	Frequency		Percentage	
	SERU	Campus	SERU	Campus
Year in College				
Freshman	2,575	7,867	19.60%	20.50%
Sophomore	2,848	7,820	21.70%	20.40%
Junior	3,087	8,778	23.50%	22.80%
Senior	4,610	13,955	35.10%	36.30%
Discipline				
Architecture	148	333	1.10%	0.90%
Business	1,498	4,043	11.40%	10.50%
Communication	1,288	3,854	9.80%	10.00%
Education	660	2,160	5.00%	5.60%
Engineering	2,148	5,583	16.40%	14.50%
Fine Arts	376	1,172	2.90%	3.10%
Geosciences	102	290	0.80%	0.80%
Liberal Arts	2,856	9,264	21.80%	24.10%
Natural Sciences	3,101	9,059	23.60%	23.60%
Nursing	314	777	2.40%	2.00%
Social Work	127	315	1.00%	0.80%
Undergraduate Studies	502	1,570	3.80%	4.10%

χ^2 for year in college (3, $N = 13,120$) = 23.99, $p < .001$

χ^2 for discipline (11, $N = 13,120$) = 107.39, $p < .001$

Cumulative GPA

The mean cumulative GPA data were available for 13,109 respondents in the dataset (11 missing values were found in the dataset). The mean cumulative GPA was 3.42 with a standard deviation of 0.57. As shown below in Table 4.5, 66.40% of the respondents had a cumulative GPA between 3.00 and 4.00, 86.40% had a cumulative GPA between 2.50 and 4.00, and only 13.60% of the sample had a cumulative GPA below 2.50.

Table 4.5: Cumulative GPAs of SERU respondents

	Frequency	Percentage
0.00 to 1.00	27	0.20%
1.01 to 1.50	65	0.50%
1.51 to 2.00	329	2.50%
2.01 to 2.50	1,359	10.40%
2.51 to 3.00	2,617	20.00%
3.01 to 3.50	4,115	31.40%
3.51 to 4.00	4,597	35.00%
Total	13,109	100.00%
Missing	11	

Use of Library Physical Resources

As described in Chapter Three, this non-normally distributed variable was divided into quintiles, thus transforming it into an ordinal variable. The quintiles created represented the following measures of use of physical resources: zero uses were represented in the first quintile; one to four uses were represented in the second quintile; 5 to 10 uses were represented in the third quintile; 11 to 28 uses were represented in the fourth quintile; and 29 or more uses were represented in the fifth quintile. This ordinal variable was used as a continuous variable in the subsequent analyses that were conducted. The frequency and percentage distributions for this variable are shown in Table 4.6.

Table 4.6: Descriptive Statistics for Use of Library Physical Resources

	Frequency	Percentage
First Quintile	3,237	26.20%
Second Quintile	2,745	22.20%
Third Quintile	1,948	15.80%
Fourth Quintile	2,152	17.40%
Fifth Quintile	2,270	18.40%
Total	12,352	100.00%
Missing cases	768	

In order to better understand who the users of the library physical resources were, a cross tabulation was conducted with the variables of use of library physical resources and the demographic and enrollment characteristics of gender, ethnicity, parental income, year in college, discipline, cumulative GPA, and graduation with five year status for the 2007 cohort (see Table 4.7 for results). When the first quintile (which represents non-users) was compared with the fifth quintile (which represents high-use individuals with 29 or more uses) the distinctions between the two groups emerged. The distinctions are discussed in more detail below; however Chi-square tests for statistical significance were not conducted for most of the cross tabulations since significant results would be a function of the large sample sizes (ranging from 8,013 to 13,120). The one exception was the Chi-square test conducted between the use of library physical resources and the graduated within five year variable since the sample size for that cross tabulation was smaller ($n = 1,901$).

With regards to gender, the proportion of females is larger in the fifth quintile (55.80%) than the first quintile (51.60%). When ethnicity was examined it was clear that within the fifth quintile there were fewer White students (40.40%) and more African American students (6.20%), Asian students (25.20%), Foreign students (6.30%), and Latino students (18.10%), as compared to the first quintile which had more White

students (57.30%) and fewer African American students (2.90%), Asian American students (15.60%), Foreign students (2.30%), and Latino students (16.20%).

Parental income was also a distinguishing factor between the two groups with the fifth quintile having a larger proportion of students at the lower end of the parental income scale (\$0-49,999) at 33.90% as compared to the first quintile at 22.10%. Likewise, the fifth quintile had a smaller percentage of students at the higher end of the parental income scale (\$200,000+) at 7.50% as compared to the first quintile at 16.30%.

With regards to the year in college, since the use measure is a cumulative measure it was not surprising to find that seniors were the highest proportion of the fifth quintile group (48.30%) and freshman represented the highest proportion of the first quintile (31.40%).

It was also not surprising to find that the Liberal Arts, Natural Science and Engineering students had the largest percentages of students in the fifth quintile (at 26.50%, 23.10%, and 13.70% respectively) since those are the three colleges with the largest enrollments at the university site where the study was conducted.

When cumulative GPA was investigated it was found that the fifth quintile had a larger proportion of students with GPAs of 2.50 or above (89.70%) as compared to students in the first quintile (82.50%).

But interestingly, when the variable representing the graduation status of the students in a 2007 cohort was examined it was found that students in the fifth quintile actually had a larger percentage of students who had not graduated within five years (13.90%) as compared to the first quintile (8.30%). The results of the Chi-square test showed a statistically significant difference across the five quintiles ($\chi^2(4, N = 1,901) = 12.44, p = .014$).

So in summary, when comparing the fifth quintile to the first quintile the most salient distinctions are that the fifth quintile has: fewer White students and more underrepresented students; more students at the lower end of the parental income scale than the upper-end of the scale; more seniors; more students with cumulative GPAs higher than 2.50, and a higher percentage of students in the 2007 cohort that had not graduated within five years of enrollment.

Table 4.7: Users of Library Physical Resources - Descriptive Statistics

	First Quintile		Second Quintile		Third Quintile		Fourth Quintile		Fifth Quintile		Percent in SERU Sample
	Freq	Percent	Freq	Percent	Freq	Percent	Freq	Percent	Freq	Percent	
Gender (n = 12,352)											
Male	1,568	48.40%	1,299	47.30%	848	43.50%	899	41.80%	1,003	44.20%	45.30%
Female	1,669	51.60%	1,446	52.70%	1,110	56.50%	1,253	58.20%	1,267	55.80%	54.70%
Ethnicity (n = 12,352)											
African American	95	2.90%	11	4.00%	86	4.40%	114	5.30%	140	6.20%	4.50%
Asian	506	15.60%	559	20.40%	398	20.40%	451	21.00%	571	25.20%	20.00%
Foreign	75	2.30%	85	3.10%	86	4.40%	125	5.80%	142	6.30%	4.20%
Latino	524	16.20%	518	18.90%	365	18.70%	452	21.00%	411	18.10%	18.30%
Unknown	167	5.20%	112	4.10%	68	3.50%	88	4.10%	83	3.70%	4.00%
White	1,855	57.30%	1,349	49.10%	936	48.00%	919	42.70%	917	40.40%	48.50%
Parental Income (n = 8,013)											
\$0-\$49,999	470	22.10%	481	26.90%	352	27.40%	422	31.00%	489	33.90%	27.70%
\$50,000-99,999	645	30.30%	523	29.20%	380	29.50%	412	30.20%	435	30.10%	30.00%
\$100,000-149,999	465	21.90%	383	21.40%	301	23.40%	281	20.60%	303	21.00%	21.50%
\$150,000-199,999	202	9.50%	133	7.40%	93	7.20%	100	7.30%	108	7.50%	7.90%
\$200,000+	346	16.30%	271	15.10%	161	12.50%	148	10.90%	109	7.50%	12.80%

Table 4.7: Users of Library Physical Resources - Descriptive Statistics - continued

	First Quintile		Second Quintile		Third Quintile		Fourth Quintile		Fifth Quintile		Percent in SERU Sample
	Freq	Percent	Freq	Percent	Freq	Percent	Freq	Percent	Freq	Percent	
Year in College (n = 13,120)											
Freshman	1,018	31.40%	655	23.90%	357	18.30%	328	15.20%	201	8.90%	19.60%
Sophomore	869	26.80%	711	25.90%	424	21.80%	435	20.20%	385	17.00%	21.70%
Junior	658	20.30%	640	23.30%	474	24.30%	565	26.30%	587	25.90%	23.50%
Senior	692	21.40%	739	26.60%	693	35.60%	824	38.30%	1,097	48.30%	35.10%
Discipline (n = 12,352)											
Architecture	1	0.00%	2	0.10%	11	0.60%	26	1.20%	107	4.70%	0.90%
Business	445	13.70%	345	12.60%	200	10.30%	179	8.30%	167	7.40%	10.50%
Communication	353	10.90%	284	10.30%	226	11.60%	187	8.70%	170	7.50%	10.00%
Education	201	6.20%	132	4.80%	85	4.40%	111	5.20%	99	4.40%	5.60%
Engineering	553	17.10%	496	18.10%	346	17.80%	335	15.60%	311	13.70%	14.50%
Fine Arts	10	0.30%	25	0.90%	37	1.90%	93	4.30%	192	8.50%	3.10%
Geosciences	11	0.30%	5	0.20%	14	0.70%	38	1.80%	22	1.00%	0.80%
Liberal Arts	518	16.00%	529	19.30%	455	23.40%	544	25.30%	602	26.50%	24.10%
Natural Sciences	783	24.20%	669	24.40%	454	23.30%	537	25.00%	525	23.10%	23.60%
Nursing	115	3.60%	93	3.40%	41	2.10%	41	1.90%	20	0.90%	2.00%
Social Work	37	1.10%	26	0.90%	12	0.60%	16	0.70%	15	0.70%	0.80%
Undergraduate Studies	210	6.50%	139	5.10%	67	3.40%	45	2.10%	40	1.80%	4.10%

Table 4.7: Users of Library Physical Resources - Descriptive Statistics - continued

	First Quintile		Second Quintile		Third Quintile		Fourth Quintile		Fifth Quintile		Percent in SERU Sample
	Freq	Percent	Freq	Percent	Freq	Percent	Freq	Percent	Freq	Percent	
Cumulative GPA (<i>n</i> = 12,341)											
0.00 to 1.00	17	0.50%	7	0.30%	3	0.20%	0	0.00%	0	0.00%	0.20%
1.01 to 1.50	31	1.00%	22	0.80%	7	0.40%	1	0.00%	1	0.00%	0.50%
1.51 to 2.00	124	3.80%	84	3.10%	40	2.10%	35	1.60%	34	1.50%	2.50%
2.01 to 2.50	395	12.20%	274	10.00%	208	10.70%	236	11.00%	197	8.70%	10.40%
2.51 to 3.00	683	21.10%	582	21.20%	391	20.10%	432	20.10%	423	18.60%	20.00%
3.01 to 3.50	1,034	32.00%	890	32.50%	639	32.80%	661	30.70%	670	29.50%	31.40%
3.51 to 4.00	949	29.40%	881	32.20%	659	33.80%	786	36.50%	945	41.60%	35.00%
Graduated within five years (2007 Cohort) (<i>n</i> = 1,901)											
Yes	286	91.70%	304	89.90%	301	90.40%	358	92.50%	457	86.10%	N/A
No	26	8.30%	34	10.10%	32	9.60%	29	7.50%	74	13.90%	N/A

Use of Library Spaces

As with the use of library physical resources variable, this non-normally distributed variable was divided into quintiles, thus transforming into an ordinal variable. The quintiles created represented the following measures of use of library spaces: zero to one use was represented in the first quintile; two to six uses were represented in the second quintile, 7 to 17 uses were represented in the third quintile, 18 to 56 uses were represented in the fourth quintile, and 57 or more uses were represented in the fifth quintile. This ordinal variable was used as a continuous variable in the analyses that were conducted in the subsequent phases of this study. Table 4.8 shows the frequency and percentage distributions for this variable.

Table 4.8: Descriptive Statistics for Use of Library Spaces

	Frequency	Percentage
First Quintile	3,026	23.10%
Second Quintile	2,530	19.30%
Third Quintile	2,389	18.20%
Fourth Quintile	2,565	19.60%
Fifth Quintile	2,602	19.80%
Total	13,112	100.00%
Missing cases	8	

As with the use of library physical resources variable, a cross tabulation was conducted in order to better understand who used the library spaces. The cross tabulation included the variable for use of library spaces and the demographic and enrollment characteristics of gender, ethnicity, parental income, year in college, discipline, cumulative GPA, and graduation with five year status for the 2007 cohort (see Table 4.9). When the first quintile (which represents low-use individuals) was compared with the fifth quintile (which represents high-use individuals with 57 or more uses) some

distinctions similar to those found for the cross tabulation of the library physical resource variable were discovered. Again, the distinctions are discussed in more detail below; however Chi-square tests for statistical significance were not conducted for most of the cross tabulations since significant results would be a function of the large sample sizes (ranging from 8,510 to 13,112). The one exception was the Chi-square test conducted between the use of library spaces and the graduated within five year variable since the sample size for that cross tabulation was smaller ($n = 2,179$).

When ethnicity was examined it was clear that within the fifth quintile there were fewer White students (29.90%) and more African American students (6.40%), Asian students (28.30%), Foreign students (8.10%), Latino students (21.50%) and students of unknown ethnicity (5.60%), as compared to the first quintile which had more White students (64.60%) and fewer African American students (3.10%), Asian students (11.10%), Foreign students (1.70%), Latino students (15.60%), and students of unknown ethnicity (3.30%). It should be noted that the difference between the proportion of White students in the first and fifth quintiles was markedly greater for the use of library spaces variable (first quintile = 64.40% and fifth quintile = 29.90%) than the use of library physical resources variable (first quintile = 57.30% and fifth quintile = 40.40%).

Like with the previous library use variable, parental income was also a distinguishing factor between the first and fifth quintile of the use of library spaces variable, with the fifth quintile having a larger proportion of students at the lower end of the parental income scale (\$0-49,999) at 39.20% as compared to the first quintile at 18.50%. The first quintile also had 18.50% of students at the higher end of the parental income scale (\$200,000+), but this dropped to 8.40% in the fifth quintile.

Also similar to the examination of the use of library physical resources variable, when the variable representing the graduation status of students in the 2007 cohort was

examined it was found that the fifth quintile had a higher percentage of students who had not graduated within five years (15.90%) as compared to the first quintile (6.20%). The results of the Chi-square test showed a statistically significant difference across the five quintiles ($\chi^2(4, N = 2,179) = 33.05, p = .001$).

But there were differences found between the demographic and enrollment characteristics of the cross tabulations of the use of spaces and use of library physical resources; these differences included gender, year in college, discipline and cumulative GPA. Unlike the use of library physical resources variable, the fifth quintile of the use of library spaces variable did not have a larger proportion of female representation. In fact, there were a smaller percentage of females (49.30%) as compared to males (50.70%). In addition, the 49.30% representation was a decrease from the percentage of females in the first quintile (59.30%).

When the year in college was examined, seniors were still the largest proportion in the fifth quintile (34.60%), but interestingly, they were also the largest proportion in the first quintile (38.30%), which in the cross tabulation with the use of library resources variable had been freshman.

Similarities with the library use variable were also found with regards to discipline; Natural Sciences, Liberal Arts, and Engineering students had the largest percentages of students in the fifth quintile at 30.00%, 27.20%, and 15.60% respectively. But unlike the previous use of library physical resources variable the same was not true for the first quintile. Liberal Arts, Natural Sciences, and Business had the largest representation in the first quintile at 21.90%, 19.40%, and 14.30% respectively.

Like the results of the cross tabulation with the use of physical resources variable, a larger proportion of students in the first and fifth quintiles of the use of library spaces variable had cumulative GPAs over 2.50 than under 2.50 (first quintile = 86.40%

compared to 13.60%; fifth quintile = 84.70% compared to 15.40%). But unlike the increase that was seen in the percentage of GPAs over 2.50 with use of library physical resources in the first quintile compared to the fifth quintile, the percentage of GPAs over 2.50 actually decreased from 86.40% to 84.70% with the use of library spaces variable.

In summary, when you compare the fifth quintile (high-use group) to the first quintile (low-use group) the distinctions are similar to those of the use of library resources variable, with the fifth quintile group having fewer White students and more underrepresented students (although the difference was much greater for the use of library spaces variable), more students at the lower end of the parental income scale than the upper-end of the scale, more seniors, the largest representation from the Natural Sciences, Liberal Arts, and Engineering disciplines, and a higher percentage of students in the 2007 cohort that had not graduated within five years of enrollment. However, there were some results that were different with the use of library spaces variable including a larger percentage of males in the fifth quintile as compared to the first quintile and fewer students with cumulative GPAs higher than 2.50 in the fifth quintile as compared to the first quintile.

Table 4.9: Users of Library Spaces - Descriptive Statistics

	First Quintile		Second Quintile		Third Quintile		Fourth Quintile		Fifth Quintile		Percent in SERU Sample
	Freq	Percent	Freq	Percent	Freq	Percent	Freq	Percent	Freq	Percent	
Gender (n = 13,112)											
Male	1,232	40.70%	1,158	45.80%	1,068	44.70%	1,160	45.20%	1,318	50.70%	45.30%
Female	1,794	59.30%	1,372	54.20%	1,321	55.30%	1,405	54.80%	1,284	49.30%	54.70%
Ethnicity (n = 13,112)											
African American	94	3.10%	84	3.30%	114	4.80%	133	5.20%	167	6.40%	4.50%
Asian	335	11.10%	469	18.50%	482	20.20%	605	23.60%	736	28.30%	20.00%
Foreign	52	1.70%	67	2.60%	73	3.10%	152	5.90%	212	8.10%	4.20%
Latino	473	15.60%	393	15.50%	468	19.60%	508	19.80%	560	21.50%	18.30%
Unknown	101	3.30%	87	3.40%	87	3.60%	110	4.30%	145	5.60%	4.00%
White	1,954	64.60%	1,420	56.10%	1,158	48.50%	1,049	40.90%	779	29.90%	48.50%
Parental Income (n = 8,510)											
\$0-\$49,999	368	18.50%	355	21.00%	436	27.60%	568	34.50%	628	39.20%	27.70%
\$50,000-99,999	597	30.00%	493	29.20%	479	30.30%	512	31.10%	476	29.70%	30.00%
\$100,000-149,999	489	24.50%	435	25.70%	325	20.60%	313	19.00%	270	16.90%	21.50%
\$150,000-199,999	171	8.60%	164	9.70%	155	9.80%	89	5.40%	93	5.80%	7.90%
\$200,000+	368	18.50%	244	14.40%	184	11.70%	164	10.00%	134	8.40%	12.80%

Table 4.9: Users of Library Spaces - Descriptive Statistics - continued

	First Quintile		Second Quintile		Third Quintile		Fourth Quintile		Fifth Quintile		Percent in SERU Sample
	Freq	Percent	Freq	Percent	Freq	Percent	Freq	Percent	Freq	Percent	
Year in College (n = 13,112)											
Freshman	600	19.80%	586	23.20%	507	21.20%	480	18.70%	400	15.40%	19.60%
Sophomore	622	20.60%	527	20.80%	532	22.30%	560	21.80%	604	23.20%	21.70%
Junior	645	21.30%	565	22.30%	537	22.50%	639	24.90%	699	26.90%	23.50%
Senior	1,159	38.30%	852	33.70%	813	34.00%	886	34.50%	899	34.60%	35.10%
Discipline (n = 13,112)											
Architecture	9	0.30%	26	1.00%	62	2.60%	45	1.80%	6	0.20%	0.90%
Business	434	14.30%	361	14.30%	273	11.40%	219	8.50%	210	8.10%	10.50%
Communication	397	13.10%	264	10.40%	248	10.40%	225	8.80%	153	5.90%	10.00%
Education	224	7.40%	111	4.40%	101	4.20%	128	5.00%	96	3.70%	5.60%
Engineering	389	12.90%	462	18.30%	429	18.00%	459	17.90%	407	15.60%	14.50%
Fine Arts	56	1.90%	91	3.60%	91	3.80%	83	3.20%	55	2.10%	3.10%
Geosciences	3	0.10%	14	0.60%	22	0.90%	33	1.30%	30	1.20%	0.80%
Liberal Arts	662	21.90%	486	19.20%	439	18.40%	560	21.80%	707	27.20%	24.10%
Natural Sciences	586	19.40%	533	21.10%	551	23.10%	648	25.30%	781	30.00%	23.60%
Nursing	108	3.60%	63	2.50%	50	2.10%	49	1.90%	44	1.70%	2.00%
Social Work	44	1.50%	18	0.70%	26	1.10%	22	0.90%	17	0.70%	0.80%
Undergraduate Studies	114	3.80%	101	4.00%	97	4.10%	94	3.70%	96	3.70%	4.10%

Table 4.9: Users of Library Spaces - Descriptive Statistics - continued

	First Quintile		Second Quintile		Third Quintile		Fourth Quintile		Fifth Quintile		Percent in SERU Sample
	Freq	Percent	Freq	Percent	Freq	Percent	Freq	Percent	Freq	Percent	
Cumulative GPA (<i>n</i> = 13,109)											
0.00 to 1.00	7	0.20%	9	0.40%	4	0.20%	3	0.10%	4	0.20%	0.20%
1.01 to 1.50	27	0.90%	17	0.70%	8	0.30%	8	0.30%	5	0.20%	0.50%
1.51 to 2.00	73	2.40%	64	2.50%	66	2.80%	68	2.70%	58	2.20%	2.50%
2.01 to 2.50	304	10.10%	201	7.90%	238	10.00%	284	11.10%	332	12.80%	10.40%
2.51 to 3.00	556	18.40%	470	18.60%	456	19.10%	550	21.40%	585	22.50%	20.00%
3.01 to 3.50	999	33.00%	794	31.40%	692	29.00%	802	31.30%	828	31.80%	31.40%
3.51 to 4.00	1,057	35.00%	975	38.50%	925	38.70%	850	33.10%	790	30.40%	35.00%
Graduated within five years (2007 Cohort) (<i>n</i> = 2,179)											
Yes	578	93.80%	403	93.70%	340	90.70%	344	88.70%	311	84.10%	N/A
No	38	6.20%	27	6.30%	35	9.30%	44	11.30%	59	15.90%	N/A

Total Library Use

After this aggregate variable was created by adding the use of library physical resources and use of library spaces together, it was transformed into a normally distributed ordinal variable. This ordinal variable was used as a continuous variable in the subsequent analyses that were conducted. See Table 4.10 for the frequency and percentage information for this variable.

Table 4.10: Descriptive Statistics for Total Library Use

	Frequency	Valid Percentage
First Quintile	2,630	21.30%
Second Quintile	2,417	19.60%
Third Quintile	2,416	19.60%
Fourth Quintile	2,413	19.50%
Fifth Quintile	2,468	20.00%
Total	13,112	100.00%
Missing cases	776	

Use of Library Physical Resources, Use of Library Spaces, and Total Library Use, and Cumulative GPA

In order to explore the potential relationship between the three library use variables and the variable of cumulative GPA, a Pearson Product Moment Correlation Coefficient (r_{xy}) was conducted. Knowing the relationship between these variables was important since it could potentially inform the interpretation of the results from the linear and logistic regressions. The results in Table 4.11 show the correlations between the three library use variables and the cumulative GPA variable were all significant at the .01 level, however none of the r values were close to the 0.20 recommended minimum effect size for practical significance (Ferguson, 2009). The strongest correlation, although not practically significant, was the positive correlation between use of library physical

resources and cumulative GPA ($r = 0.112, n = 12,341, p < .001$) indicating that as the use of library physical resources increases, so does a student's cumulative GPA. Another positive, yet weaker and not practically significant, correlation was the one between total library use and GPA ($r = 0.030, n = 12,341, p = .001$). The positive nature of the correlation again indicates that as total library use increases, a student's cumulative GPA also increases. The only negative correlation was between use of library spaces and cumulative GPA ($r = -0.037, n = 13,109, p < .001$). Although the r value for this correlation was weak and not practically significant, it still indicated that as use of library spaces increases, a student's cumulative GPA decreases.

Table 4.11: Correlation of Academic Library Use and Cumulative GPA

	Use of Library Physical Resources	Use of Library Spaces	Total Library Use	Cumulative GPA
Use of Library Physical Resources	1	0.355**	.--†	0.112**
Use of Library Spaces		1	.--†	-0.037**
Total Library Use			1	0.030**
Cumulative GPA				1

** . Correlation is significant at the 0.01 level (2-tailed).

† . The r values for the correlations between 1) use of library physical resources and total library use ($r = 0.675, n = 12,344, p < .001$) and 2) use of library spaces and total library use ($r = 0.836, n = 12,344, p < .001$) were not shown because of multicollinearity issues since the total library use variable is a composite of the use of library physical resources and use of library spaces variables.

Satisfaction with Library Support Subfactor

The satisfaction with library support subfactor ($n = 10,130$) is a continuous variable with a mean of 5.36, a standard deviation of 1.69, and a range of 8.50. The data were slightly negatively skewed, but were still considered to be normally distributed since a skewness value between 0.00 and 0.50 indicates that they were approximately symmetrical (Bulmer, 1979). The descriptive statistics for this variable are available in Table 4.12.

Table 4.12: Descriptive Statistics for Satisfaction with Library Support Subfactor

Valid n	10,130
Missing n	2,990
Mean	5.36
Std. Deviation	1.69
Variance	2.86
Range	8.50
Minimum	0.10
Maximum	8.60
Skewness	-0.28
SE of Skewness	0.02
Kurtosis	-0.23
SE of Kurtosis	0.05

Exploring the Outcome Variables – Engagement

This section of the descriptive statistics focuses on the outcomes variables of sense of belonging and satisfaction, academic engagement, and academic disengagement, which were used as outcome variables in Astin's (1991) I-E-O model. These dependent variables were the sense of belonging and satisfaction subfactor, academic engagement subfactor, and academic disengagement factor.

Sense of Belonging and Satisfaction Subfactor

The sense of belonging and satisfaction subfactor ($n = 10,251$) is a continuous variable with a mean of 5.58, a standard deviation of 1.67, and a range of 8.10. The data were slightly positively skewed. Since the skewness value was between 0.50 and 1.00, the data were considered only moderately skewed and therefore were treated as normally distributed (Bulmer, 1979). See Table 4.13 for the descriptive statistics for this variable.

Academic Engagement Subfactor

The academic engagement subfactor ($n = 11,686$) is a continuous variable with a mean of 5.08, a standard deviation of 1.88, and a range of 9.70. The data were slightly positively skewed, but were considered normally distributed because of the skewness value between 0.00 and 0.50 indicating that they were approximately symmetrical (Bulmer, 1979). The descriptive statistics for this variable are available below in Table 4.13.

Academic Disengagement Factor

The academic disengagement factor ($n = 11,374$) is a continuous variable with a mean of 4.82, a standard deviation of 1.53, and a range of 9.70. The data were slightly negatively skewed, but with a skewness value of near 0.50, the data were considered approximately symmetrical, and therefore normally distributed (Bulmer, 1979). See Table 4.13 for this variable's descriptive statistics.

Table 4.13: Descriptive Statistics for Sense of Belonging and Satisfaction, Academic Engagement, and Academic Disengagement

	Sense of Belonging and Satisfaction Subfactor	Academic Engagement Subfactor	Academic Disengagement Factor
Valid <i>n</i>	10,251	11,686	11,374
Missing <i>n</i>	2,869	1,434	1,746
Mean	5.58	5.08	4.82
Std. Deviation	1.67	1.88	1.53
Variance	2.80	3.53	2.33
Range	8.10	9.70	9.70
Minimum	0.10	0.10	0.10
Maximum	8.20	9.80	9.80
Skewness	-0.73	0.26	-0.53
SE of Skewness	0.02	0.02	0.02
Kurtosis	0.21	-0.54	0.16
SE of Kurtosis	0.05	0.05	0.05

Exploring the Outcome Variables – Persistence

In addition to the outcome of engagement, this study investigated undergraduate persistence using a dependent variable exported from the student information system. This variable indicated whether a SERU respondent, who was part of a cohort that enrolled in the university in 2007 ($n = 2,181$), had graduated five years after matriculation. As stated in Chapter 3, a five-year measure for graduation was used since at the time of the study six years had not passed since the 2007 cohort enrolled in the university. As indicated in Table 4.14 below, 90.70% of the students in the 2007 cohort had graduated within five years of enrolling, while 9.30% had not graduated. The fate of the students who had not graduated within five years is not known; these students could have left the university permanently, temporarily stopped out, or might still be enrolled and working towards graduation.

Table 4.14: Five-Year Graduation Status of the 2007 Cohort

	Frequency	Percentage
Graduated within five years	1,978	90.70%
Did not graduate within five years	203	9.30%
Total	2,181	100.00%

In order to be able to more effectively interpret the results of the point bi-serial correlation and logistic regressions conducted to investigate research questions number four, five, and six, the demographic and enrollment characteristics of the 2007 cohort were explored to see how they compared to the larger sample. Table 4.15 compares the 2007 cohort ($n = 2,181$) to the SERU sample without the 2007 cohort data ($N = 10,939$) on the following demographic and enrollment characteristics: gender, ethnicity, parental income, year in college, discipline, and cumulative GPA. Due to the large size of the SERU sample ($N = 10,939$) Chi-square tests for statistical significance were not conducted for the cross tabulations since significant results would be a function of the large sample sizes.

When the 2007 cohort is compared to the rest of the SERU sample on gender there is a slight overrepresentation by females (1.20%) and a slight underrepresentation by males, but overall the 2007 cohort and the remaining SERU sample were very close on gender representation.

There were more differences between the 2007 cohort and the rest of the SERU sample with regards to ethnic representation. The 2007 cohort had overrepresentation from African American students (0.80%), Asian students (4.00%), and White students (2.60%) and underrepresentation from foreign students (1.00%) and Latino students (2.00%) and students of unknown ethnicity (4.60%).

When parental income was explored the 2007 cohort was found to have fewer students in the two lowest income categories (56.00% as compared to 58.10% for the rest of the SERU sample) and more students in the two highest income categories (22.60% as compared to 20.40% for the rest of the SERU sample). Therefore, although the percent differences were relatively small, comparatively the 2007 cohort was comprised of wealthier students.

The differences between the year in college of the 2007 cohort and the rest of the sample are quite sizable but easily understood because the students in the 2007 cohort had been enrolled for five years when the year in college variable was created. It would be surprising to find many students still classified as freshman or sophomore five years after initial enrollment. Therefore, the fact that 99.50% of the 2007 cohort is classified as a junior or senior (as compared to 50.50% of the rest of the SERU sample) makes logical sense.

The discipline of the students in the 2007 cohort and the rest of the SERU sample did show some differences upon examination. The 2007 cohort had an overrepresentation of the following: architecture discipline (0.40%), business discipline (4.10%), communication discipline (1.80%), engineering discipline (2.20%), and liberal arts discipline (0.40%); on the other hand, it had an underrepresentation of the following: fine arts discipline (0.30%), geosciences discipline (0.20%), natural sciences discipline (3.00%), nursing discipline (0.30%), social work discipline (0.20%), and undergraduate studies discipline (4.60%). Clearly the most striking differences in discipline representation are the overrepresentation of business, communication, and engineering students and the underrepresentation of natural sciences. The discrepancy in undergraduate studies is easily explained by the fact that 99.50% of the cohort is

comprised of junior and senior students and undergraduate studies is a discipline designed for lower-level students.

When cumulative GPA was explored it was found that the 2007 cohort had a higher percentage of students with cumulative GPAs above 2.50 (91.60%) as compared to the rest of the SERU sample (85.40%). Since the 2007 cohort is comprised primarily of students in their senior year of college, it is not surprising that their GPAs might be a bit higher than the rest of the SERU sample.

Table 4.15: Comparison of 2007 Cohort to the Remainder of the SERU Sample – Demographic and Enrollment Characteristics

	2007 Cohort		SERU Sample	
	Frequency	Percent	Frequency	Percent
Gender	<i>(n = 2,181)</i>		<i>(N = 10,939)</i>	
Male	966	44.30%	4,976	45.50%
Female	1,215	55.70%	5,963	54.50%
Ethnicity	<i>(n = 2,181)</i>		<i>(N = 10,939)</i>	
African American	114	5.20%	478	4.40%
Asian	510	23.40%	2,118	19.40%
Foreign	74	3.40%	482	4.40%
Latino	364	16.70%	2,042	18.70%
Unknown	5	0.20%	526	4.80%
White	1,105	50.70%	5,257	48.10%
Parental Income	<i>(n = 1,503)</i>		<i>(N = 7,013)</i>	
\$0-\$49,999	380	25.30%	1,978	28.20%
\$50,000-99,999	461	30.70%	2,096	29.90%
\$100,000-149,999	323	21.50%	1,512	21.60%
\$150,000-199,999	126	8.40%	546	7.80%
\$200,000+	213	14.20%	881	12.60%
Year in College	<i>(n = 2,181)</i>		<i>(N = 10,939)</i>	
Freshman	0	0.00%	2,575	23.50%

Table 4.15: Comparison of 2007 Cohort to the Remainder of the SERU Sample –
Demographic and Enrollment Characteristics - continued

	2007 Cohort		SERU Sample	
	Frequency	Percent	Frequency	Percent
Sophomore	10	0.50%	2,838	25.90%
Junior	200	9.20%	2,887	26.40%
Senior	1,971	90.40%	2,639	24.10%
Discipline	<i>(n = 2,181)</i>		<i>(N = 10,939)</i>	
Architecture	32	1.50%	116	1.10%
Business	323	14.80%	1,175	10.70%
Communication	246	11.30%	1,042	9.50%
Education	108	5.00%	552	5.00%
Engineering	397	18.20%	1,751	16.00%
Fine Arts	56	2.60%	320	2.90%
Geosciences	13	0.60%	89	0.80%
Liberal Arts	482	22.10%	2,374	21.70%
Natural Sciences	461	21.10%	2,640	24.10%
Nursing	46	2.10%	268	2.40%
Social Work	17	0.80%	110	1.00%
Undergraduate Studies	0	0.00%	502	4.60%
Cumulative GPA	<i>(n = 2,179)</i>		<i>(N = 10,930)</i>	
0.00 to 1.00	2	0.00%	27	0.20%
1.01 to 1.50	26	0.10%	63	0.60%
1.51 to 2.00	154	1.20%	303	2.80%
2.01 to 2.50	385	7.10%	1,205	11.00%
2.51 to 3.00	720	17.70%	2,232	20.40%
3.01 to 3.50	892	33.00%	3,395	31.10%
3.51 to 4.00	2,179	40.90%	3,705	33.90%

Like the previous comparison of the 2007 cohort to the rest of the SERU sample that focused on the two groups' differences in demographic and enrollment

characteristics, it was also necessary to compare these groups on their library use variables in order to make more informed interpretations of the analyses investigating the outcome variable of persistence. Table 4.16 shows the results of the comparisons of the 2007 cohort to the rest of the SERU sample on the variables of use of library physical resources, use of library spaces, and total library use. Again, due to the large size of the SERU sample (ranging from 10,445 to 10,993) Chi-square tests for statistical significance were not conducted for the cross tabulations since significant results would be a function of the large sample sizes.

The comparison of use of library physical resources variable shows a striking difference between the 2007 cohort and the rest of the SERU sample, with a larger percentage (27.90%) of the 2007 cohort being represented in the fifth quintile as compared to the rest of the SERU sample (16.60%), indicating a larger percentage of the 2007 cohort are considered high use than the rest of the SERU sample. The opposite was found when the first quintile (non-users) was examined. A smaller percentage of the 2007 cohort (16.40%) was represented in the first quintile, as compared with the rest of the SERU sample (28.00%), indicating a larger percentage of the rest of the SERU sample were considered non-users of library physical resources.

When the use of library spaces variable was examined, differences were also observed, although they were less dramatic. A larger percentage (20.40%) of the rest of the SERU sample was represented in the fifth quintile as compared to the 2007 cohort (17.00%), indicating a larger percentage of the SERU sample used library spaces at the highest level. A larger difference was observed between the groups in the first quintile, with 28.30% of the 2007 cohort being represented in the first quintile as compared with 22.00% of the rest of the SERU sample being represented in this quintile. These results indicated that a larger percentage of the SERU sample used library spaces at the highest

level, and a larger percentage of the 2007 cohort used the library spaces at the lowest level.

The total library use variable is an variable of the use of library physical resources and use of library spaces variables and as such the magnitudes of the differences between the cohort and the rest of the SERU sample are in between the differences seen in the individual variables. The only conclusions that can be drawn from the comparisons were that the largest percentage of the 2007 cohort was represented in the fifth quintile while the largest percentage of the rest of the SERU sample was represented in the first quintile.

Table 4.16: Comparison of 2007 Cohort to Remainder of the SERU Sample – Library Use

	2007 Cohort		SERU Sample	
	Frequency	Percent	Frequency	Percent
Use of Library Physical Resources	<i>(n = 1,901)</i>		<i>(N = 10,451)</i>	
First Quintile	312	16.40%	2,925	28.00%
Second Quintile	338	17.80%	2,407	23.00%
Third Quintile	333	17.50%	1,615	15.50%
Fourth Quintile	387	20.40%	1,765	16.90%
Fifth Quintile	531	27.90%	1,739	16.60%
Use of Library Spaces	<i>(n = 2,179)</i>		<i>(N = 10,933)</i>	
First Quintile	618	28.30%	2,410	22.00%
Second Quintile	430	19.70%	2,100	19.20%
Third Quintile	375	17.20%	2,014	18.40%
Fourth Quintile	388	17.80%	2,177	19.90%
Fifth Quintile	370	17.00%	2,232	20.40%
Total Library Use	<i>(n = 1,899)</i>		<i>(N = 10,445)</i>	
First Quintile	363	19.10%	2,267	21.70%
Second Quintile	354	18.60%	2,063	19.80%
Third Quintile	383	20.20%	2,033	19.50%
Fourth Quintile	396	20.90%	2,017	19.30%
Fifth Quintile	403	21.20%	2,065	19.80%

PHASE ONE: RELATIONSHIP BETWEEN ACADEMIC LIBRARY USE AND UNDERGRADUATE STUDENT ENGAGEMENT

In order to answer research question number one – is there a relationship between the use of an academic library’s physical resources or spaces and undergraduate student engagement – a Pearson Product Moment Correlation Coefficient (r_{xy}) was calculated. Table 4.17 shows the correlation matrix between the three independent variables (use of library physical resources, use of library spaces, and total library use) and the three

dependent variables (sense of belonging and satisfaction, academic engagement, and academic disengagement).

Table 4.17: Correlation of Academic Library Use and Sense of Belonging and Satisfaction, Academic Engagement, and Academic Disengagement

	Use of Library Physical Resources	Use of Library Spaces	Total Library Use	Sense of Belonging and Satisfaction	Academic Engagement	Academic Disengagement (Inverted Scale)
Use of Library Physical Resources	1	0.355**	.--†	-0.027**	0.185**	0.039**
Use of Library Spaces		1	.--†	-0.109**	0.002	0.028**
Total Library Use			1	-0.087**	0.092**	0.031**
Sense of Belonging and Satisfaction				1	0.275**	-0.041**
Academic Engagement					1	0.020*
Academic Disengagement (Inverted Scale)						1

** . Correlation is significant at the 0.01 level (2-tailed).

* . Correlation is significant at the 0.05 level (2-tailed).

† . The r values for the correlations between 1) use of library physical resources and total library use ($r = 0.675$, $n = 12,344$, $p = .001$) and 2) use of library spaces and total library use ($r = 0.836$, $n = 12,344$, $p = .001$) were not shown because of multicollinearity issues since the total library use variable is a composite of the use of library physical resources and use of library spaces variables.

The results of the correlation with sense of belonging and satisfaction indicated that use of library physical resources ($r = -0.027$, $n = 9,631$, $p = .008$), use of library spaces ($r = -0.109$, $n = 10,251$, $p < .001$), and total library use ($r = -0.087$, $n = 9,631$, $p < .001$) are all statistically significant at the .01 level and are all negatively correlated with the dependent variable. Therefore, the results indicate that as the use of the library, its resources, spaces, or both, increases, sense of belonging and satisfaction decreases. However, with r values between -0.027 and -0.109 the r value does not meet the “recommended minimum effect size representing a practically significant effect for social science data” (Ferguson, 2009, p.2) of 0.20.

When examining the outcome of academic engagement, the Pearson correlation results show a positive and statistically significant relationship at the .01 level with the use of library physical resources ($r = 0.185$, $n = 10,986$, $p < .001$) and total library use ($r = 0.092$, $n = 10,986$, $p < .001$), but no relationship with use of library spaces ($r = 0.002$, $n = 11,686$, $p = .857$). These results can be interpreted to show that as use of library physical resources or total library use increases, academic engagement increases. But there is no relationship between use of library spaces and academic engagement. The significant r value of 0.092 associated with total library use shows a positive correlation, but again should not be considered to be practically significant for social science research (Ferguson, 2009). The r value of 0.185 associated with the use of library physical resources and academic engagement shows a positive relationship that is close to the 0.20 recommend minimum effect size for practical significance (Ferguson, 2009). Ferguson (2009) states that the recommended thresholds are not intended to be absolute measures and therefore, the strength of this positive association was considered small, yet practically significant.

The correlation matrix also shows that academic disengagement (inverted scale) is positively correlated with the use of library physical resources ($r = 0.039$, $n = 10,693$, $p < .001$), use of library spaces ($r = 0.028$, $n = 11,374$, $p = .002$), and total library use ($r = 0.031$, $n = 10,693$, $p = .001$) at the .01 level. The results of these correlations show that the use of library physical resources, spaces, or total library use is related to a decrease in academic disengagement. But again, with r values ranging from 0.028 to 0.039, the correlations should not be considered practically significant for social science research (Ferguson, 2009).

It is important to note that since most of the statistically significant r values do not reach the threshold for practical significance for social science research these results should be interpreted with caution. However, the existence of the statistically significant results of this Pearson Correlation does support the rejection of the null hypothesis, in favor of the alternative hypothesis – that there is a relationship between the use of an academic library's physical resources or spaces and undergraduate student engagement.

PHASE TWO: PREDICTIVE RELATIONSHIP BETWEEN ACADEMIC LIBRARY USE AND UNDERGRADUATE STUDENT ENGAGEMENT

The second phase of the data analysis focused on investigating research question number two – is there a predictive relationship between the type of academic library use (use of physical resources or use of spaces) and undergraduate student engagement? In order to investigate this research question, three multiple linear regressions were conducted that explored the main effects of the pre-college and college characteristics and experiences on each of the three engagement outcomes (sense of belonging and satisfaction, academic engagement, and academic disengagement).

A blocked modeling technique was utilized for all three regression models since it facilitated the entering of pre-college characteristics and experiences as input variables

and the college characteristics and experiences as the environment variables, thereby aligning with the I-E-O (Astin, 1991) analytic framework. For each of the three regressions the following variables representing students' pre-college characteristics and experiences were entered in the first block as input variables: gender (male was the reference group), ethnicity (White was the reference group), parental income, and SAT z-score. The second block contained the environment variables representing college characteristics and experiences, including year in college (senior was the reference group), discipline (Liberal Arts was the reference group), cumulative GPA, use of library physical resources, and use of library spaces.

Categorical variables were dummy coded; no weight variable was used in the regressions. The three models were run as forward regressions using an F probability of .05 to enter the model and .10 for removal from the model. The results for each regression are presented in Tables 4.18, 4.19, and 4.20. Due to the large sample size the threshold for statistical significance was set at the .01 level and only those results are interpreted. In addition, although there are many variables used in the regression models, in order to be efficient in the discussion of the analyses the only results interpreted were the independent variables of interest in the second research question, which focuses on the use of library physical resources and the use of library spaces variables. The tables provided in this section show the unstandardized coefficient (B), the standard error (SE), the standardized coefficient (Beta), the value of the t statistic (t), and the significance of the t value (Sig.). When a forward linear regression technique is utilized, variables are added one by one to the model until it can no longer be improved by adding another variable. As a result of this technique the final models shown in Tables 4.18, 4.19 and 4.20 include some variables that became not significant after the addition of subsequent

variables; these not statistically significant variables were represented in the final models for completeness.

Academic Library Use Predicting Sense of Belonging and Satisfaction

For this multiple linear regression the variables were entered into the following regression equation, in two blocks:

$$\text{sense of belonging and satisfaction} = a + b_{\text{gender}} + b_{\text{ethnicity}} + b_{\text{parentalincome}} + b_{\text{SATzscore}} + b_{\text{year}} + b_{\text{discipline}} + b_{\text{cumGPA}} + b_{\text{resources}} + b_{\text{spaces}}$$

Twenty-five variables were entered into the regression with eleven of them being significant at the .01 level. The dependent variable in the regression was the SERU sense of belonging and satisfaction subfactor. The results of the model are summarized in Table 4.18. The R^2 value of the final model was 0.134, indicating that 13.40% of the variance in the sense of belonging and satisfaction variable is explained by this model. The R^2 value of 0.134 meets the “recommended minimum effect size representing a practically significant effect for social science data” (Ferguson, 2009, p. 2) of 0.04 but is below the value of .25 representing a moderate effect, so the effect should be considered to be a small effect. Cohen’s f^2 , another measurement of effect size, for this model was calculated to be 0.155. The standard interpretation for a Cohen’s f^2 effect size has a value of 0.02 indicating a small effect, 0.15 indicating a medium effect, and 0.35 indicating a large effect (Cohen, 1988). Based on those guidelines the effect size for this model should be considered medium.

Of the eight pre-college variables that were entered into the model in the first (input) block, five of them were statistically significant at the .01 level: African American ethnicity ($B = -0.411, p < .001$), Asian ethnicity ($B = -0.561, p < .001$), Foreign ethnicity

($B = -0.626, p < .001$), Unknown ethnicity ($B = -0.390, p = .002$), and parental income ($B = 0.044, p < .001$).

Seventeen variables were entered in the second (environment) block, and the six variables that were significant at the .01 level included business discipline ($B = 0.270, p < .001$), education discipline ($B = 0.237, p = .006$), natural sciences discipline ($B = -0.202, p < .001$), junior year ($B = -0.117, p = .007$), cumulative GPA ($B = 0.838, p < .001$), and use of library spaces ($B = -0.043, p = .001$).

The results of the multiple linear regression analysis show that as the use of library spaces increases by each quintile, sense of belonging and satisfaction decreases by .043 when controlling for the other variables in the model. Therefore, these data support the conclusion that use of library spaces decreases the sense of belonging and satisfaction for the reference group. The use of library physical resources was not significant and was therefore not included in the final model. Since the regression resulted in a statistically significant model the null hypothesis can be rejected, and the alternative hypothesis – that there is a predictive relationship between the type of academic library use (use of physical resources or use of spaces) and sense of belonging and satisfaction – can be accepted.

Table 4.18: Multiple Linear Regression: Academic Library Use Predicting Sense of Belonging and Satisfaction

<i>n</i> = 7,394					
	B	SE	Beta	t	Sig
Constant	3.11	.127		24.535	.000
Pre-College Characteristics and Experiences					
Female Gender	.027	.037	.008	.731	.465
African American Ethnicity	-.411	.092	-.050	-4.446	.000
Asian Ethnicity	-.561	.047	-.138	-11.942	.000
Foreign Ethnicity	-.626	.108	-.064	-5.802	.000
Unknown Ethnicity	-.390	.126	-.034	-3.091	.002
Parental Income	.044	.009	.058	4.990	.000
SAT Z-Score	-.055	.023	-.032	-2.419	.016
College Characteristics and Experiences					
Business Discipline	.270	.060	.051	4.482	.000
Education Discipline	.237	.087	.031	2.723	.006
Communication Discipline	.148	.063	.027	2.364	.018
Natural Sciences Discipline	-.202	.044	-.053	-4.539	.000
Junior Year	-.117	.043	-.029	-2.708	.007
Cumulative GPA	.838	.037	.285	22.926	.000
Use of Library Spaces	-.043	.013	-.038	-3.304	.001

$R^2 = .134$, $F = 81.70$ ($df = 7,393$), $p < .001$

Academic Library Use Predicting Academic Engagement

For this multiple linear regression the variables were entered into the following regression equation:

$$\text{academic engagement} = a + b_{\text{gender}} + b_{\text{ethnicity}} + b_{\text{parentalincome}} + b_{\text{SATzscore}} + b_{\text{year}} + b_{\text{discipline}} + b_{\text{cumGPA}} + b_{\text{resources}} + b_{\text{spaces}}$$

Again, twenty-five variables were entered into the regression, with thirteen of them being significant at the .01 level (see Table 4.19 for the results). The dependent variable for this regression was the SERU academic engagement subfactor. The R^2 value of the final model was 0.138, indicating that 13.80% of the variance in the academic

engagement variable is explained by this model. With an R^2 value of 0.138 this model also meets the “recommended minimum effect size representing a practically significant effect for social science data” (Ferguson, 2009, p. 2) of 0.04, but is below the value of .25 representing a moderate effect, so therefore the effect should be considered to be small (Ferguson, 2009). The Cohen’s f^2 value for this model was 0.160. The standard interpretation for a Cohen’s f^2 effect size has a value of 0.02 indicating a small effect, 0.15 indicating a medium effect, and 0.35 indicating a large effect (Cohen, 1988); therefore, based on those guidelines the effect size for this model should be considered medium.

Of the eight variables that entered in the first (input) block, the two that were found to be statistically significant at the .01 level were Asian ethnicity ($B = -0.455, p < .001$) and SAT Z-score ($B = -0.085, p = .001$).

Seventeen variables entered the model in the second (environment) block, and 11 were significant at the .01 level. These variables included architecture discipline ($B = 0.821, p < .001$), business discipline ($B = 0.440, p < .001$), engineering discipline ($B = -0.679, p < .001$), fine arts discipline ($B = 0.725, p < .001$), natural sciences discipline ($B = -0.498, p < .001$), undergraduate studies discipline ($B = -0.503, p < .001$), freshman year ($B = -0.470, p < .001$), sophomore year ($B = -0.404, p < .001$), junior year ($B = -0.332, p < .001$), cumulative GPA ($B = 0.528, p < .001$), and use of library physical resources ($B = 0.168, p < .001$).

The results of the multiple linear regression analysis show that as the use of library physical resources increases by each quintile academic engagement increases by .168, when controlling for the other variables in the model. These data support the conclusion that use of library physical resources increases levels of academic engagement. The use of library spaces was not significant and was therefore not included

in the final model. Since this regression resulted in a statistically significant model the null hypothesis can be rejected, and the alternative hypothesis – that there is a predictive relationship between the type of academic library use (use of physical resources or use of spaces) and academic engagement – can be accepted.

Table 4.19: Multiple Linear Regression: Academic Library Use Predicting Academic Engagement

<i>n</i> = 7,525					
	B	SE	Beta	t	Sig
Constant	3.33	.148		22.529	.000
Pre-College Characteristics and Experiences					
African American Ethnicity	.216	.102	.023	2.115	.034
Asian Ethnicity	-.455	.051	-.100	-8.892	.000
Parental Income	.020	.010	.023	2.037	.042
SAT Z-score	-.085	.025	-.044	-3.384	.001
College Characteristics and Experiences					
Architecture Discipline	.821	.185	.049	4.450	.000
Business Discipline	.440	.072	.074	6.140	.000
Communication Discipline	-.172	.073	-.028	-2.377	.017
Engineering Discipline	-.679	.062	-.139	-10.936	.000
Fine Arts Discipline	.725	.126	.065	5.765	.000
Natural Sciences Discipline	-.498	.055	-.117	-9.091	.000
Undergraduate Studies Discipline	-.503	.106	-.055	-4.744	.000
Freshman Year	-.470	.057	-.109	-8.240	.000
Sophomore Year	-.404	.055	-.093	-7.303	.000
Junior Year	-.332	.055	-.075	-6.001	.000
Cumulative GPA	.528	.040	.162	13.098	.000
Use of Library Physical Resources	.168	.015	.133	11.352	.000

$R^2 = .138$, $F = 75.38$ ($df = 7,524$), $p < .001$

Academic Library Use Predicting Academic Disengagement

For this multiple linear regression the variables were entered into the following regression equation in two blocks:

$$\text{academic disengagement} = a + b_{\text{gender}} + b_{\text{ethnicity}} + b_{\text{parentalincome}} + b_{\text{SATzscore}} + b_{\text{year}} + b_{\text{discipline}} + b_{\text{cumGPA}} + b_{\text{resources}} + b_{\text{spaces}}$$

The dependent variable in this regression was the SERU academic disengagement factor, which is an inverted scale, so higher values on this variable indicate less academic disengagement. Twenty-five variables were entered into the regression with thirteen of them being significant at the .01 level (see Table 4.20 for the results). The R^2 value of the final model was 0.085, indicating that 8.50% of the variance in the academic disengagement variable is explained by this model. As with the previous two regressions, this model's R^2 value meets the "recommended minimum effect size representing a practically significant effect for social science data" (Ferguson, 2009, p. 2) of .04 but is well below the value of .25 representing a moderate effect, so therefore the effect size should be considered small (Ferguson, 2009). The Cohen's f^2 value for the model was 0.093. The standard interpretation for a Cohen's f^2 effect size has a value of 0.02 indicating a small effect, 0.15 indicating a medium effect, and 0.35 indicating a large effect (Cohen, 1988); therefore, based on those guidelines the effect size for this model should be considered small.

Eight variables entered the model in the first (input) block with four of them being significant at the .01 level. The variables that remained in the model were female gender ($B = 0.345, p < .001$), Asian ethnicity ($B = -0.214, p < .001$), Latino ethnicity ($B = 0.268, p < .001$), and parental income ($B = -0.082, p < .001$).

Of the 17 variables that entered the regression model in the second (environment) block, nine of them were significant at the .01 level. These significant variables were

architecture discipline ($B = 0.533, p < .001$), communication discipline ($B = -0.241, p < .001$), engineering discipline ($B = 0.529, p < .001$), natural sciences discipline ($B = 0.435, p < .001$), nursing discipline ($B = 0.528, p < .001$), freshman year ($B = 0.283, p < .001$), sophomore year ($B = 0.179, p < .001$), junior year ($B = 0.151, p = .001$), and cumulative GPA ($B = 0.426, p < .001$).

The results of the multiple linear regression analysis show that neither use of library physical resources nor use of library spaces were significant predictors of the outcome of academic disengagement at the .01 level. Use of library physical resources was significant at the .05 level ($B = 0.026, p < .05$) but the large sample size calls into question the practical significance of this result. Therefore, these data do not support the conclusion that there is a predictive relationship between the use of library physical resources or library spaces and academic disengagement; therefore the null hypothesis – that there is no predictive relationship between the type of academic library use (use of physical resources or use of spaces) and academic disengagement – cannot be rejected.

Table 4.20: Multiple Linear Regression: Academic Library Use Predicting Academic Disengagement (Inverted Scale)

	B	SE	Beta	t	Sig
<i>n</i> = 7,342					
Constant	2.962	.114		26.064	.000
Pre-College Characteristics and Experiences					
Female Gender	.345	.035	.117	9.961	.000
Asian Ethnicity	-.214	.044	-.059	-4.908	.000
Latino Ethnicity	.268	.045	.072	5.938	.000
Unknown Ethnicity	.194	.117	.019	1.657	.098
Parental Income	-.082	.008	-.122	-10.275	.000
College Characteristics and Experiences					
Architecture Discipline	.533	.151	.040	3.538	.000
Communication Discipline	-.241	.058	-.049	-4.144	.000
Engineering Discipline	.529	.049	.136	10.876	.000
Natural Sciences Discipline	.435	.042	.129	10.464	.000
Nursing Discipline	.528	.113	.054	4.685	.000
Freshman Year	.283	.047	.083	6.040	.000
Sophomore Year	.179	.046	.052	3.897	.000
Junior Year	.151	.046	.043	3.285	.001
Cumulative GPA	.426	.031	.164	13.874	.000
Use of Library Physical Resources	.026	.012	.026	2.149	.032

$R^2 = .085$, $F = 45.22$ ($df = 7,341$), $p < .001$

PHASE THREE: PREDICTIVE RELATIONSHIP BETWEEN ACADEMIC LIBRARY USE, STUDENT CHARACTERISTICS, AND UNDERGRADUATE ENGAGEMENT

This phase of the study focused on research question number three: is there a predictive relationship between the use of an academic library’s physical resources or spaces and undergraduate student engagement based on a student’s gender, ethnicity, parental income level, SAT score, cumulative GPA, college discipline, or year in college? In order to answer this question three multiple linear regressions were run, one per engagement outcome (sense of belonging and satisfaction, academic engagement, and

academic disengagement), that focused on the interactions between the pre-college/college characteristics and experiences and the library-use variables, in order to determine their predictive effect on the outcome variables.

In continued accordance with Astin's I-E-O model (1991) the variables were entered in blocks representing the input and environment components of the model. For each of the three regressions the first input block contained the student pre-college characteristics and experiences; the variables were gender, ethnicity, parental income, and SAT Z-score. The second environment block contained the following college characteristics and experiences: year in college, discipline, cumulative GPA, satisfaction with library support subfactor, use of library physical resources, and use of library spaces. The third block in each regression contained the interactions of the student characteristics and experiences with the library-use variables including: gender*resources, ethnicity*resources, parental income*resources, SAT Z-score*resources, year*resources, discipline*resources, cumulative GPA*resources, lib satisfaction*resources, gender*spaces, ethnicity*spaces, parental income*spaces, SAT Z-score*spaces, year*spaces, discipline*spaces, cumulative GPA*spaces, and lib satisfaction*spaces.

For all three regressions, the categorical variables were dummy coded; no weight variable was used in the regressions. The regressions were run as forward regressions using an *F* probability of .05 to enter the model and .10 for removal from the model. If the resulting model had significant interactions among variables, but those variables were not included as main effects, the model was run again to include all main effects. Any variables that became not significant as a result of the inclusion of the main effect variables were removed from the model.

This study employed two quantitative approaches to investigating the interactions between the independent variables. Because of the possibility of statistical significance

based on the large sample size ($n = 13,120$) the interactions were first explored using a series of multivariate general linear models, so that any independent variables showing significant interactions at the .05 level could then be entered into the regression model. The general linear model was run with a random selection of 10.00% of the sample using a custom model that explored the main effects as well as the interactions between the characteristic and experience variables (gender, ethnicity, parental income, SAT Z-score, year in college, discipline, cumulative GPA, library satisfaction SERU subfactor) and the library-use variables (library physical resources and library spaces). The general linear model was run twenty times in order to find the interactions that were statistically significant between the independent variables at least 80.00% to 90.00% of the time. The repeated general linear models did not result in any interactions being statistically significant more than 25.00% of the time (see Table D.1 in Appendix D for the results of the general linear models).

However, since answering the third research question was based solely on the results of the interactions between the pre-college/college variables and the library-use variables in the linear regressions, in an abundance of caution, the researcher decided not to rely solely on the results of the general linear models. Therefore, the interactions between the pre-college/college variables and the library-use variables were entered into the third block of the three regressions with the dependent variables of sense of belonging and satisfaction, academic engagement, and academic disengagement. However, the results of these three regressions should be judiciously interpreted since their statistical significance could be a function of the larger sample size of the regression when compared to the smaller sample size associated with the general linear model. As with the regressions in phase two, the results that are described and interpreted are those which directly answer the research questions (i.e., the interactions between student

characteristics and the library-use variable). Significant main effects of any variables in significant interactions will also be briefly interpreted. The tables provided in this section show the unstandardized coefficient (B), the standard error (SE), the standardized coefficient (Beta), the value of the t statistic (t), and the significance of the t value (Sig.).

Academic Library Use and Student Characteristics Predicting Sense of Belonging and Satisfaction

For this multiple linear regression the variables were entered into the following regression equation in three blocks:

$$\begin{aligned} \text{sense of belonging and satisfaction} = & a + b_{\text{gender}} + b_{\text{ethnicity}} + b_{\text{parentalincome}} + b_{\text{SATzscore}} + b_{\text{year}} \\ & + b_{\text{discipline}} + b_{\text{cumGPA}} + b_{\text{libsatisfaction}} + b_{\text{resources}} + b_{\text{spaces}} + b_{\text{gender*resources}} + b_{\text{ethnicity*resources}} + \\ & b_{\text{parentalincome*resources}} + b_{\text{SATzscore*resources}} + b_{\text{year*resources}} + b_{\text{discipline*resources}} + b_{\text{cumGPA*resources}} + \\ & b_{\text{libsatisfaction*resources}} + b_{\text{gender*spaces}} + b_{\text{ethnicity*spaces}} + b_{\text{parentalincome*spaces}} + b_{\text{SATzscore*spaces}} + \\ & b_{\text{year*spaces}} + b_{\text{discipline*spaces}} + b_{\text{cumGPA*spaces}} + b_{\text{libsatisfaction*spaces}}. \end{aligned}$$

Seventy-four variables entered into the regression with 17 of them being significant at the .01 level (see Table 4.21 for the results). The dependent variable was the SERU sense of belonging and satisfaction subfactor. The R^2 value of the final model was 0.225, indicating that 22.50% of the variance in the sense of belonging and satisfaction variable is explained by this model. The R^2 value for this model meets the “recommended minimum effect size representing a practically significant effect for social science data” (Ferguson, 2009, p. 2) of 0.04 and is close to the value for a moderate effect size of 0.25 (Ferguson, 2009). The Cohen’s f^2 value for the model was 0.290. The standard interpretation for a Cohen’s f^2 effect size has a value of 0.02 indicating a small effect, 0.15 indicating a medium effect, and 0.35 indicating a large effect (Cohen, 1988); therefore, based on those guidelines the effect size for this model should be considered to be medium.

Of the eight variables that entered the model in the first input block, four were significant at the .01 level, including African American ethnicity ($B = -0.306, p = .001$), Asian ethnicity ($B = -0.421, p < .001$), Foreign ethnicity ($B = -0.473, p < .001$), and parental income ($B = 0.040, p < .001$).

Eighteen variables entered the model in the second (environment) block and the 10 variables that were significant at the .01 level were: cumulative GPA ($B = 0.548, p < .001$), business discipline ($B = 0.405, p = .001$), communication discipline ($B = 0.409, p = .001$), natural sciences discipline ($B = -0.150, p = .001$), freshman year ($B = -0.329, p < .001$), sophomore year ($B = -0.160, p = .001$), junior year ($B = -0.169, p < .001$), satisfaction with library support ($B = 0.285, p < .001$), use of library physical resources ($B = -0.382, p < .001$), and use of library spaces ($B = -0.053, p = .001$).

The third block contained the interactions of the student characteristics and experiences; forty-eight variables entered this third block with three being significant at the .01 level; those variables included Latino ethnicity*use of library spaces ($B = 0.105, p = .001$), cumulative GPA*use of library physical resources ($B = 0.096, p < .001$), SAT Z-score*use of library physical resources ($B = -0.035, p = .01$).

When the interactions in the model are examined, the following conclusions can be drawn, when controlling for the other variables: for Latino students, the use of library spaces increases their sense of belonging and satisfaction by 0.105 as compared to non-Latino students; for students with higher cumulative GPAs, the use of library physical resources increases their sense of belonging and satisfaction by 0.096, as compared to students with lower cumulative GPAs; and for students with higher SAT scores, the use of library physical resources decreases their sense of belonging and satisfaction by 0.035, as compared with students with lower SAT scores. In addition to the significant interactions in the model there were also significant main effects. The conclusions that

can be drawn from these main effects, when controlling for other variables in the model, are: for each point increase in students' GPAs their sense of belonging and satisfaction increases by 0.548; for each quintile increase in the use of library physical resource, sense of belonging and satisfaction decreases by 0.382; and for each quintile increase in the use of library spaces, sense of belonging and satisfaction decreases by 0.053.

As previously noted, this model should be interpreted with caution since some of the statistical significance of the interactions may be related to sample size ($n = 7,246$). However, based on the results of this model, use of library spaces increases the sense of belonging and satisfaction for Latino students. Use of library resources increases the sense of belonging and satisfaction for students with higher cumulative GPAs, while it decreases the sense of belonging and satisfaction of students with higher SAT scores. However, since the regression resulted in a statistically significant model the null hypothesis can be rejected, and the alternative hypothesis – there a predictive relationship between the use of an academic library's physical resources or spaces and undergraduate sense of belonging and satisfaction based on a student's gender, ethnicity, parental income level, SAT score, cumulative GPA, college discipline, or year in college – can be accepted.

Table 4.21: Multiple Linear Regression: Academic Library Use and Student Characteristics Predicting Sense of Belonging and Satisfaction

n = 7,246

	B	SE	Beta	t	Sig.
Constant	2.766	.245		11.298	.000
Pre-College Characteristics and Experiences					
Female Gender	.022	.036	.007	.625	.532
African American Ethnicity	-.306	.091	-.037	-3.357	.001
Asian Ethnicity	-.421	.047	-.105	-8.865	.000
Latino Ethnicity	-.161	.104	-.039	-1.545	.122
Foreign Ethnicity	-.473	.106	-.049	-4.475	.000
Unknown Ethnicity	-.251	.123	-.022	-2.043	.041
SAT Z-score	.080	.046	.047	1.734	.083
Parental Income	.040	.008	.054	4.773	.000
College Characteristics and Experiences					
Cumulative GPA	.548	.071	.188	7.673	.000
Business Discipline	.405	.120	.078	3.385	.001
Communication Discipline	.409	.123	.076	3.329	.001
Education Discipline	.204	.084	.027	2.425	.015
Engineering Discipline	.074	.054	.017	1.357	.175
Natural Sciences Discipline	-.150	.046	-.040	-3.233	.001
Freshman Year	-.329	.087	-.086	-3.772	.000
Sophomore Year	-.160	.048	-.041	-3.343	.001
Junior Year	-.169	.048	-.043	-3.547	.000
Satisfaction with Library Support	.285	.010	.291	27.589	.000
Use of Library Physical Resources	-.382	.079	-.341	-4.855	.000
Use of Library Spaces	-.053	.016	-.046	-3.326	.001
Student Characteristics and Academic Library Use Interactions					
Latino Ethnicity*Use of Library Spaces	.105	.031	.088	3.423	.001
Cumulative GPA*Use of Library Physical Resources	.096	.024	.304	4.031	.000
SAT Z-score*Use of Library Physical Resources	-.035	.014	-.068	-2.563	.010
Freshman Year*Use of Library Physical Resources	.073	.030	.052	2.479	.013

Table 4.21 cont.

Business Discipline*Use of Library Spaces	-.084	.039	-.047	-2.127	.033
Communication Discipline*Use of Library Spaces	-.082	.042	-.044	-1.985	.047

$R^2 = .225, F = 80.70 (df = 7,245), p < .001$

Academic Library Use and Student Characteristics Predicting Academic Engagement

For this multiple linear regression the variables were entered into the following regression equation in three blocks, which was consistent with the I-E-O (Astin, 1991) analytic methodology used for the previous regressions,

$$\begin{aligned} \text{academic engagement} = & a + b_{\text{gender}} + b_{\text{ethnicity}} + b_{\text{parentalincome}} + b_{\text{SATzscore}} + b_{\text{year}} + b_{\text{discipline}} + \\ & b_{\text{cumGPA}} + b_{\text{resources}} + b_{\text{spaces}} + b_{\text{gender*resources}} + b_{\text{ethnicity*resources}} + b_{\text{parentalincome*resources}} + \\ & b_{\text{SATzscore*resources}} + b_{\text{year*resources}} + b_{\text{discipline*resources}} + b_{\text{cumGPA*resources}} + b_{\text{libsatisfaction*resources}} \\ & b_{\text{gender*spaces}} + b_{\text{ethnicity*spaces}} + b_{\text{parentalincome*spaces}} + b_{\text{SATzscore*spaces}} + b_{\text{year*spaces}} + b_{\text{discipline*spaces}} \\ & + b_{\text{cumGPA*spaces}} + b_{\text{libsatisfaction*spaces}}. \end{aligned}$$

Seventy-four variables entered into the regression with 14 of them being significant at the .01 level (see Table 4.22 for the results). The dependent variable for this linear regression was the SERU academic engagement subfactor. The R^2 value of the final model was 0.164, indicating that 16.40% of the variance in the academic engagement variable is explained by this model. The R^2 value for this model meets the “recommended minimum effect size representing a practically significant effect for social science data” (Ferguson, 2009, p. 2) of 0.04, but is below the value of .25 representing a moderate effect, so therefore the effect size should be considered small (Ferguson, 2009). The Cohen’s f^2 value for this model was 0.196. Based on the standard interpretation for Cohen’s f^2 effect sizes, with 0.02 representing a small effect, 0.15 representing a medium effect, and 0.35 representing a large effect, so this should be considered medium effect size (Cohen, 1988).

Eight variables entered the regression in the first (input) block, only one of which was significant at the .01 level: SAT Z-score ($B = -0.136, p = .004$).

Of the 18 variables that entered the model in the second (environment) block, 11 were significant at the .01 level, including: cumulative GPA ($B = 0.257, p = .001$), architecture discipline ($B = 0.596, p < .001$), business discipline ($B = 0.745, p < .001$), engineering discipline ($B = -0.666, p < .001$), fine arts discipline ($B = 0.676, p < .001$), natural sciences discipline ($B = -0.505, p < .001$), undergraduate studies discipline ($B = -0.533, p < .001$), freshman year ($B = -0.682, p < .001$), sophomore year ($B = -0.418, p < .001$), junior year ($B = -0.706, p < .001$), and satisfaction with library support ($B = .167, p < .001$).

The third and final block contained the interactions and of the 48 variables that entered, two were significant at the .01 level, including: cumulative GPA*use of library physical resources ($B = 0.080, p = .002$) and business discipline*use of library spaces ($B = -0.141, p = .001$).

When the interactions in the model are examined, the following conclusions can be drawn, when controlling for the other variables in the model: for students with higher cumulative GPAs, the use of library physical resources increases their academic engagement by 0.080, as compared to students with lower cumulative GPA; and for business students, the use of library spaces decreases their academic engagement by 0.141, as compared to students in other disciplines. In addition to the significant interactions in the model there were also significant main effects. The conclusions that can be drawn from these main effects, when controlling for other variables in the model, are: business students have a 0.745 increase in their academic satisfaction as compared to liberal arts students, and for each point increase in a student's cumulative GPAs their academic engagement increases by 0.257.

As with the previous regression model, these interactions should be interpreted with caution since some of the statistical significance may be related to sample size ($n = 8,611$). However, based on the results of this model, use of an academic library's physical resources increases academic engagement for students with higher cumulative GPAs and use of library spaces decreases the academic engagement for business students. Since the regression resulted in a statistically significant model the null hypothesis can be rejected, and the alternative hypothesis – that there is a predictive relationship between the use of an academic library's physical resources or spaces and undergraduate academic engagement based on a student's gender, ethnicity, parental income level, SAT score, cumulative GPA, college discipline, or year in college – can be accepted.

Table 4.22: Multiple Linear Regression: Academic Library Use and Student Characteristics Predicting Academic Engagement

n = 8,611

	B	SE	Beta	t	Sig
Constant	3.541	.261		13.586	.000
Pre-College Characteristics and Experiences					
African American Ethnicity	.211	.093	.023	2.265	.024
Asian Ethnicity	-.182	.105	-.040	-1.744	.081
SAT Z-score	-.136	.048	-.073	-2.861	.004
College Characteristics and Experiences					
Cumulative GPA	.257	.076	.079	3.377	.001
Architecture Discipline	.596	.170	.036	3.507	.000
Business Discipline	.745	.129	.126	5.791	.000
Communication Discipline	-.152	.067	-.025	-2.262	.024
Engineering Discipline	-.666	.058	-.136	-11.570	.000
Fine Arts Discipline	.676	.118	.060	5.750	.000
Natural Sciences Discipline	-.505	.051	-.118	-9.899	.000
Undergraduate Studies Discipline	-.533	.099	-.058	-5.405	.000
Freshman Year	-.682	.100	-.157	-6.827	.000
Sophomore Year	-.418	.052	-.095	-8.028	.000
Junior Year	-.706	.126	-.157	-5.592	.000
Satisfaction with Library Support	.167	.011	.153	15.277	.000
Use of Library Physical Resources	-.115	.084	-.091	-1.369	.171
Use of Library Spaces	-.020	.016	-.016	-1.229	.219
Academic Library Use and Student Characteristics Interactions					
Asian Ethnicity*Use of Library Physical Resources	-.070	.032	-.053	-2.229	.026
SAT Z-score*Use of Library Physical Resources	.021	.014	.038	1.492	.136
Cumulative GPA*Use of Library Physical Resources	.080	.025	.222	3.139	.002
Business Discipline*Use of Library Spaces	-.141	.042	-.070	-3.325	.001
Freshman Year*Use of Library Physical Resources	.070	.034	.043	2.089	.037
Junior Year*Use of Library Spaces	.069	.033	.053	2.093	.036

Table 4.22 cont.

Junior Year*Use of Library Physical Resources	.063	.034	.047	1.840	.066
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$R^2 = .164, F = 69.99 (df = 8,610), p < .001$

Academic Library Use and Student Characteristics Predicting Academic Disengagement

For this multiple linear regression the variables were entered into the following regression equation in three blocks consistent with the I-E-O (Astin, 1991) analytic framework:

$$\begin{aligned} \text{academic disengagement} = & a + b_{\text{gender}} + b_{\text{ethnicity}} + b_{\text{parentalincome}} + b_{\text{SATzscore}} + b_{\text{year}} + b_{\text{discipline}} \\ & + b_{\text{cumGPA}} + b_{\text{resources}} + b_{\text{spaces}} + b_{\text{gender*resources}} + b_{\text{ethnicity*resources}} + b_{\text{parentalincome*resources}} + \\ & b_{\text{SATzscore*resources}} + b_{\text{year*resources}} + b_{\text{discipline*resources}} + b_{\text{cumGPA*resources}} + b_{\text{libsatisfaction*resources}} + \\ & b_{\text{gender*spaces}} + b_{\text{ethnicity*spaces}} + b_{\text{parentalincome*spaces}} + b_{\text{SATzscore*spaces}} + b_{\text{year*spaces}} + b_{\text{discipline*spaces}} \\ & + b_{\text{cumGPA*spaces}} + b_{\text{libsatisfaction*spaces}}. \end{aligned}$$

Again, seventy-four variables entered into the regression with nineteen of them being significant at the .05 level (see Table 4.23 for the results). The dependent variable for this linear regression was the SERU academic disengagement factor (inverted scale). The R^2 value of the final model was 0.095, indicating that 9.50% of the variance in the academic disengagement variable is explained by this model. The R^2 value for this model meets the “recommended minimum effect size representing a practically significant effect for social science data” (Ferguson, 2009, p. 2) of 0.04 but is below the value of .25 representing a moderate effect, so therefore the effect size should be considered small (Ferguson, 2009). The Cohen’s f^2 value for this model was 0.105. The standard interpretation for Cohen’s f^2 effect sizes has 0.02 indicating a small effect, 0.15 a indicating a medium effect, and 0.35 indicating a large effect, so the effect size for this model should be considered small (Cohen, 1988).

Of the eight variables that were entered into the regression in the first input block, six variables were significant at the .01 level including: female gender ($B = 0.332, p < .001$), Asian ethnicity ($B = -0.173, p < .001$), Latino ethnicity ($B = 0.202, p < .001$), Unknown ethnicity ($B = 0.623, p = .01$), parental income ($B = -0.607, p < .001$), and SAT Z-score ($B = -0.164, p < .001$).

Eighteen variables next entered in the environment block and the nine variables that were significant at the .01 level were: cumulative GPA ($B = 0.535, p < .001$), architecture discipline ($B = 0.570, p < .001$), engineering discipline ($B = 0.589, p < .001$), communication discipline ($B = -0.246, p < .001$), natural sciences discipline ($B = 0.459, p < .001$), nursing discipline ($B = 0.467, p < .001$), freshman year ($B = 0.283, p < .001$), junior year ($B = 0.147, p = .002$), and satisfaction with library support ($B = 0.035; p < .001$).

Of the forty-eight variables that entered the third interactions block, none were significant at the .01 level. These results show that none of the interactions were significant predictors of the outcome of academic disengagement. Two interactions were significant at the .05 level, Unknown ethnicity*use of library physical resources ($B = -0.183, p < .05$) and sophomore year*use of library physical resources ($B = 0.067, p < .05$), but the large sample size calls into question the practical significance of this result. Since the regression did not result in a statistically significant model at the .01 level the null hypothesis – there is no predictive relationship between the use of an academic library's physical resources or spaces and undergraduate academic disengagement based on a student's gender, ethnicity, parental income level, SAT score, cumulative GPA, college discipline, or year in college – cannot be rejected.

Table 4.23: Multiple Linear Regression: Academic Library Use and Student Characteristics Predicting Academic Disengagement

n = 7,164

	B	SE	Beta	t	Sig
(Constant)	2.421	.136		17.751	.000
Pre-College Characteristics and Experiences					
Female Gender	.332	.035	.110	9.265	.000
Asian Ethnicity	-.173	.044	-.048	-3.887	.000
Latino Ethnicity	.202	.046	.055	4.383	.000
Unknown Ethnicity	.623	.241	.061	2.591	.010
Parental Income	-.067	.008	-.100	-8.222	.000
SAT Z-score	-.164	.021	-.106	-7.654	.000
College Characteristics and Experiences					
Cumulative GPA	.535	.034	.206	15.680	.000
Architecture Discipline	.570	.151	.043	3.775	.000
Communication Discipline	-.246	.058	-.050	-4.221	.000
Engineering Discipline	.589	.050	.152	11.893	.000
Natural Sciences Discipline	.459	.042	.136	10.935	.000
Nursing Discipline	.467	.112	.048	4.170	.000
Freshman Year	.283	.048	.083	5.925	.000
Sophomore Year	-.015	.089	-.004	-.164	.870
Junior Year	.147	.046	.042	3.161	.002
Satisfaction with Library Support	.035	.010	.041	3.544	.000
Use of Library Physical Resources	.014	.015	.014	.927	.354
Use of Library Spaces	.003	.013	.003	.210	.833
Academic Library Use and Student Characteristics Interactions					
Unknown Ethnicity*Use of Library Physical Resources	-.183	.080	-.054	-2.298	.022
Sophomore Year*Use of Library Physical Resources	.067	.028	.060	2.429	.015

$R^2 = .095$, $F = 37.61$ ($df = 7,163$), $p < .001$

PHASE FOUR: RELATIONSHIP BETWEEN ACADEMIC LIBRARY USE AND UNDERGRADUATE PERSISTENCE

In the final phases of the analyses, phases four, five, and six, the focus turned from the outcome of student engagement to the outcome of undergraduate student persistence. Persistence for this study was defined as a student staying in college through graduation (Berger, Ramirez, & Lyon, 2005) and it was operationalized using a variable that indicated whether a SERU respondent, who was part of a cohort that enrolled in the university in 2007, had graduated five years after matriculation. In order to examine research question number four – is there a relationship between the use of an academic library’s physical resources or spaces and undergraduate student persistence? – a Point Bi-serial Correlation (r_{pb}) was calculated. Table 4.24 shows the correlation matrix between the independent variables (use of library physical resources, use of library spaces, and total library use) and the dependent variable (graduation within five years of enrollment).

The results of the correlations show that use of library physical resources ($r = -0.049$, $n = 1,901$, $p = .032$) is statistically significant at the .05 level, and negatively correlated with undergraduate persistence, indicating that as the use of library physical resources increases the persistence to graduation within five years decreases. However, with an r value of .049 the correlation does not come close to meeting the “recommended minimum effect size representing a practically significant effect for social science data” (Ferguson, 2009, p.2) of .20.

With regards to use of library spaces ($r = -0.118$, $n = 2,179$, $p < .001$) and total library use ($r = -0.117$, $n = 1,899$, $p < .001$), the correlation matrix shows they are statistically significant at the .01 level and, like the use of library physical resources, they are both negatively correlated with undergraduate persistence. Similar to the use of

library physical resources, as the use of library spaces or total library use increases the persistence to graduation within five years decreases. The r values for use of library spaces and total library use, at -0.118 and -0.117, respectively, are higher than that of the use of library physical resources (-0.049), but they still do not meet the “recommended minimum effect size representing a practically significant effect for social science data” (Ferguson, 2009, p.2) of 0.20.

It is important to note that since none of the statistically significant r values reach the threshold for practical significance for social science research these results should be interpreted with caution. However, the existence of the statistically significant results of this Point Bi-serial Correlation does support the rejection of the null hypothesis, in favor of the alternative hypothesis – that there a relationship between the use of an academic library’s physical resources or spaces and undergraduate student persistence.

Table 4.24: Correlation of Academic Library Use and Undergraduate Persistence

	Use of Library Physical Resources	Use of Library Spaces	Total Library Use	Graduated within 5 years
Use of Library Physical Resources	1	0.355**	--†	-0.049*
Use of Library Spaces		1	--†	-0.118**
Total Library Use			1	-0.117**
Graduated within 5 years				1

** . Correlation is significant at the 0.01 level (2-tailed).

* . Correlation is significant at the 0.05 level (2-tailed).

† . The *r* values for the correlations of 1) use of library physical resources and total library use ($r = 0.675, n = 12,344, p < .001$) and 2) use of library spaces and total library use ($r = 0.836, n = 12,344, p < .001$) were not included in the table because of multicollinearity issues, since the total library use variable is a composite of the use of library physical resources and use of library spaces variables.

PHASE FIVE: PREDICTIVE RELATIONSHIP BETWEEN ACADEMIC LIBRARY USE AND UNDERGRADUATE PERSISTENCE

In order to answer research question number five – is there a predictive relationship between the type of academic library use (use of physical resources or use of spaces) and undergraduate student persistence? – a logistic regression was conducted. For this logistic regression the variables were entered into the following equation in two blocks, one input and one environment block, in continued alignment with the I-E-O model (Astin, 1991):

$$\text{persistence} = a + b_{\text{gender}} + b_{\text{ethnicity}} + b_{\text{parentalincome}} + b_{\text{SATzscore}} + b_{\text{year}} + b_{\text{discipline}} + b_{\text{cumGPA}} + b_{\text{resources}} + b_{\text{spaces}} + b_{\text{overallengage}} + b_{\text{acadengage}} + b_{\text{acaddisengage}} + e.$$

The categorical variables were dummy coded; no weight variable was used in the regression. The dependent variable was undergraduate persistence, operationalized using a dichotomous variable indicating whether a student who entered in a 2007 cohort had graduated within five years of enrollment (represented by 1), or had not graduated within five years of enrollment (represented by 0). Twenty-eight variables entered into the regression with eight of them being significant at the .05 level (see Table 4.25 for the results). The regression was run as a forward stepwise regression using an F probability of .05 to enter the model and .10 for removal from the model. The Cox and Snell R^2 value = 0.178. The R^2 value for this model meets the “recommended minimum effect size representing a practically significant effect for social science data” (Ferguson, 2009, p. 2) of 0.04 but is below the value of .25 representing a moderate effect, so therefore the effect size should be considered small (Ferguson, 2009). Due to the smaller sample size associated with the 2007 cohort ($n = 2,181$) the threshold for statistical significance that was used for phases five and six was .05.

Eight precollege characteristics and experiences were entered in the first block as input variables, including gender (male was the reference group), ethnicity (White was the reference group), parental income, and SAT Z-score. Only one of the variables was significant at the .05 level, female gender ($B = 0.885, p < .001$).

The environment variables of college characteristics and experiences that were entered in the second block included year in college (senior was the reference group), discipline (Liberal Arts was the reference group), cumulative GPA, use of physical library resources, use of library spaces, sense of belonging and satisfaction, academic engagement, and academic disengagement. Twenty variables entered in the second block and only seven were significant at the .05 level. These included cumulative GPA ($B = 2.195, p < .001$), architecture discipline ($B = -2.392, p < .001$), education discipline ($B = -1.739, p < .001$), nursing discipline ($B = -2.397, p < .001$), junior year ($B = -1.389, p < .001$), sense of belonging and satisfaction ($B = 0.146, p = .030$), and use of library spaces ($B = -0.221, p = .005$).

The results of the logistic regression analysis show that for the reference group (Male, White ethnicity, Liberal Arts discipline, Senior Year) as use of library spaces increases through each quintile, they have a 19.80% decrease in the odds they will graduate within five years, when controlling for other variables in the model. The use of library physical resources was not statistically significant, and was therefore not included in the final model. These data support the conclusion that use of library spaces decreases the likelihood of persistence to graduation within five years of enrollment. Since the regression resulted in a statistically significant model the null hypothesis can be rejected, and the alternative hypothesis – there is a predictive relationship between the type of academic library use (use of physical resources or use of spaces) and undergraduate persistence – can be accepted.

Table 4.25: Logistic Regression: Academic Library Use Predicting Undergraduate Persistence

	B	SE	Wald	df	Sig.	Exp(B)
Constant	-4.422	.847	27.264	1	.000	.012
Pre-College Characteristics and Experiences						
Female Gender	.885	.247	12.859	1	.000	2.424
SAT Z-score	-.203	.147	1.906	1	.167	.817
College Characteristics and Experiences						
Cumulative GPA	2.195	.274	64.324	1	.000	8.976
Architecture Discipline	-2.392	.590	16.458	1	.000	.091
Education Discipline	-1.739	.411	17.868	1	.000	.176
Nursing Discipline	-2.397	.693	11.969	1	.001	.091
Sophomore Year	-22.080	21615.444	.000	1	.999	.000
Junior Year	-1.389	.281	24.450	1	.000	.249
Sense of Belonging and Satisfaction	.146	.068	4.686	1	.030	1.158
Use of Library Spaces	-.221	.079	7.773	1	.005	.802

Cox and Snell R² = .178

PHASE SIX: PREDICTIVE RELATIONSHIP BETWEEN ACADEMIC LIBRARY USE, STUDENT CHARACTERISTICS, AND UNDERGRADUATE PERSISTENCE

In order to answer research question number six – is there a predictive relationship between the use of an academic library’s physical resources or spaces and undergraduate student persistence based on a student’s gender, ethnicity, parental income level, SAT score, cumulative GPA, college discipline, year in college, sense of belonging and satisfaction, academic engagement, or academic disengagement? – a logistic regression was conducted. For this logistic regression the variables were entered into the following equation in three blocks:

$$\begin{aligned}
\text{persistence} = & a + b_{\text{gender}} + b_{\text{ethnicity}} + b_{\text{parentalincome}} + b_{\text{SATzscore}} + b_{\text{year}} + b_{\text{discipline}} + b_{\text{cumGPA}} + \\
& b_{\text{libsatisfaction}} + b_{\text{overallengage}} + b_{\text{acadengage}} + b_{\text{acaddisengage}} + b_{\text{resources}} + b_{\text{spaces}} + b_{\text{gender*resources}} + \\
& b_{\text{ethnicity*resources}} + b_{\text{parentalincome*resources}} + b_{\text{SATzscore*resources}} + b_{\text{year*resources}} + b_{\text{discipline*resources}} + \\
& b_{\text{cumGPA*resources}} + b_{\text{libsatisfaction*resources}} + b_{\text{gender*spaces}} + b_{\text{ethnicity*spaces}} + b_{\text{parentalincome*spaces}} + \\
& b_{\text{SATzscore*spaces}} + b_{\text{year*spaces}} + b_{\text{discipline*spaces}} + b_{\text{cumGPA*spaces}} + b_{\text{libsatisfaction*spaces}} + e.
\end{aligned}$$

The categorical variables were dummy coded; no weight variable was used in the regression. The dependent variable for this analysis was the same dichotomous persistence variable that was used in the previous two analyses; the variable indicates whether a student has graduated within five years of enrollment (represented by 1) or has not graduated within five years of enrollment (represented by 0). Seventy-four variables were entered in the logistic regression with only seven of them being significant at the .05 level (see Table 4.26 for the results). The variables in the first two blocks were entered in a forward stepwise manner, with an *F* probability of .05 to enter the model and .10 for removal from the model. The third block, which contained the interactions, was forced into the model since the regression was not converging due to the large number of variables being entered. The resulting model had significant interactions among variables, but those variables were not included as main effects, so the model was run again to include all main effects. Any variables that become not significant as a result of the inclusion of the main effect variables were removed from the model. The Cox and Snell R^2 value for the model was 0.160, which met the “recommended minimum effect size representing a practically significant effect for social science data” (Ferguson, 2009, p. 2) of 0.04 but is below the value of .25 representing a moderate effect, so therefore the effect size should be considered small (Ferguson, 2009).

Continuing to follow the I-E-O model, student pre-college characteristics and experiences were entered in the first block as input variables. These variables included

gender (male was the reference group), ethnicity (White was the reference group), parental income, and SAT Z-score. Only one of the eight variables that entered the model was significant, female gender ($B = 1.002, p < .001$).

The environment variables of college characteristics and experiences included: year in college (senior was the reference group), discipline (Liberal Arts was the reference group), cumulative GPA, satisfaction with library support, sense of belonging and satisfaction, academic engagement, academic disengagement, use of library physical resources, and use of library spaces; these variables were entered into the second block. The variables for freshman year and undergraduate studies discipline were removed from the analysis since they had no cases and were being treated as constants in the model. The variable for sophomore year was also removed because of a very low number in the sample ($n = 10$). Of the eighteen variables that entered the model in this block, only four were significant at the .05 level: junior year ($B = -1.261, p < .001$), cumulative GPA ($B = 2.102, p < .001$), sense of belonging and satisfaction ($B = 0.122, p = .035$), and use of library physical resources ($B = -0.226, p = .002$).

The interactions between the variables representing student characteristics and experiences and the library-use variables were entered into the third and final block. The variables entered in this block included: gender*resources, ethnicity*resources, parental income*resources, SAT Z-score*resources, year*resources, discipline*resources, cumulative GPA*resources, lib satisfaction*resources, gender*spaces, ethnicity*spaces, parental income*spaces, SAT score*spaces, year*spaces, discipline*spaces, cumulative GPA*spaces, lib satisfaction*spaces. None of the forty-eight variables that entered the regression in this block was significant. Since the logistic regression did not result in a model in which any of the interactions were statistically significant the null hypothesis must be accepted – there is no predictive relationship between the use of an academic

library's physical resources or spaces and undergraduate student engagement based on a student's gender, ethnicity, parental income level, SAT score, cumulative GPA, college discipline, or year in college.

Table 4.26: Logistic Regression: Academic Library Use and Student Characteristics Predicting Undergraduate Persistence

n = 1,496

	B	SE	Wald	df	Sig.	Exp (B)
Constant	-4.295	.689	38.646	1	.000	.014
Pre-College Characteristics and Experiences						
Female Gender	1.002	.210	22.794	1	.000	2.724
College Characteristics and Experiences						
Cumulative GPA	2.102	.216	94.341	1	.000	8.183
Junior Year	-1.261	.246	26.288	1	.000	.283
Sense of Belonging and Satisfaction	.122	.058	4.443	1	.035	1.130
Use of Library Physical Resources	-.226	.075	9.217	1	.002	.797

*Cox and Snell R*² = .160

Chapter Five: Conclusions and Implications

The fifth and final chapter of this work provides an overview of the study, summarizes its key findings, discusses the implications of those findings, examines the contributions of the study, and suggests areas for future research.

OVERVIEW OF STUDY

Academic libraries are fundamental co-curricular resources that help students, and the faculty that teach them, reach their educational goals by providing the expertise needed to purchase and maintain access to critical scholarly resources, teach information literacy principles (a foundational element of critical inquiry), and provide physical and virtual spaces that enable intellectual discovery. But academic libraries, like many other co-curricular campus resources, are facing increased pressure to demonstrate their contributions to the missions of their colleges or universities (Dugan & Herson, 2002; Gratch-Lindauer, 1998; Herson, 2002; Poll & Payne, 2006). This drive to prove relevance and value by articulating the library's contribution to the institution's goals of teaching and learning is a reflection of the enormous accountability pressures facing higher education as a whole.

Over the last two decades there has been a growing interest in accountability in higher education, but during the recent times of fiscal crisis, uncertainty, and retrenchment, colleges and universities have faced increased calls for productivity and accountability from their numerous external constituents including federal, state, and local governments, accrediting agencies, trustees and boards, and parents and students (Alexander, 2000; Brown & Malenfant, 2012; Gold & Albert, 2006; Lederman, 2010). This new focus on productivity and accountability has often centered on the area of

student persistence and degree attainment. (Alexander, 2000; Brown & Malenfant, 2012; Gold & Albert, 2006; Lederman, 2010).

Although they reflect a recent and popular trend, these external calls for increased persistence and degree attainment are not without merit. The four-year graduation rate for all four-year academic institutions in the U.S. stood at 36.40% in 2008, which ranked the U.S. 15th among the other 27 OECD countries, a measure it ranked second on in 1995 (Knapp, Kelly-Reid, & Ginder, 2010, Organisation for Economic Co-operation and Development, 2011a). The U.S. slowdown in educational attainment relative to other industrialized nations is worrisome, but when coupled with the fact that the U.S. spends more than any other country on postsecondary education – it spent \$461 billion in 2009, a 42.00% increase from 2000 – it becomes much more troubling (Organisation for Economic Co-operation and Development, 2011b). This downward trend in achievement coupled with the upward trend in spending has led to concerns about U.S. global economic competitiveness (Alexander, 2000), social mobility (Carnevale, Smith & Strohl, 2010), and the rising financial costs associated with postsecondary education (Schneider, 2010b; Thrum, 2010; Vedder & Denhart, 2011). Not surprisingly, it has also led to increased scrutiny of productivity and increased calls for accountability.

The goal of this study was to explore whether there was a relationship between academic library use and student success; it was conducted in response to the pressures for academic libraries to demonstrate value and relevance by articulating their contribution to their institutions' goals of student success. Student success is a multifaceted concept encompassing many aspects of the college experience, but this study focused on the successful student outcomes of undergraduate engagement and persistence.

Engagement, as conceived by Kuh, Kinzie, Schuh, Whitt, and Associates (2005), has two components: what the student does and what the institution does. The student component includes the “time and effort students put into their studies and other activities that lead to the experiences and outcomes that constitute student success” (Kuh, Kinzie, Schuh, Whitt, and Associates, 2005, p. 9), while the institution’s responsibilities include “the ways the institution allocates resources and organizes learning opportunities and services to induce students to participate in and benefit from such activities” (Kuh, Kinzie, Schuh, Whitt, and Associates, 2005, p. 9). It was the institution’s effect on student engagement, and the academic library’s potential role as a direct or indirect contributor, which was of interest in this study. Engagement was an important facet of student success to study since research has shown that when a student engages with an institution’s social and academic opportunities, persistence is positively affected (Astin, 1977, 1993; Kuh, Kinzie, Buckley, Bridges, & Hayek, 2006; Kuh, Kinzie, Schuh, Whitt, & Associates, 2005; Pascarella & Terenzini, 2005; Tinto, 1975, 1987, 1993).

For investigation in this study persistence was defined as “the desire and action of a student to stay within the system of higher education from beginning year through degree completion” (Berger, Ramirez, & Lyon, 2005, p. 7). For this study the seminal theories of student persistence from Spady (1970), Tinto (1975, 1987, 1993), and Bean (1980) were examined. All three of these theories stress the importance of student experiences, both academic and social, and how they can impact integration and institutional commitment, which in turn both affect persistence. Empirical research has also shown how student characteristics (e.g., age, gender, ethnicity, socioeconomic status, etc.), enrollment patterns (e.g., full-time vs. part-time enrollment, continuous enrollment, delayed enrollment, etc.), and institutional factors (e.g., size, selectivity, sector, etc.) affect persistence, in both positive and negative ways.

The review of the literature for this study also demonstrated that academic libraries are beginning to turn their attention to library outcomes, defined as “the ways in which library users are changed as a result of their contact with the library’s resources and programs” (Association of College and Research Libraries, 1998, para. 13), rather than simply examining inputs (e.g., number of resources) or outputs (e.g., number of resources circulated). The literature review conducted for this study found a paucity of research on the relationship of academic library use and student engagement and persistence, with only three studies found which examined student engagement, as conceptualized by Kuh, or Astin’s related theory of involvement. Seven studies were identified which investigated the relationship between academic library use and student persistence. Unfortunately, some of these studies suffered from methodological weaknesses, such as small sample sizes, not controlling for background variables, or conceptual problems with the variables (e.g., using one variable to represent the complex notion of library use). As evidenced by the small number of studies on this subject, research on library outcomes, especially those having to do with student engagement and persistence, has been largely ignored. Despite this lack of research, recent literature has expressed increasing interest in the subject, with more emphasis being placed on the investigation of how library outcomes may be directly or indirectly impacting students, their success, and the larger institutional mission as an important way of demonstrating value and relevance in an age of accountability (Matthews, 2012, Oakleaf, 2010).

This quantitative study explored the relationship between academic library use (physical resources and spaces) and undergraduate student engagement and persistence at a large, public research university. The conceptual and analytic framework employed for this study was Astin’s input-environment-outcome (I-E-O) college impact model (1970, 1991). The I-E-O model theorizes that college impact can be assessed by examining how

student inputs (the raw materials students bring with them to college) and environment (all aspects of the institution that may affect its students) interact and affect student outcomes (the changes in students' development including achievement, knowledge, skills, etc.) (Astin, 1970). A unique methodological approach was employed for this study in which multiple sources of data from across campus were combined into one consolidated dataset which provided detailed, student-level data. The data sources that were combined included the results from the Student Experience in the Research University (SERU) survey, institutional data from the university's student information system, and library-use data from four university library data systems. All identifying information was removed from the dataset prior to being accessed by the researcher, thereby ensuring anonymity.

Six research questions were investigated in this study. Three questions examined the relationship between academic library use (including type of use), student characteristics, and undergraduates' sense of belonging and satisfaction, academic engagement, and academic disengagement using Pearson's correlation and six linear regressions (three exploring main effects and three exploring interactions). Three research questions focused on the relationship between academic library use (including type of use), student characteristics, and undergraduate persistence utilizing a point bi-serial correlation and two logistic regressions (one exploring main effects and one exploring interactions). A summary of findings is discussed in detail in the next section.

SUMMARY OF FINDINGS AND INTERPRETATION

This discussion of findings is divided into two sections; the first section summarizes the findings of the analyses in which engagement was the outcome variable, and the second section summarizes the findings related to the outcome of persistence.

Engagement Findings

The first research question investigated whether there was a relationship between the use of an academic library (its physical resources, spaces, or both) and the outcomes of sense of belonging and satisfaction, academic engagement, and academic disengagement. The statistically significant results of the correlations indicated that use of library physical resources, library spaces, and total library use were all negatively associated with the outcome of sense of belonging and satisfaction. Therefore, as students' use of library physical resources, library spaces, or both increased, their sense of belonging and satisfaction decreased. It should be noted, however, that the r values of the correlations were below the "recommended minimum effect size representing a practically significant effect for social science data" of 0.20 (Ferguson, 2009, p. 2).

The r values for the correlations between the variables for use of library physical resources, total library use, and the outcome of academic engagement were all significant at the .01 level. The use of library physical resources and total use of the library variables were positively correlated with academic engagement ($r = 0.185$ and $r = 0.092$, respectively), while the use of library spaces was not significantly correlated with academic engagement. Based on the results of the correlation it can be concluded that as students' use of library physical resources or total library use increased so did their academic engagement. The r value for the total library use variable (0.092) was below the "recommended minimum effect size representing a practically significant effect for social science data" (Ferguson, 2009, p. 2) of 0.20, but the r value for the use of library resources (0.185) was close to the threshold and should therefore be considered a small effect size.

The correlations between use of library physical resources, library spaces, or total library use and academic disengagement variable (inverted scale) were also significant at

the .01 level and showed a positive relationship indicating that as students' library use increased the academic disengagement variable increased (which represents a positive outcome since the scale is inverted). The r values for all the library-use variables were very low at 0.039, 0.028, and 0.031, respectively, and they failed to meet the "recommended minimum effect size representing a practically significant effect for social science data" of 0.20 (Ferguson, 2009, p. 2).

In summary, when the results of the nine correlations between the three library-use variables and the three outcome variables are reviewed in aggregate the only relationship that could be considered practically significant was between the use of library physical resources and academic engagement, but the effect size of the relationship should be considered small. This positive correlation between the use of library physical resources and academic engagement appears to align with Kuh's theory of engagement (Kuh, Schuh, Whitt & Associates, 1991; Kuh, 2001). Kuh theorized that engagement occurs when student effort is connected with an environment that is ripe with effective academic opportunities. Kuh's theory stresses that there are two components of student engagement, the time and effort put forth by the student and how the institution allocates resources and provides effective learning opportunities (Kuh, Kinzie, Schuh, Whitt, & Associates, 2005). Also related to Kuh's theory of engagement is the level of academic challenge, one of the five benchmarks of effective educational practice. Kuh argues that an institution that embraces academic challenge creates an environment in which students are challenged with high levels of reading and writing and complex cognitive tasks. The results appear to support the potential role the library plays in providing resources that facilitate academic engagement.

The analyses next turned to whether there was a predictive relationship between the type of academic library use (use of physical resources or spaces) and students' sense

of belonging and satisfaction, academic engagement, and academic disengagement. In order to answer this research question three linear regressions were conducted.

Similar to the results from the Pearson correlation, when sense of belonging and satisfaction was examined as an outcome variable the use of library spaces had a significantly negative predictive relationship, when controlling for the other input and environment variables in the model. Therefore, as students' use of library spaces increased their sense of belonging decreased. The R^2 for the model was 0.134 which met the threshold for practical significance and indicates a small amount of the variance being explained by the model, and a small effect size (Ferguson, 2009). The Cohen's f^2 value was 0.155 representing a medium effect size (Cohen, 1988). However, unlike the negative relationship that was shown by the results of the Pearson correlation, the use of library physical resources was not a significant predictor of sense of belonging and satisfaction based on the results of the regression.

When academic engagement was examined as an outcome variable in the linear regression, the results once again mirrored the results of the Pearson correlation. The use of library physical resources was shown to have a significantly positive predictive relationship with academic engagement, when controlling for the other variables in the model. So as students' use of library physical resources increased, so did their academic engagement. And similar to the lack of relationship found between the use of library spaces and academic engagement in the correlation, the use of library spaces was found to have no predictive relationship with academic engagement. The R^2 value of 0.138 for the model also met the threshold for practical significance, representing a small effect size (Ferguson, 2009); the Cohen's f^2 value was 0.160, indicating a medium effect size (Cohen, 1988).

The results of the linear regression with academic disengagement found that neither use of library physical resources nor use of library spaces was related to this outcome. This result differed from the result of the correlation, which found a statistically significant relationship. The R^2 value for the model examining the main effects of the other non-library use independent variables exceeded the threshold for practical significance (0.04) at 0.085 (Ferguson, 2009), and the Cohen's f^2 value was 0.093; both of these measures indicate a small effect size (Ferguson, 2009; Cohen, 1988).

Therefore, when the linear regressions which examined the predictive relationship of the two types of library use on the three outcome variables of sense of belonging and satisfaction, academic engagement, and academic disengagement are reviewed in aggregate the main conclusions that can be drawn are: the use of library physical resources is a positive predictor of academic engagement while the use of library spaces is a negative predictor of sense of belonging and satisfaction. The positive predictive relationship between use of library resources and academic engagement found in these regressions, like the results from the correlations, continues to align with Kuh's theory of engagement (Kuh, Schuh, Whitt & Associates, 1991; Kuh, 2001), which posits that the academic effort put forth by students (e.g., using the physical resources offered by the library) coupled with an academic environment that utilizes effective educational practices (e.g., level of academic challenge, supportive campus environment) increases engagement.

The negative relationship that was found between use of library spaces and sense of belonging and satisfaction differs from the results of the 2003 study by Kuh and Gonyea (2003). Their study found no relationship between library use and the overall impact of the college experience or satisfaction with the college experience, while these results showed a negative relationship between the two variables. Although the results in

this study differ from Kuh's and Gonyea's (2003) study, there may be a logical interpretation for the results. The questions that comprise the sense of belonging and satisfaction subfactor in the SERU survey include questions about self-reported GPA, value of their education for the price they are paying, overall academic experience, overall social experience, sense of belonging, and commitment to the institution. Students who are using an academic library's spaces at higher rates than other students may be enrolled in more challenging coursework that necessitates longer hours in the library, or these students may be having academic difficulty and are therefore spending longer hours in the library. Either of these scenarios might have a negative impact on their self-reported GPAs, and their own rating of their academic experience, social experience, sense of belonging, and commitment to the institution. Students who spend long hours in the library may not be connecting with other students or faculty, which may be diminishing their academic and social experience and their sense of belonging. One implication of these results, which will be discussed further in the implications section of this chapter, could be that academic libraries need to create more of a sense of community for their student users by providing them with opportunities to connect with other students, faculty, and the library staff while they are using library resources and spaces.

This study not only investigated whether the type of library use was related to, and predictive of, student engagement, but it also explored the possibility that this predictive relationship may be related to students' characteristics or experiences. Three linear regressions, one per outcome, were conducted to examine the interactions between the library-use variables (physical resources or spaces) and eight input and environment variables (gender, ethnicity, parental income, SAT Z-score, year in college, discipline, cumulative GPA, and satisfaction with library support).

The first analysis explored the sense of belonging and satisfaction and found the use of library physical resources by students with higher cumulative GPAs to be a positive predictor of the outcome variable, while the use of library physical resources by students with higher SAT scores was found to be a negative predictor of sense of belonging and satisfaction. In addition, the use of library spaces was found to be a positive predictor of sense of belonging and satisfaction for Latino students. The R^2 value of the model was 0.225, close to the threshold for a moderate effect of 0.25 (Ferguson, 2009). The Cohen's f^2 value was 0.290, which was the largest f^2 value of any of the regression models. An f^2 value of 0.290 represents a medium effect size (Cohen, 1988).

When academic engagement was analyzed as an outcome variable the use of library physical resources was found to have a positive predictive relationship for students with higher cumulative GPAs. In contrast to the results from the previous correlation and main effects linear regression, use of library spaces was related to academic engagement; when the interaction effects were examined, the results showed a negative predictive relationship for academic engagement for business students. The R^2 value for this model was 0.164, indicating practical significance and a small effect size. The Cohen's f^2 value was 0.196, which is considered a measurement of a medium effect size (Cohen, 1988).

The results of the linear regression for academic disengagement showed no interaction effects significant at the .01 level. These results indicate that there is not a predictive relationship between library use (either use of library physical resources or spaces) and student background or characteristics for the outcome of academic disengagement.

When the results across all three regressions that investigated the interaction of library use and student background and enrollment characteristics were reviewed in aggregate, there were five practically significant findings including: 1) use of library spaces was found to be a positive predictor of sense of belonging and satisfaction for Latino students, 2) use of physical resources was found to be a negative predictor of sense of belonging and satisfaction for students with higher SATs, 3) use of physical resources was found to be a positive predictor of sense of belonging and satisfaction for students with higher cumulative GPAs, 4) use of spaces was found to be a negative predictor of academic engagement for business students, and 5) use of physical resources was found to be a positive predictor of academic engagement for students with higher GPAs. The only finding that was consistent across the models was that use of library physical resources appears to positively predict both sense of belonging and satisfaction and academic engagement for students with higher GPAs. The previous studies that were conducted on library use and student engagement (Kuh & Gonyea, 2003; Laird & Kuh, 2005; Mark & Boruff-Jones, 2003) did not investigate the interaction effects of library use and student characteristics and experiences, so these study results cannot be interpreted in light of previous literature, but they certainly have implications for practice and will be discussed in the implications section of this chapter.

Persistence Findings

As a reminder, the correlations and logistic regressions with the persistence variable, which indicated whether a student had graduated within five years of enrollment, were conducted with a subset of 2,181 students who enrolled at the university in 2007. When the cohort was compared to the rest of the SERU sample on a variety of demographic and enrollment characteristics the cohort was found to have an

overrepresentation of females, African American students, Asian American students, White students, students in the two highest parental income categories, students with cumulative GPAs above 2.50, and students in the following disciplines: architecture, business, communication, engineering, and liberal arts. With regards to library use, the cohort was overrepresented in the fifth quintile (high use) of use of library resources and underrepresented in the first quintile (no use), while underrepresented in the fifth quintile (high use) in use of library spaces and overrepresented in the first quintile (low use). In other words, the results indicate that the 2007 cohort used library resources more and library spaces less than the rest of the SERU sample.

The results of the correlation between the use of library physical resources, library spaces, and total library use showed that they were all negatively correlated with graduation within five years of enrollment indicating that as library use increases the likelihood of graduating within five year of enrollment decreases. The r values were low, ranging from -0.049 (library physical resources) to -0.118 (library spaces). Although the r values were statistically significant at the .01 level, the r values fail to meet the threshold of practical significance.

When the predictive relationship between type of library use (physical resources or spaces) and persistence was explored using a logistic regression the results showed that use of library spaces decreased the odds that the student had graduated within five years by almost 20.00%. The use of library physical resources was not found to be significant in the regression model. The Cox and Snell R^2 value for the model was 0.178 which indicates a small effect size that was practically significant. These results were surprising since the cohort had an overrepresentation of students who according to the literature persist at higher rates, including females (Astin & Oseguera, 2005; Astin, Tsui, & Avalos, 1996), Asian American and White students (U.S. Department of Education,

1997; Astin & Oseguera, 2005), and students from higher income groups (Astin, 1993; Pascarella & Terenzini, 1991). African American students were the only students overrepresented in the cohort whom research shows are less likely to persist to undergraduate degree attainment (U.S. Department of Education, 1997; Astin & Oseguera, 2005).

The third and final analysis for the outcome of persistence investigated whether there was a predictive relationship between the type of library use and student characteristics and experiences. The model did not find any significant predictive relationship between the library use, student characteristics, and persistence to graduation within five years of enrollment.

In summary, the results from the analyses for the outcome of persistence that had practical significance indicated that use of library spaces was negatively predictive of persistence to graduation within five years of enrollment. This seemingly counterintuitive result makes the researcher wonder if the way in which use of library spaces variable was generated, relying on student interaction with library spaces, is somehow affecting these results. Trying to put these results in the context of previous literature is challenging since there are only two previous studies that examined library use and persistence at a single institution. The study by Kramer and Kramer in 1968 found a correlation between checking out library resources and freshman to sophomore persistence, but this study did not examine persistence to graduation. Another study by Haddow and Johnson (2010) also found a positive relationship between library use and student persistence, although their study only examined persistence from the beginning to the end of one semester. Since the results of the analyses of the persistence variable seem inconclusive, it would appear that further exploration of the persistence variable through follow-up studies would be necessary prior to drawing any final conclusions.

When the results from the four correlations, six linear regressions, and two logistic regressions are examined in totality an important trend emerges. This trend is that some of the effect size estimates (the r or R^2 values) of the models showed statistical significance, but not practical significance due the small effect sizes. The r values for the correlations for the outcome variables of sense of belonging and satisfaction, academic engagement, and academic disengagement ranged from -0.027 to 0.185, with only the correlation between use of library physical resources and academic engagement being practically significant. The R^2 values for the linear regressions for these same variables ranged from 0.085 to 0.225. The R^2 values were all practically significant, but with the exception of the moderate effect of the model showing the predictive relationship between library use, student characteristics and sense of belonging and satisfaction, all models resulted in small effect sizes. The Cohen's f^2 values indicate medium effect sizes in four of the regression models, with two models reflecting small effect sizes. Likewise the correlations for the persistence variables ranged from -0.049 to 0.118, all below the level of practical significance, and the Cox & Snell R^2 values for the two logistic regressions were 0.160 and 0.178, indicating small effect sizes. The implications of this trend are addressed in the areas for further research section of this chapter.

IMPLICATIONS FOR PRACTICE

Now that an overview of the study has been presented, as well as a summary of findings, the implications for practice of the overall study and some select results are highlighted and further explored. The study's implications will be presented in two parts: the first discusses the overall implications of the study and its methodology and the second examines the implications of some specific results.

One of the most important implications of this study was its successful use of a methodology that combined institutional and library sources of data in order to create a student-level dataset that could be used to assess the relationship between library use and student success outcomes (specifically, in the case of this study, engagement and persistence). Much of the library assessment literature has been calling for studies to look outside the typical input and output measures, and to start connecting library data with institutional data in order to facilitate the examination of the library impact on student outcomes (Dugan & Hernon, 2002; Gratch-Lindauer, 1998; Hernon, 2002; Matthews, 2012, Oakleaf, 2010, Poll & Payne, 2006). The literature has also argued that in order to truly demonstrate value, academic libraries need to be able to collect and analyze individual student-level data (Oakleaf, 2010, Matthews, 2012). Oakleaf (2010) argued that

until libraries know that that student #5 with major A has downloaded B number of articles from database C, checked out D number of books, participated in E workshops and online tutorials, and completed courses F, G, and H, libraries cannot correlate any of those student information behaviors with attainment of other outcomes. Until librarians do that, they will be blocked in many of their efforts to demonstrate value (p. 97).

For this study two external sources of data from the institution were used: student demographic data from the student information system and the results of the Student Experience in the Research University (SERU) survey. Data from a variety of library data sources were also used, including the integrated library system (which manages the circulation of materials from the libraries), the interlibrary loan management system, and two separate internally-developed databases that manage access to library computer workstations and the reservations of library study rooms. All five of these sources of data were combined into one dataset and all identifying information was removed prior to the researcher gaining access to the data in order to maintain user privacy. This methodology

successfully enabled the researcher to look anonymously at each student's demographics and characteristics, enrollment data, information about his or her experiences as a student at the institution, and how he or she had used the library. Combining these data sources was an invaluable mechanism for creating a more complete look at each individual student. Although this provided a robust dataset for analysis, there were some limitations associated with this model that are discussed in more detail in the next section.

A second implication of this study was the illumination of the need for academic libraries to do a better job of gathering and managing their data and data systems. It is the opinion of the researcher that the results of this study were negatively impacted by the lack of a complete library dataset. Some of the gaps in the data were the result of operational aspects of the library at the study site (e.g., not requiring people who enter the library to authenticate themselves in any manner, or not having an integrated library system which would allow for more robust data recovery), while others resulted from data loss stemming from data management decisions that were made by the library (e.g., not keeping some data logs for more than 30 days). The ramifications of this lack of data were that, unfortunately, an incomplete picture was drawn of library use, both of its resources and its spaces. Resource usage as defined for this study only captured the use of physical resources, at a time when use of electronic resources is a critical aspect of library use. Like the limited picture of resource usage, this study was only able to develop a partial representation of the use of library spaces. Measurement of student interaction with library space was limited to computer workstation use and study room reservation, because no other aspects of use of library spaces were recorded or logged. The result of this limitation was that students who used the institution's library spaces without interacting in one of these ways are not represented in the data. In the researcher's opinion, that makes the interpretation of the results regarding library space

more problematic because it is not clear whether this subset of students is truly representative of the entire population of library users. Improved access to library data would have made this study stronger and would have allowed the conclusions to be stronger as well. Like other types of libraries, academic libraries make patron privacy a paramount priority. No one would disagree with the importance of that commitment, or argue that patron privacy should not be protected, but there needs to be a better way of building data systems that capture patron use data so that it would be accessible for these types of assessment studies (Oakleaf, 2010).

A third implication of this study is the need for more long-term, institution-wide, and collaborative data strategies that will facilitate more of this type of research in the future. The researcher was fortunate to have had the opportunity to engage individuals at the university site who were both willing and able to work collaboratively and share the data needed to be able to undertake this study. Without the direct involvement of these individuals, the lack of formal institutional policies designed to support this type of research would have made the dataset difficult, if not impossible, to acquire.

Although the methodology used for this study was innovative and resulted in a very valuable and unique dataset, it has a couple of disadvantages. One disadvantage is the fact that the dataset is static; it only provided a snapshot in time for a set of students and their academic library use. Another disadvantage is that it was time consuming to create the dataset and it required a unique effort from numerous people across campus to extract and share the necessary data, making it a challenging methodology to be employed for future research. A more fruitful approach for this type of research in the future would be the creation of a long-term data sharing strategy that would allow ongoing and real-time access to this type of data to enable continual assessment. An institutional data sharing strategy would not only help an academic library assess its

value and relevance to the university, it could also help university administrators better understand the different components of the institution's educational environment. A better understanding of the educational environment could affect curriculum and program development, pedagogical approaches, and student development services and programming.

The call for a campus-wide, collaborative, and long-term assessment strategy involving the academic libraries seems to be gaining some traction in the world of higher education. In January 2013, as the final chapter of this dissertation was being written, the Association of College and Research Libraries launched an initiative called Assessment in Action: Academic Libraries and Student Success. The program is funded by a grant from the Institute of Museum and Library Services (IMLS) and is a partnership with the Association for Institutional Research (AIR) and the Association of Public and Land-grant Universities (APLU) (Association of College and Research Libraries, 2012). The goals of the program are to:

develop the professional competencies of librarians to document and communicate the value of their academic libraries primarily in relation to their institution's goals for student learning and success [...], build and strengthen collaborative relationships with higher education stakeholders around the issue of library value [...], contribute to higher education assessment work by creating approaches, strategies, and practices that document the contribution of academic libraries to the overall goals and missions of their institutions (Association of College and Research Libraries, 2012, para. 6).

If the Assessment in Action program is successful, perhaps undertaking a doctoral study like this will not be necessary in the future because this type of assessment will be continually conducted in real time.

The remainder of this section focuses on the implications of some select results from the study. One of the main findings of this study was the positive and predictive

relationship between use of library resources and increased academic engagement. This is an important finding when seeking to understand the value the library brings to engaging students academically. In this result one can see how an academic library, and its role on campus, can be related to at least two of the five benchmarks of effective education practices outlined by Kuh, Kinzie, Schuh, Whitt, and Associates (2005). The five benchmarks include level of academic challenge, active and collaborative learning, student-faculty interaction, enriching educational experiences, and supportive campus environment; the two benchmarks which may be related to this finding are level of academic challenge and the creation of a supportive campus environment. The benchmarks of effective educational practice are important because they create an environment that provides ample opportunities for engagement (Wolf-Wendel, Ward & Kinzie, 2009).

One could argue that the use of library resources by students directly supports the level of academic challenge benchmark (i.e., the complexity of a student's cognitive tasks resulting from academic challenge requiring high levels of reading and writing). Academic work that requires reasoning and critical inquiry increases the level of academic challenge for students, and the use of library resources, such as scholarly research, primary source documents, and special collections, is an excellent way to facilitate these higher-level skills.

Another effective educational benchmark which could be strengthened based on these findings is the creation of a supportive campus environment. A supportive campus environment helps students succeed academically and socially and promotes good relations between students, faculty, and staff (Kuh, Kinzie, Schuh, Whitt, & Associates, 2005). As a fundamental co-curricular resource, academic libraries play a role in the creation of a supportive campus environment through the provision of library resources

and assistance with utilizing them. Providing the resources that students need to succeed in their academic work, coupled with expertise, instruction, and assistance highlights the academic library's contribution towards the creation of a supportive campus environment for students.

The positive and predictive relationship between use of library resources and academic engagement is also important because of its implications for the college curricula. As faculty develop their curricula they should be creating assignments that require more use of the resources and services available from their academic library as a means of fostering academic engagement, an outcome which would benefit both their individual classes as well as the institution as a whole.

Another finding that has potential implications for academic libraries is the negative predictive relationship between use of library spaces and students' sense of belonging and satisfaction. It makes logical sense that students who spend a lot of time in an academic library may feel a reduced sense of campus belonging and decreased satisfaction with their social experience. Some students who spend more time in the library may be taking more challenging coursework or may be struggling academically, both of which could affect their GPA and satisfaction with the academic experience. Perhaps academic librarians should consider ways in which they could help students who use the library often to feel more engaged with the social aspects of college life and increase their sense of belonging. Creating a sense of community among frequent users and having the library be a space for social, as well as academic, endeavors could help students experience a greater sense of belonging as well as overall satisfaction with college life. Academic libraries should also consider ways in which to support students academically, whether they are taking challenging classes or struggling in their coursework. More academic libraries should consider partnering with academic support

services on campus, including writing centers, tutors, and supplemental instruction resources, and bringing those services into the library so that they serve students at their point of need, thereby providing optimal academic support and hopefully increasing satisfaction with the academic experience.

CONTRIBUTION OF THE STUDY

The completion of this study has made contributions to the field in three important ways. One contribution of this study is that it serves as an example of one methodological approach to studying the under-researched area of the impact of the academic library on the mission of the institution. As previously noted, there were improvements that could be made to the methodology, as well as suggestions to use additional methodologies in future studies, but the undertaking of a study that created a large and robust student-level dataset was an important step forward for research in this area.

A second contribution of this study is that it provides more information for faculty and campus administrators about how one key aspect of the institutional environment, the academic library, may be affecting the important goal of student success. This study helps to shed a bit more light on the role of an academic library in the very complex college environment, showing that it has a potential role in contributing to the academic engagement of students. It also demonstrates the need for faculty, administrators, and academic libraries to partner together to further develop curricula and design collegiate experiences that increase engagement and maximize persistence.

The third contribution of this study is to show that even as the role of the academic library continues to change and evolve there are ways that academic libraries

can use research to answer questions regarding value and relevance in a meaningful way. Even though research of this nature can be difficult, there is value in undertaking it.

AREAS FOR FURTHER RESEARCH

This section of the chapter focuses on areas for further research based on the results of this study. Some of the areas recommended for further research are related to the implications explored in the previous section, while some are new.

First and foremost, more research on the academic library's impact on student engagement and persistence needs to be conducted. As is evident from the literature review, very little attention has been focused on this topic, and in the current accountability-driven climate in higher education, academic libraries ignore the topic of library contribution to student success outcomes at their peril. Also, based on the small to medium effect sizes shown in many of the analyses different quantitative and qualitative methodologies should also be explored in order to further research this topic.

In addition to more studies focusing on student engagement and persistence, more research should be conducted on how academic libraries contribute to other institutional goals and missions. There are a multitude of other areas awaiting exploration, including institutional outcomes (e.g., reputation or prestige), faculty outcomes (e.g. research productivity and grant awards), and student outcomes (e.g., learning outcomes, graduation rates, achievement, employment post-graduation, graduate school acceptance, or other student experiences) (Oakleaf, 2010). And as stated in the implications section, the best strategy for undertaking more research would be a collaborative campus effort with an eye to a long-term strategy.

The implications of the negative results with regards to persistence cannot be ignored, but they are, admittedly, inconclusive. The fact that one of the three persistence

analyses showed a practically significant negative relationship between persistence and library usage is somewhat surprising considering the positive results from the analyses with the engagement outcome, especially considering that research has shown a connection between engagement and persistence (e.g., Astin, 1984, 1985; Cabrera, Nora & Castaneda, 1992; Harper & Quaye, 2009; Pascarella & Terenzini, 2005; Pike, Schroeder & Berry, 1997; Tinto, 1993). But these results also underscore the complex nature of student persistence. As the literature review showed, there are many intervening variables that can affect student persistence, including both input variables and environment variables. Since the results of the analyses for the persistence outcome seem to be inconsistent with other findings in the study as well as the literature in general, more research is recommended in order to develop further insights in this area.

CONCLUSION

As the drumbeat of calls for accountability and the pressures for improved student success outcomes shows no signs of slowing, academic libraries need to increase their abilities and capabilities for demonstrating value and relevance to their colleges or universities. In today's data-driven environment, libraries can no longer validate their worth by counting journals purchased or books lent. Ubiquitous technologies like computers and the Internet lead users to question the library's value while researchers and administrators apply increasingly sophisticated performance measurements to every aspect of each organization within the higher education institution. Caught in the middle, the library must adopt a more analytical approach to demonstrating its value, relevance, and role in fulfilling its mission or risk being marginalized. The good news is that the international academic library community is eager to learn and adapt, the technologies are easily available (if not already in place), and a growing body of knowledge

demonstrates that the academic library plays a key role in supporting its institutional mission of educating the scientists, scholars, and leaders of tomorrow.

Appendix A

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This year's survey has three parts:

I. Academic engagement, time use, academic and personal development, overall satisfaction, and evaluation of the educational experience.

II. Background information

III. A randomly assigned module emphasizing academic experience, civic engagement, personal development, or items of special interest to the campus

Your questionnaire is not submitted until you press the "Submit" button at the end.

Part I: ACADEMIC ENGAGEMENT, TIME, STUDENT DEVELOPMENT, ACADEMIC ENGAGEMENT, CAMPUS CLIMATE, SATISFACTION, AND EVALUATION OF THE EDUCATIONAL EXPERIENCE

Academic Engagement

During this academic year, how often have you done each of the following?

Never; Rarely; Occasionally; Somewhat often; Often; Very often

Contributed to a class discussion

Brought up ideas or concepts from different courses during class discussions

Asked an insightful question in class

Found a course so interesting that you did more work than was required

Chosen challenging courses, when possible, even though you might lower your GPA by doing so

Made a class presentation

Had a class in which the professor knew or learned your name

How frequently have you engaged in these activities so far this academic year?

Never; Rarely; Occasionally; Somewhat often; Often; Very often

Taken a small research-oriented seminar with faculty

Communicated with a faculty member by e-mail or in person

Talked with the instructor outside of class about issues and concepts derived from a course

Interacted with faculty during lecture class sessions

Worked with a faculty member on an activity other than coursework (e.g., student organization, campus committee, cultural activity)

How frequently during this academic year have you done each of the following?

Never; Rarely; Occasionally; Somewhat often; Often; Very often

Turned in a course assignment late

Gone to class without completing assigned reading

Gone to class unprepared
Skipped class
Raised your standard for acceptable effort due to the high standards of a faculty member
Extensively revised a paper at least once before submitting it to be graded
Sought academic help from instructor or tutor when needed
Worked on class projects or studied as a group with other classmates outside of class
Helped a classmate better understand the course material when studying together

Use of Time

During this academic year, what was the average number of hours per night you slept on weeknights?

0-2; 3-4; 5-6; 7-8; 9-10; 11+

How many hours do you spend in a typical week (7 days) on the following activities?

0; 1-5; 6-10; 11-15; 16-20; 21-25; 26-30; More than 30

Attending classes, discussion sections or labs
Studying and other academic activities outside of class
Paid employment (include paid internships)
Of your total hours spent working for pay, about how many hours did you work on campus?
Of your total hours spent working for pay, about how many hours were related to your academic interests?
Attending movies, concerts, sports, or other entertainment events
Performing community service or volunteer activities
Participating in physical exercise, recreational sports, or physically active hobbies
Participating in spiritual or religious activities
Participating in student clubs or organizations
Pursuing a recreational or creative interest (arts/crafts, reading, music, hobbies, etc.)
Socializing with friends
Partying
Spending time with family
Using the computer or smart phone for non-academic purposes (games, shopping, e-mail/instant messaging, etc.)
Watching TV
Commuting to school and to work

RCampusID

FirstName

LastName

CampusGender

Email1

Email2

CollegeCode1
MajorCode1
CollegeCode2
MajorCode2
MajorText2
MajorText1
ShowMajor
ModuleAssign
Campus
SALUTATION

Academic and Personal Development

Please rate your level of proficiency in the following areas when you started at this campus and now.

When you started here & Current ability level

Very poor; Poor; Fair; Good; Very good; Excellent

Analytical and critical thinking skills

Ability to be clear and effective when writing

Ability to read and comprehend academic material

Foreign language skills

Understanding of a specific field of study

Quantitative (mathematical and statistical) skills

Ability to speak clearly and effectively in English

Ability to understand international perspectives (economic, political, social, cultural)

Computer skills

Internet skills

Library research skills

Other research skills

Ability to prepare and make a presentation

Interpersonal (social) skills

Similarly, please rate your abilities now and when you first began at this university on the following dimensions.

When you started here & Current ability level

Very poor; Poor; Fair; Good; Very good; Excellent

Ability to appreciate, tolerate and understand racial and ethnic diversity

Ability to appreciate the fine arts (e.g., painting, music, drama, dance)

Ability to appreciate cultural and global diversity

Understanding the importance of personal social responsibility

Self-awareness and understanding

Campus Climate for Diversity

Indicate how strongly you agree or disagree with each of the following statements.

Strongly disagree; Disagree; Somewhat disagree; Somewhat Agree; Agree; Strongly agree

I feel free to express my political beliefs on campus

I feel free to express my religious beliefs on campus

Students are respected here regardless of their economic or social class

Students are respected here regardless of their gender

Students are respected here regardless of their race or ethnicity

Students are respected here regardless of their religious beliefs

Students are respected here regardless of their political beliefs

Students are respected here regardless of their sexual orientation

Students are respected here regardless of their disabilities

On average, how much of your assigned course reading have you completed this academic year?

0-10%; 11-20%; 21-30%; 31-40%; 41-50%; 51-60%; 61-70%; 71-80%; 81-90%; 91-100%

Plans and Aspirations

What do you plan to do when you graduate? (Choose one)

Enroll in graduate or professional school; Work full-time; Work part-time; Be self-employed; Study or work abroad; Join armed forces; Work in an internship or volunteer position; Take a year off; Do something else; I have no idea at this point; Other

What career do you hope to eventually have after you've completed your education? (Choose one)

Artistic, creative professions; Business, finance-related professions; Education; Engineering, computer programming; Law; Medicine, health-related professions; Psychology, helping professions; Researcher, scientist; Other; I have no idea whatsoever

What is the HIGHEST academic degree or credential that you plan to earn eventually? (Choose one)

Bachelor's degree (BA, BS, etc.); Teaching credential; Business master's (MBA); Other professional master's; Academic master's; Law degree; Medical doctorate other than MD; Medical Doctor; Doctorate; Multiple doctoral degrees; I don't know yet

If other, please elaborate

If other, please elaborate

Indicate the following research and creative activities that you are currently doing or have completed as a *Name of University* student.

Yes, doing now or have done; No

A research project, creative activity, or paper as part of your coursework

At least one student research course

At least one independent study course

Assist faculty in research with course credit

Assist faculty in research for pay without course credit

Assist faculty in research as a volunteer without course credit

Work on creative projects under the direction of faculty with course credit_

Work on creative projects under the direction of faculty for pay without course credit

Work on creative projects under the direction of faculty as a volunteer without course credit

Overall Satisfaction and Agreement

Please rate your level of satisfaction with the following aspects of your university education.

Very dissatisfied; Dissatisfied; Somewhat dissatisfied; Somewhat satisfied; Satisfied; Very satisfied

University grade point average

Overall social experience

Overall academic experience

Value of your education for the price you're paying

Please rate your level of agreement with the following statements.

Strongly disagree; Disagree; Disagree somewhat; Agree somewhat; Agree; Strongly agree

I feel that I belong at this campus

Knowing what I know now, I would still choose to enroll at this campus

(Upper Division Students will see) Evaluation of the Major

(Lower Division Students will see) Evaluation of the Educational Experience

(UD) Were the following factors very important to you in deciding on your major?

(LD) Which of the following factors do you consider to be very important to you in deciding on your major?

Yes; No

Intellectual curiosity

Leads to a high paying job

Prepares me for a fulfilling career

Complements desire to study abroad

Parental desires

Easy requirements

Allows time for other activities

Provides international opportunities

Prestige

Couldn't get into my first choice of major

Interest in subject area

Prepares me for graduate/professional school

Other

Please describe:

Thinking back over your coursework this academic year, how often were you REQUIRED to do the following?

Never; Rarely; Occasionally; Somewhat often; Often; Very often

Recognize or recall specific facts, terms, and concepts

Explain methods, ideas, or concepts and use them to solve problems
Break down material into component parts or arguments into assumptions to see the basis for different outcomes and conclusions
Judge the value of information, ideas, actions, and conclusions based on the soundness of sources, methods and reasoning
Create or generate new ideas, products, or ways of understanding

Thinking back on this academic year, how often have you done each of the following?

Never; Rarely; Occasionally; Somewhat often; Often; Very often

Used facts and examples to support your viewpoint
Incorporated ideas or concepts from different courses when completing assignments
Examined how others gathered and interpreted data and assessed the soundness of their conclusions
Reconsidered your own position on a topic after assessing the arguments of others

(UD only) Please answer the following questions about your major.

Yes; No

Do you understand how the requirements of your major combine to produce a coherent understanding of a field of study?
Are the program requirements well defined?
Are department rules and policies clearly communicated?
Is the description of the major in the catalog accurate?

Please answer the following questions about your educational experience overall.

Yes; No

Are there open channels of communication between faculty and students regarding student needs, concerns, and suggestions?
Are students treated equitably and fairly by the faculty?
Do faculty clearly explain what constitutes plagiarism and its consequences?
Do faculty provide prompt and useful feedback on student work?

(UD only) How satisfied are you with each of the following aspects of your educational experience in the major?

Very dissatisfied; Dissatisfied; Somewhat dissatisfied; Somewhat satisfied; Satisfied; Very satisfied

Variety of courses available in your major
Quality of lower-division courses in your major
Quality of upper-division courses in your major

How satisfied are you with each of the following aspects of your educational experience overall?

Very dissatisfied; Dissatisfied; Somewhat dissatisfied; Somewhat satisfied; Satisfied; Very satisfied

Advising by faculty on academic matters
Advising by student peer advisers on academic matters
Advising by school or college staff on academic matters
Advising by departmental staff on academic matters
Quality of faculty instruction

Quality of teaching by graduate student TAs
Availability of courses for general education or breadth requirements
Availability of courses needed for graduation
Access to small classes
Access to faculty outside of class
Ability to get into a major that you want
Opportunities for research experience or to produce creative products
Educational enrichment programs (e.g., study abroad, internships)
Accessibility of library staff
Availability of library research materials

(UD only) How many professors do you know well enough to ask for a letter of recommendation in support of an application for a job or for graduate or professional school?

Zero; 1; 2; 3; 4 or more

Would you like to evaluate another major?

Which major would you like to now evaluate? Your prior selection appears below.

If other, please select your major from this list.

(UD) Were the following factors very important to you in deciding on your major?

(LD) Which of the following factors do you consider to be very important to you in deciding on your major?

Yes; No

Intellectual curiosity
Leads to a high paying job
Prepares me for a fulfilling career
Complements desire to study abroad
Parental desires
Easy requirements
Allows time for other activities
Provides international opportunities
Prestige
Couldn't get into my first choice of major
Interest in subject area
Prepares me for graduate/professional school
Other
If other, please elaborate:

(UD only) Please answer the following questions about your major.

Yes; No

Do you understand how the requirements of your major combine to produce a coherent understanding of a field of study?

Are the program requirements well defined?

Are department rules and policies clearly communicated?

Is the description of the major in the catalog accurate?

Please answer the following questions about your educational experience overall.

Yes; No

Are there open channels of communication between faculty and students regarding student needs, concerns, and suggestions?

Are students treated equitably and fairly by the faculty?

Do faculty clearly explain what constitutes plagiarism and its consequences?

Do faculty provide prompt and useful feedback on student work?

(UD only) How satisfied are you with each of the following aspects of your educational experience in the major?

Very dissatisfied; Dissatisfied; Somewhat dissatisfied; Somewhat satisfied; Satisfied; Very satisfied

Variety of courses available in your major

Quality of lower-division courses in your major

Quality of upper-division courses in your major

How satisfied are you with each of the following aspects of your educational experience overall?

Very dissatisfied; Dissatisfied; Somewhat dissatisfied; Somewhat satisfied; Satisfied; Very satisfied

Advising by faculty on academic matters

Advising by student peer advisers on academic matters

Advising by school or college staff on academic matters

Advising by departmental staff on academic matters

Quality of faculty instruction

Quality of teaching by graduate student TA's

Availability of courses for general education or breadth requirements

Availability of courses needed for graduation

Access to small classes

Access to faculty outside of class

Ability to get into a major that you want

Opportunities for research experience or to produce creative products

Educational enrichment programs (e.g., study abroad, internships)

Accessibility of library staff

Availability of library research materials
PipedCampus

PART II: YOUR BACKGROUND AND PERSONAL CHARACTERISTICS

Will you complete a bachelor degree this spring or summer?

Probably yes; Probably no

(Not Graduating Soon) How concerned HAVE YOU BEEN about paying for your undergraduate education up to now?

Not at all concerned; Unconcerned; Somewhat unconcerned; Somewhat concerned; Concerned; Very concerned

(Not Graduating Soon) How concerned are you about paying for your undergraduate education NEXT YEAR?

Not at all concerned; Unconcerned; Somewhat unconcerned; Somewhat concerned; Concerned; Very concerned

(Soon Graduating) How concerned HAVE YOU BEEN about paying for your undergraduate education up to now?

Not at all concerned; Unconcerned; Somewhat unconcerned; Somewhat concerned; Concerned; Very concerned

(Soon Graduating) How concerned are you about your accumulated educational debt?

Not at all concerned; Unconcerned; Somewhat unconcerned; Somewhat concerned; Concerned; Very concerned

Which of the following have you done in the past year to meet college expenses? (Select all that apply)

- Applied for financial aid for the first time
- Asked financial aid office to reevaluate my application
- Bought fewer books, bought cheaper used books, read books on reserve
- Took a leave of absence or a quarter/semester off
- Took more courses per term
- Took fewer courses per term
- Took action to graduate more quickly
- Did not retake a class to improve grade
- Decided against study abroad
- Took a community college course because it was cheaper
- Took a job for the first time at college
- Worked before but increased the number of hours worked
- Increased the debt I carry on my credit card
- Increased my annual student loan amount
- Have cut expenses overall / have been more frugal
- None of the above. Cost hasn't been a problem
- Other

How frequently have you engaged in the following behaviors in the past year?

Never; Rarely; Occasionally; Somewhat often; Often; Very often

Skipped meals to save money

Cut down on personal/recreational spending

Worried about my personal debt

Worried about my family's debt and financial circumstances

(Hidden) Have you heard about the Blue and Gold Opportunity Plan, which ensures that scholarships and grants will cover fees for students from families making less than \$70,000 a year, with financial need?

To what extent do you agree or disagree with this statement: Given the grants and scholarships, if any, that you receive, the total cost of attending the *Name of University* is manageable.
Strongly disagree; Disagree; Disagree somewhat; Agree somewhat; Agree; Strongly agree

Is there anything else that you would like to tell us about the impact of the cost to attend on your educational experience at *Name of University*?

When did you come to the United States to live?

I was born in the U.S.; 1991 or earlier; 1992; 1993; 1994; 1995; 1996; 1997; 1998; 1999; 2000; 2001; 2002; 2003; 2004; 2005; 2006; 2007; 2008; 2009 or later

When did you learn to speak English?

English is my native language; Before I was 5 years old; When I was 6 to 10 years old; When I was 11 to 15 years old; After turning 16 years old

To the best of your knowledge, where were these relatives born?

In U.S.; Outside the U.S.

My mother

My father

My mother's mother

My father's mother

My mother's father

My father's father

What is the highest level of education reached by your mother? (Choose one)

None (did not receive formal education); Less than high school diploma; High school diploma; Associate's or postsecondary certificate; Bachelor's degree; Post-baccalaureate certificate; Master's degree; A professional degree; Doctoral degree

What is the highest level of education reached by your mother?

What is the highest level of education reached by your mother in the United States?

What is the highest level of education reached by your mother in a Foreign Country?

What is the highest level of education reached by your father? (Choose one)

None (did not receive formal education); Less than high school diploma; High school diploma; Associate's or postsecondary certificate; Bachelor's degree; Post-baccalaureate certificate; Master's degree; A professional degree; Doctoral degree

What is the highest level of education reached by your father?

What was the highest level of education reached by your father in the United States?

What was the highest level of education reached by your father in a Foreign Country?

To the best of your knowledge, how many of your grandparents went to college? (Choose one)

I don't know; None; One; Two; Three; Four

Which of the following best describes your social class when you were growing up? (Choose one)

Wealthy; Upper-middle or professional middle; Middle-class; Working-class; Low-income or poor

Are you a financially independent student? (Choose one)

Yes; No

(Not Independent Student) To the best of your knowledge, which category includes the total annual combined income of your parent(s) before taxes in 2009? (Choose one)

Less than \$10,000; \$10,000 to \$19,999; \$20,000 to \$34,999; \$35,000 to \$49,999; \$50,000 to \$64,999; \$65,000 to \$79,999; \$80,000 to \$99,999; \$100,000 to \$124,999; \$125,000 to \$149,999; \$150,000 to \$199,999; \$200,000 or more

(Independent Student) To the best of your knowledge, which category includes your household's total annual combined income before taxes in 2009? (Choose one)

Less than \$10,000; \$10,000 to \$19,999; \$20,000 to \$34,999; \$35,000 to \$49,999; \$50,000 to \$64,999; \$65,000 to \$79,999; \$80,000 to \$99,999; \$100,000 to \$124,999; \$125,000 to \$149,999; \$150,000 to \$199,999; \$200,000 or more

What is your religious/spiritual preference? (Choose one)

Spiritual but not associated with a major religion; Not particularly spiritual; No preference; Agnostic; Atheist; Baptist; Buddhist; Christian Church (Disciples); Eastern Orthodox; Episcopalian; Hindu; Jewish; Lutheran; Methodist; Mormon; Muslim; Presbyterian; Quaker; Roman Catholic; Seventh Day Adventist; Sikh; Taoist; Unitarian/Universalist; United Church of Christ/Congregational; Other Christian; Other Religion

What is your sexual orientation? (Choose one)

Bisexual; Gay/Lesbian; Heterosexual; Questioning/Unsure; Queer; Decline to state; Other

With which gender do you identify? (Choose one)

Woman (Female); Man (Male); Transgender; Genderqueer; Decline to state; Other

How would you characterize your political orientation? (Choose one)

Very liberal; Liberal; Slightly liberal; Moderate or middle of the road; Slightly conservative; Conservative; Very conservative

Please indicate the highest level of organized sports in which you participate? (Choose one)

Professional sports; NCAA with athletic scholarship; NCAA without athletic scholarship; Campus club sports team; Intramural sports; Competitive personal (e.g., 5K races); Personal recreation; Does not apply to me

On average, how many hours a week do you spend on this one activity? (Must be numeric)

ModuleAssign

Who do you live with? (Choose one)

No one. I live alone; I share an apartment or door room with at least one other Name of University student; I share an apartment with peers who are not Name of University students; I live with at least one parent; I am a single parent living with children; I live with my spouse or domestic partner and children; I live with my spouse or domestic partner without children; Other

What is your primary mode of transportation to campus during the spring 2011 term? (Choose one)

Walk; Bicycle; Apartment or campus shuttle bus; University bus; City bus; Subway train or other train (e.g. Amtrak); Carpool (2 or more); Drive alone; Motorcycle, motorized scooter, or moped; Rollerblade, skateboard, skate, or scooter; Mobility scooter, powered wheelchair, or wheelchair; Other

How far from campus do you live? (Choose one)

On campus or < 1 mile; 1 mile to 2 miles; 3 miles to 10 miles; 11 to 20 miles; 21 miles or more

Where are you living this term? (Choose one)

University residence hall; University owned apartment or house (on- or off-campus); With family; Sorority or fraternity; Co-op student housing; Off-campus in an apartment; Off-campus in a house; Other

PART III: ACADEMIC EXPERIENCE & GLOBALIZATION

We would like to hear more about being an undergraduate at a research university. Please indicate your level of agreement with the following statements.

Strongly disagree; Disagree; Disagree somewhat; Agree somewhat; Agree Strongly agree

The *Name of University* has a strong commitment to undergraduate education

Attending a university with world-class researchers is important to me

It doesn't really matter where I get my undergraduate education (*Name of University*, regional college, community college) since they are all similar in quality

The emphasis on research detracts from the quality of teaching on this campus

How important to you are the following aspects of being an undergraduate at a research university like the *Name of University*?

Not important; Not very important; Somewhat important; Important; Very important; Essential

Learning about faculty research

Having courses with faculty members who refer to their own research as part of the class

Learning research methods

Assisting faculty members in their research, for pay or as a volunteer

Pursuing your own research

The prestige of this campus when you apply to grad school

The prestige of this campus when you apply for a job

Having access to a world-class library collection

Being able to attend plays, concerts, lectures, and other cultural

Have you completed or are you now participating in the following activities?

Yes, doing now or have done; No

Internship under the direction of a faculty member

Other internship (e.g., co-op, clinical assignment)

Any *Name of University* study abroad, including summer study abroad

Study abroad program affiliated with another college or university

Traveled abroad for a service learning, volunteer, or work experience

Traveled abroad for cross-cultural experience or informal education

Traveled abroad for recreation

Enrolled in a course with an international/global focus

Obtained a certificate/minor/major with an international/global theme (e.g., in Latin American Studies)

While attending *Name of University*, how frequently have you engaged in the following?

Never; Rarely; Occasionally; Somewhat often; Often; Very often

Interacted with students from outside the U.S. in class (e.g., through section discussions, study groups or class projects)

Interacted with students from outside the U.S. in social settings (e.g., in clubs or student organizations, or in informal settings)

Developed a friendship with a student from outside the U.S.

Worked with a faculty member on a project with an international/global theme

Presented a paper at a symposium or conference or participated in a panel on international/global topics

Attended lectures, symposia, workshops or conferences on international/global topics

Attended a performance with an international/global focus

During this academic year, how frequently have you followed news about the following?

Never; Rarely; Occasionally; Somewhat often; Often; Very often

The United States

Countries outside the United States

Global politics and diplomacy

Global climate and environmental issues

International business and economics

Global health issues

International conflicts and peace issues

As a Name of University student, how would you rate your competencies below?

When you started here & Current ability level

Very poor; Poor; Fair; Good; Very good; Excellent

Understanding of the complexities of global issues

Ability to apply disciplinary knowledge in a global context

Linguistic and cultural competency in at least one language other than my own

Ability to work with people from other cultures

Comfort working with people from other cultures

During this academic year, how often have each of the following been obstacles to your school work or academic success?

Not at all; Rarely; Occasionally; Frequently; All the time

Competing job responsibilities (i.e., paid employment)

Competing family responsibilities

Other competing responsibilities (e.g., athletics, clubs, internship)

Weak English skills

Weak math skills

Inadequate study skills (e.g., knowing how to start, knowing how to get help, organizing material)

Poor study behaviors (e.g., wait till last minute, easily distracted, too much social time, too much web surfing)

Bad study environment (e.g., noisy roommate, poor Internet access, inadequate computer or software)

Feeling depressed, stressed, or upset

Physical illness or condition

How important is it to you to graduate in four years or, if you are a transfer student, in two years?

Not important; Not very important; Somewhat important; Important; Very important; Essential; Not applicable

PART III: COMMUNITY AND CIVIC ENGAGEMENT

Activities

Indicate the way in which you have been involved in the following campus-based activities or organizations this academic year.

Participant or member; Officer or leader; Neither

Academic (e.g., math club, philosophy club)

Advocacy (e.g., Amnesty International, Living Wage Advocacy, Sierra Club)

Campus sports club (e.g., rugby club, Kendo club)

Campus varsity team (e.g., basketball, softball, soccer)
Governing bodies (e.g., student government, IFC, panhellenic, residence hall association)
Greek fraternity or sorority
Honor society
Media (e.g., campus newspaper, radio station)
Performing group (e.g., school band, dance team)
Political (e.g., Young Republicans, College Democrats)
Recreational (e.g., chess club, bike club, rock climbing club)
Religious (e.g., Korean Campus Ministry, World Peace Buddhist Club)
Service (e.g., Special Olympics volunteers Club, Jewish Social Action Committee)
Other campus-based club or organization
Off-campus club or organization

To what extent do you agree or disagree with the following statements?

Strongly disagree; Disagree; Somewhat disagree; Somewhat Agree; Agree; Strongly agree

Opportunities for community service while here are important to me

Opportunities to develop my leadership skills while here are important to me

Opportunities to connect my academic work with community-based experience are important to me

Community Service & Leadership

DURING THIS ACADEMIC YEAR, have you done community service either on or off campus?

No; Yes

How did you get involved in community service? If you have been involved in more than one form of community service, please answer for the one that has been the largest time commitment.

Yes; No

Through a related class

Through a program where I receive course credit (e.g., field studies credit for tutoring)

Through a formal service program (AmeriCorps, VISTA, etc.) where I receive pay or a stipend

Through my fraternity or sorority

Through another student organization on campus

Through a university department or program

Through my religious organization or church

Through my internship

I found the work on my own

Other

If other, please elaborate

What was the focus of the organization where you did this community service? (Select all that apply.)

- Access and success in higher education
- Agriculture/nutrition
- Animal welfare
- Arts education
- Arts, community/public arts (all disciplines)
- Child care
- Civil rights/human rights
- Conflict resolution
- Crime/criminal justice
- Disability issues
- Disaster preparedness
- Diversity/multiculturalism

- Economic development
- Education, pre-K to community college
- Environment/sustainability issues
- Global citizenship
- Health
- HIV/AIDS
- Housing/homelessness
- Hunger
- Immigrants/migrant worker rights
- International issues
- Legal aid
- Mental health
- Mentoring
- Parenting
- Poverty
- Reading/writing
- Senior/elder services
- Sexual assault
- Substance abuse
- Tax form preparation
- Technology
- Transportation
- Tutoring
- Voting
- Women's issues
- Other

If your involvement in community service was through a related class, please list the name and number of the course:

Course name and number:

Please name up to three organizations and their location (for example, "United Way, City, State") where you participated in community engagement during this academic year:

Organization name and location

Organization name and location

Organization name and location

Thinking about your participation in all forms of community service, which includes service through clubs, courses, and one-time events, please estimate how many total hours of service you completed this academic year (Choose one):

One to ten hours; Eleven to twenty hours; Twenty-one to fifty hours; Fifty-one to one hundred hours; More than one hundred hours

Which of the following were significant reasons for getting involved in community service?

A significant reason; Not a significant reason

Required as part of my academic program

Required by my fraternity/sorority
Unique or interesting opportunity arose to participate
Encouragement from friends or family
Belief in the particular cause
Location of where the work was to be conducted
Opportunity to learn new things
Opportunity to enhance my academic achievement
Opportunities to develop leadership skills
Become a better citizen and community participant
Change conditions in the community
Strengthen my resume for graduate school or employment
Other
If other, please elaborate

Service-learning courses

During this academic year, how many times have you enrolled in a course that had a service learning component?

Zero; Once; Twice; Three times; More than three times

What was the average number of total service hours for the service-learning courses you took?

One to ten hours; Eleven to twenty-five hours; Twenty-six to fifty hours; More than fifty hours

In addition to voluntary community service activities, there are other critical community involvement activities. To what extent have you been involved in the following community-focused experiences during this academic year:

To what extent have you been involved in the following community-focused experiences during this academic year:

Not at all; One term or less; More than one term

Course-based service-learning
Study abroad or other internationally-based experience
Volunteer or community service experience
Internship or clinical practicum
Academic field study
Community-based research
Business apprenticeship
Other
If other, please elaborate

In your community-focused experiences during this academic year, were you engaged in any of the following issues/activities?

Yes; No

Political or legislative work

Charity
Disaster relief or incident response
Protest or march for a particular cause
Social justice-related activities
Community empowerment and development
Religious-related work
Career or professional development experiences
Experiences for academic learning and development
Other
If other, please elaborate

To what extent has participation in community-focused activities at this University influenced your desire to continue community-focused activities after you graduate? (Choose one)

Not at all; To some extent; To a great extent

National and Global Engagement

Do you consider yourself to be a? (Choose one)

Democrat; Republican; Independent; Other

(Democrat) Do you consider yourself to be a strong Democrat?

Yes; No

(Republican) Do you consider yourself to be a strong Republican?

Yes; No

(Independent and Other) Do you lean more toward the Democratic Party or Republican Party?

Democratic; Republican

Do you think this country is moving in the right direction or wrong direction? (Choose one)

Right direction; Wrong direction; Don't know

During this academic year, how frequently have you followed news about the following?

Never; Rarely; Occasionally; Somewhat often; Often; Very often

The United States

Countries outside the United States

Global politics and diplomacy

Global climate and environmental issues

International business and economics

Global health issues

International conflicts and peace issues

As a {Name of University} student, how would you rate your competencies below?

When you started here & Current ability level

Very poor; Poor; Fair; Good; Very good; Excellent

Understanding of the complexities of global issues

Ability to apply disciplinary knowledge in a global context

Linguistic and cultural competency in at least one language other than my own

Ability to work with people from other cultures

Comfort working with people from other cultures

In the classroom, how often have you been asked to

Never; Rarely; Occasionally; Sometimes; Often; Very often

Acknowledge personal differences

Appreciate the world from someone else's perspective

Interact with someone with views that are different from your own

Discuss and navigate controversial issues

Define an issue or challenge and identify possible solutions

Implement a solution to an issue or challenge

Reflect upon the solution of an issue or challenge

Reflect on community or social issues as a shared responsibility

Reflect on your individual responsibility for community or social issues

Act on community or social issues

Outside the classroom, how often do you

Never; Rarely; Occasionally; Sometimes; Often; Very often

Acknowledge personal differences

Appreciate the world from someone else's perspective

Interact with someone with views that are different from your own

Discuss and navigate controversial issues

Define an issue or challenge and identify possible solutions

Implement a solution to an issue or challenge

Reflect upon the solution of an issue or challenge

Reflect on community or social issues as a shared responsibility

Reflect on your individual responsibility for community or social issues

Act on community or social issues

PART III: STUDENT LIFE AND DEVELOPMENT

Goals & Aspirations

Indicate how important each of the following college goals is to you.

Very important; Somewhat important; Not important

Be in a position to give something back to my community after finishing my education

Acquire a well-rounded general education

Discover what kind of person I really want to be

Achieve a high GPA

Form romantic relationships

Establish meaningful friendships

Prepare for graduate or professional school

Obtain the skills I need to pursue my chosen career

Be in a position to make a lot of money after finishing my education

Explore new ideas

Enjoy my college years before assuming adult responsibilities

Develop a personal code of values and ethics

Develop an in-depth understanding of a specific field of study

Integrate spirituality into my life

Establish social networks that will help further my career

Obtain the skills I need to function in the international arena

Perceptions and Campus Climate

Based on your experience and observation, rate the general climate for students at *Name of University* along the following dimensions, Campus climate is:

Friendly Hostile

6 5 4 3 2 1

Caring Impersonal

6 5 4 3 2 1

Intellectual Not Intellectual

6 5 4 3 2 1

Tolerant of diversity Intolerant of diversity

6 5 4 3 2 1

Safe Dangerous

6 5 4 3 2 1

Too hard academically Too easy academically

6 5 4 3 2 1

Affordable Not affordable

6 5 4 3 2 1

How often have you gained a deeper understanding of other perspectives through conversations with fellow students because they differed from you in the following ways?

Never; Rarely; Occasionally; Somewhat often; Often; Very often

Their religious beliefs were very different from yours

Their political opinions were very different from yours

They were an immigrant or from an immigrant family

They were of a different nationality from your own

They were of a different race or ethnicity from your own

Their gender was different

Their sexual orientation was different

They were from a different social class

They had physical or other observable disabilities

They had learning, psychological, or other disabilities that are not readily apparent

In this academic year, I have heard teaching faculty or instructors express negative or stereotypical views about:

Never; Rarely; Occasionally; Somewhat often; Often; Very often

Races or ethnicities

Genders

Sexual orientations

Political affiliation, opinions or beliefs

Religions

Social classes

Immigrant backgrounds

Physical or other observable disabilities

Psychological, learning or other disabilities that are not readily apparent

In this academic year, I have heard nonteaching staff or administrators express negative or stereotypical views about:

Never; Rarely; Occasionally; Somewhat often; Often; Very often

Races or ethnicities

Genders

Sexual orientations

Political affiliation, opinions or beliefs
Religions
Social classes
Immigrant backgrounds
Physical or other observable disabilities
Psychological, learning or other disabilities that are not readily apparent

In this academic year, I have heard students express negative or stereotypical views about:

Never; Rarely; Occasionally; Somewhat often; Often; Very often

Races or ethnicities
Genders
Sexual orientations
Political affiliation, opinions or beliefs
Religions
Social classes
Immigrant backgrounds
Physical or other observable disabilities
Psychological, learning or other disabilities that are not readily apparent

Please rate your awareness and understanding of the following issues when you started at this campus and now.

When you started here & Current ability level

Very poor; Poor; Fair; Good; Very good; Excellent

My own racial and ethnic identity
Social class and economic differences/issues
Racial and ethnic differences/issues
Gender differences/issues
Sexual orientation differences/issues
Physical or other observable disabilities
Learning, psychological, or other disabilities that are not readily apparent

What is your level of agreement or disagreement with the following:

Strongly disagree; Disagree; Disagree somewhat; Agree somewhat; Agree Strongly agree

I feel valued as an individual on this campus
There is a clear sense of appropriate and inappropriate behavior on this campus
I am proud to be a student at this campus
Most students are proud to attend this school
This institution values students' opinions
Academic cheating is a problem on this campus
Alcohol use is a problem on this campus
Drug use is a problem on this campus
Diversity is important on this campus
Diversity is important to me

Mental Health and Wellness

During this academic year, how often has feeling depressed, stressed, or upset been an obstacle to your school work or academic success?

Never; Rarely; Occasionally; Somewhat often; Often; Very often

In this academic year, what was your experience with *Name of University* counseling and psychological services?

Didn't need; Needed but didn't use; Used the service at least once

If you might have needed this service but didn't use this service, why not?

True for me; Not true for me

I had never heard of it

I didn't know what it offered

I didn't know if I was eligible

I didn't know how to access it

I didn't think it would help

I had concerns about possible costs

I had concerns about possible lack of confidentiality

I was embarrassed to use it

I didn't have enough time

It has a poor reputation

The hours are inconvenient

The location is inconvenient

The wait for an appointment was too long

I got help from another university service or staff person

I got help off campus

Was the treatment that you received effective? (Choose one)

Very effective; Effective; Not effective; Not applicable

Please rate the quality of service that you received. (Choose one)

Excellent; Good; Fair; Poor

How could the counseling service better serve your needs? Please be specific.

Summary Observations

Please describe for us the most important way that you have changed or developed as a person since you became a student at the *Name of University*.

Please describe for us the most important way in which your awareness, understanding, or relationship to the world we live in has changed since you became a student at the *Name of University*

Group Identification

Think about the type of person you are. With which, if any, of the following types of students at this campus do you personally identify? That is, which of these "college identities" describes who you are? (Please select all that apply.)

Artsy students

Athletes/jocks

Conservative students

Feminist students

Fraternity/sorority members

Immigrant students

Lesbian, gay, bisexual, transgender, or self-identified queer students

Liberal students

Partiers

- Religious or spiritual students
- Slackers
- Students from very poor backgrounds
- Students from very rich backgrounds
- Students in my major or field of interest
- Students involved in my campus organization
- Students of my racial or ethnic background
- Students who are serious about getting good grades
- Students with disabilities
- Transfer students

With which ONE of these groups do you MOST strongly identify? (Choose one)

Artsy students; Athletes/jocks; Conservative students; Feminist students; Fraternity/sorority members; Immigrant students; Lesbian, gay, bisexual, transgender, or self-identified queer students; Liberal students; Partiers; Religious or spiritual students; Slackers; Students from very poor backgrounds; Students from very rich backgrounds; Students in my major or field of interest; Students involved in my campus organization; Students of my racial or ethnic background; Students who are serious about getting good grades; Students with disabilities; Transfer students

With which ONE of these groups do you LEAST identify? (Choose one)

Artsy students; Athletes/jocks; Conservative students; Feminist students; Fraternity/sorority members; Immigrant students; Lesbian, gay, bisexual, transgender, or self-identified queer students; Liberal students; Partiers; Religious or spiritual students; Slackers; Students from very poor backgrounds; Students from very rich backgrounds; Students in my major or field of interest; Students involved in my campus organization; Students of my racial or ethnic background; Students who are serious about getting good grades; Students with disabilities; Transfer students

Please indicate the extent to which you agree with the following statements.

Strongly disagree; Disagree; Somewhat disagree; Somewhat agree; Agree; Strongly agree

Students of my race/ethnicity are respected on this campus

Students of my socio-economic status are respected on this campus

Students of my gender are respected on this campus

Students of my religious beliefs are respected on this campus

Students of my political beliefs are respected on this campus

Students of my sexual orientation are respected on this campus

Students of my immigration background are respected on this campus

Students with a physical, psychological, or learning disability like mine are respected on this campus

PART 3: ITEMS OF SPECIAL INTEREST TO *Name of University*

First, choose to tell us about either the best or the worst advice about your undergraduate education at *Name of University* and about your experience with advising in general. Your responses may be shared anonymously with faculty, staff, and other current and future students as part of an effort to improve the undergraduate experience at *Name of University*.

- BEST advice since starting at *Name of University*
- WORST advice since starting at *Name of University*

What was the advice and how did it affect your undergraduate education? Please describe only one and use fewer than 50 words.

Is there a *Name of University* faculty or staff member who has gone above and beyond the call of duty to help you succeed at *Name of University*? Please identify this person and describe briefly their efforts on your behalf.

Before you came here, to whom did you turn for advice about preparing for or selecting colleges? Please select up to three.

- Parent or guardian
- Another relative of yours
- Friend not enrolled in college
- A *Name of University* undergraduate
- Friend enrolled in a college or university other than *Name of University*
- High school counselor
- High school teacher
- College or university teacher
- College or university adviser
- College or university websites
- Other websites or publications
- Other

Thinking back to when you were applying to colleges, which of the following types of information did you look for on university websites? Please mark all that apply.

- Information about specific majors and/or programs of study
- Admissions requirements
- Current student profiles
- Data on graduation rates
- Data on job placement rates and starting salaries
- Information about housing
- Information about tuition and costs
- Information about financial aid
- Information about student clubs
- Information about athletics
- Quick facts about the institution
- Frequently Asked Questions (FAQs)
- Ways to interact with members of the university community (e.g. email, portals, blogs)
- None of the above
- Other

Reflecting on your high school experience, what do you wish you would have done to improve your preparation for *Name of University*? Please use fewer than 50 words.

If you had an academic challenge or were experiencing trouble with a class, what top one, two, or three people/places would you turn to first for help? Please select up to 3.

- Parent/other relative
- Friend/roommate
- Resident assistant (RA)
- Advising and tutoring resources
- Professor/instructor
- Academic advisor
- Name of University* Learning Center
- Name of University* Counseling and Mental Health Center
- Name of University* Services for Students with Disabilities
- Private tutor or other non- *Name of University* professional

Other *Name of University* Office/Department

Other

Please specify:

If you were talking to a friend or family member who was applying to college, which of the following would you say are the most valuable aspects of attending *Name of University*? Please mark all that apply.

- Academic reputation of the campus
- Reputation of a specific major
- An inclusive and cohesive student body in which new students feel welcome
- A *Name of University* education prepares students well for graduate school
- A *Name of University* education prepares students well for their career
- Availability of student support services and programs
- Opportunities for undergraduates to conduct research
- Opportunities to be engaged with social, environmental, or political issues
- Opportunities to develop skills outside the classroom
- Opportunities for involvement in student government
- Opportunities for involvement in student clubs or groups
- Volunteer and community service experiences
- Availability of study abroad programs
- Name of University* location in...
- Access to recreational activities and facilities that help me stay physically fit
- Other

Which major?

Which service or program?

Are you a member of a Greek sorority or fraternity?

Yes; No

Which one?

Please indicate your awareness, use, and level of satisfaction with the following resources at *Name of University*

Are you aware of this service: *Yes; No*

Have you used this service: *Yes; No*

If used, how satisfied are you: *Not at all satisfied; Somewhat satisfied; Satisfied; Very satisfied*

List of services at university

Think about the one activity, involvement, or ongoing experience that makes you feel most connected to *Name of University*. Which of these best describes the nature of this connection to *Name of University*? (Choose one)

Primarily academic (related to major, etc.); Primarily co-curricular (student group or other organized activity, etc.); Primarily interpersonal (friends, informal activities, etc.)

Which of these best describes how you identify with *Name of University*? (Choose one)

*It is my core identity -- I am a *Name of University*!; It is a very important part of who I am; It is a somewhat important part of who I am; It is a part of who I am, but not that important; I do NOT identify with *Name of University* at all*

If you were seeking information for the first time from a *Name of University* office such as list of offices, what would be your preferred way of finding this information? (Choose one)

I would go to the website; I would call on the phone; I would visit the office in person; I would ask a fellow Name of University student; I would ask a professor/instructor; I would ask a Name of University non-student staff member; Other

During this academic year, how often have you communicated with a Name of University faculty or staff member using social media (including sites like Facebook or Twitter)?

Never; Rarely; Occasionally; Somewhat often; Often; Very often

What is the main source you use to receive information about the Name of University community (i.e. events, announcements, etc.)? (Choose one)

University website; University email; Non-University email; Facebook; Twitter; Text messages; Student newspaper; Other

How would you prefer to receive information about the Name of University community (i.e. events, announcements, etc.)? (Choose one)

University website; University email; Non-University email; Facebook; Twitter; Text messages; Sstudent newspaper; Other

Please rate your proficiency in the following areas when you started at this campus and now.

When you started here & Current ability level

Poor; Fair; Good; Very good

I balance schoolwork with my other activities and commitments.

I allow enough time to complete multiple drafts of an assignment if necessary.

When I encounter a challenging problem or assignment that I can't solve immediately, I keep working until I find a solution.

I actively participate in class discussions.

I participate in study groups outside of class.

I seek out professors, TA's, peers, or other resources for help outside of class.

I have identified what is necessary for entry into the careers that I may be interested in.

I know my academic strengths and weaknesses.

I can identify steps I need to take to reach my educational goals.

I break down complex problems into smaller, more manageable parts.

I use appropriate research methods when completing assignments.

I evaluate the information I find for quality, validity, credibility, and relevance.

I create charts, graphs, and/or outlines to organize and help interpret complex information.

I adapt my research methods when I come across something unexpected.

I evaluate the strengths and weaknesses of arguments.

I support my ideas with evidence.

I avoid plagiarism in my work.

I know that the things I learn in class will be useful to me later in life.

Thinking of your overall classroom experience this past semester, what is your level of agreement with each of the following?

Strongly disagree; Somewhat disagree; Somewhat agree; Strongly agree

Many of my classes had too many students for effective teaching

Several of my classrooms were overcrowded

The workload in many of my classes was excessive

Too many of my classes have a strictly lecture format

Too few of my classes used information technology effectively

Too many of my classes overused online technology

Too few of my classes encouraged student participation

Most of my classes allowed for the pursuit of my own interests to some degree

Thinking of your overall classroom experience this past semester, what is your level of agreement with each of the following?

Last semester, most of my professors/instructors . . .

Strongly disagree; Somewhat disagree; Somewhat agree; Strongly agree

Were clear about the expectations they had for student success

Were fair in their grading practices

Took into account different learning styles of students

Showed an interest in my opinions

Attempted to understand any difficulties I had

Provided clear and useful explanations of ideas

Worked hard to make the subjects interesting

Provided helpful feedback other than grades on my progress

Allowed adequate time frames for work to be completed

Explained the standard of work expected

Emphasized understanding, not just the memorization of facts

Encouraged peer group interaction inside the classroom

Encouraged peer group interaction outside the classroom

Please indicate whether you participated in the following and rate their importance to your success at

Name of University:

Participation: *Participated; Didn't participate*

Importance: *Very important; Important; Somewhat important; Not important*

Academic Advising

Assisting faculty in research

Assisting faculty on creative projects (e.g., musical compositions, product or graphic designs)

Academic enrichment activities (e.g., visiting speakers, performances)

Assistance with academic skills (e.g., time management, goal setting, study skills)

Participating in internship opportunities
Peer mentoring you received
Tutoring you received
Small classes or seminars
Social opportunities with students like you

What is your experience with each of the following services?

Use: *Didn't need; Needed but didn't use; Used*

How important is each service to your success at *Name of University*: *Extremely important; Very important; Somewhat important; Not very important; Not at all important*

List of Services

Student Programs and Services

The following questions were asked to students in the following programs:

List of Programs

Did this contact with *Name of University* staff include any of the following? And if so, how important are these different types of interactions with student affairs/student services staff members to your success at *Name of University*?

How often during this academic year did you spend time with a *Name of University* staff member from [insert program name here]?

Never; Rarely; Occasionally; Somewhat often; Often; Very often

Helping you learn skills not necessarily taught in the classroom (such as leadership or community advocacy, etc.) - Did contact include?

Yes; No or NA

Helping you learn skills not necessarily taught in the classroom (such as leadership or community advocacy, etc.) - How important was this type of interaction to you?

Extremely important; Very important; Somewhat important; Not very important; Not at all important

Providing academic support, such as advising or referral to support services like *Name of Service* - Did contact include?

Yes; No or NA

Providing academic support, such as advising or referral to support services like *Name of Service* - How important was this type of interaction to you?

Extremely important; Very important; Somewhat important; Not very important; Not at all important

Assisting you with problem solving or personal development - Did contact include? *Yes; No or NA*

Assisting you with problem solving or personal development - How important was this type of interaction to you?

Extremely important; Very important; Somewhat important; Not very important; Not at all important

Assisting you in a time of crisis - Did contact include?

Yes; No or NA

Assisting you in a time of crisis - How important was this type of interaction to you?

Extremely important; Very important; Somewhat important; Not very important; Not at all important

Serving as a mentor - Did contact include?

Yes; No or NA

Serving as a mentor - How important was this type of interaction to you?

Extremely important; Very important; Somewhat important; Not very important; Not at all important

Helping you successfully navigate administrative procedures such as registering for classes or obtaining financial aid - Did contact include?

Yes; No or NA

Helping you successfully navigate administrative procedures such as registering for classes or obtaining financial aid - How important was this type of interaction to you?

Extremely important; Very important; Somewhat important; Not very important; Not at all important

Providing you with a well-rounded education - Did contact include?

Yes; No or NA

Providing you with a well-rounded education - How important was this type of interaction to you?

Extremely important; Very important; Somewhat important; Not very important; Not at all important

What is the SINGLE, MOST IMPORTANT thing that your campus could realistically do to create a better undergraduate experience for students like you? Please describe only one and use fewer than 50 words.

Appendix B

Table B.1: Parental Income Level

	Frequency	Percentage
Less than \$10,000	298	3.50%
\$10,000 to \$19,999	467	5.50%
\$20,000 to \$34,999	820	9.60%
\$35,000 to \$49,999	773	9.10%
\$50,000 to \$64,999	769	9.00%
\$65,000 to \$79,999	761	8.90%
\$80,000 to \$99,999	1,027	12.10%
\$100,000 to \$124,999	1,272	14.90%
\$125,000 to \$149,999	563	6.60%
\$150,000 to \$199,999	672	7.90%
\$200,000 or more	1,094	12.80%
Total	8,516	
Missing	4,604	

Table B.2: Income Variable: Comparison of Missing Values to Valid Values

Missing values ($n = 4,604$)

Income variable ($n = 8,516$)

	Missing Values	Percentage	Valid Values
Gender			
Male	46.10%		44.90%
Female	53.90%		55.10%
Ethnicity			
African American	5.30%		4.10%
American Indian	0.50%		0.30%
Asian	20.40%		19.80%
Foreign	4.70%		4.00%
Latino	18.00%		18.50%
Unknown	5.40%		3.30%
White	45.70%		50.00%

Table B.2: Income Variable: Comparison of Missing Values to Valid Values - continued

	Percentage	
	Missing Values	Valid Values
Missing values ($n = 4,604$)		
Income variable ($n = 8,516$)		
Class Level		
Freshman	16.30%	21.40%
Sophomore	21.50%	21.80%
Junior	25.30%	22.60%
Senior	36.90%	34.20%
College		
Architecture	1.20%	1.10%
Business	11.90%	11.11%
Communication	9.50%	10.00%
Education	5.60%	4.70%
Engineering	15.60%	16.80%
Fine Arts	3.10%	2.70%
Geosciences	0.70%	0.80%
Liberal Arts	22.40%	21.40%
Natural Sciences	22.40%	24.30%
Nursing	2.60%	2.30%
Social Work	1.30%	.80%
Undergraduate Studies	3.70%	3.90%

Table B.3: Independent Variables: Satisfaction with Library Support Subfactor

Variable	Scale
How satisfied are you with each of the following aspects of your educational experience overall?	
Educational enrichment programs (e.g. study abroad, internships)	1 = Very dissatisfied 2 = Dissatisfied 3 = Somewhat dissatisfied 4 = Somewhat satisfied 5 = Satisfied 6 = Very satisfied
Accessibility of library staff	1 = Very dissatisfied 2 = Dissatisfied 3 = Somewhat dissatisfied 4 = Somewhat satisfied 5 = Satisfied 6 = Very satisfied
Availability of library research materials	1 = Very dissatisfied 2 = Dissatisfied 3 = Somewhat dissatisfied 4 = Somewhat satisfied 5 = Satisfied 6 = Very satisfied

Table B.4: Results of the General Linear Model with Satisfaction of Library Support and Library-Use Variables

Source	Dependent Variable	Type III Sum of Squares	df	Mean Square	F	Sig.
Corrected Model	Library Spaces Usage	27.699a	1	27.699	13.316	.000
	Library Physical Resources Usage	179.688b	1	179.688	85.034	.000
Intercept	Library Spaces Usage	6558.196	1	6558.196	3152.775	.000
	Library Physical Resources Usage	4861.408	1	4861.408	2300.568	.000
Satisfaction with Library Support	Library Spaces Usage	27.699	1	27.699	13.316	.000
	Library Physical Resources Usage	179.688	1	179.688	85.034	.000
Error	Library Spaces Usage	19794.563	9516	2.080		
	Library Physical Resources Usage	20108.580	9516	2.113		
Total	Library Spaces Usage	100769.000	9518			
	Library Physical Resources Usage	94784.000	9518			
Corrected Total	Library Spaces Usage	19822.262	9517			
	Library Physical Resources Usage	20288.267	9517			

a. $R^2 = .001$ (Adjusted $R^2 = .001$)

b. $R^2 = .009$ (Adjusted $R^2 = .009$)

Table B.5: Dependent Variables: Sense of Belonging and Satisfaction Subfactor

Variable	Scale
Self-reported college GPA	1 = Very dissatisfied 2 = Dissatisfied 3 = Somewhat dissatisfied 4 = Somewhat satisfied 5 = Satisfied 6 = Very satisfied
Value of your education for the price you are paying	1 = Very dissatisfied 2 = Dissatisfied 3 = Somewhat dissatisfied 4 = Somewhat satisfied 5 = Satisfied 6 = Very satisfied
Overall academic experience	1 = Very dissatisfied 2 = Dissatisfied 3 = Somewhat dissatisfied 4 = Somewhat satisfied 5 = Satisfied 6 = Very satisfied
Overall social experience	1 = Very dissatisfied 2 = Dissatisfied 3 = Somewhat dissatisfied 4 = Somewhat satisfied 5 = Satisfied 6 = Very satisfied
Knowing what I know now, I would still choose to enroll in this campus	1 = Strongly disagree 2 = Disagree 3 = Disagree somewhat 4 = Agree somewhat 5 = Agree 6 = Strongly agree
I feel that I belong at this campus	1 = Strongly disagree 2 = Disagree 3 = Disagree somewhat

4 = Agree somewhat
5 = Agree

Table B.6: Dependent Variables: Academic Involvement and Initiative Subfactor
(Academic Engagement)

Variable	Scale
Chosen challenging courses, when possible, even though you might lower your GPA by doing so	1 = Never 2 = Rarely 3 = Occasionally 4 = Somewhat often 5 = Often 6 = Very often
Made a class presentation	1 = Never 2 = Rarely 3 = Occasionally 4 = Somewhat often 5 = Often 6 = Very often
How many professors do you know well enough to ask for a letter of recommendation from?	zero 1 2 3 4 or more
Communicated with a faculty member by email or in person	1 = Never 2 = Rarely 3 = Occasionally 4 = Somewhat often 5 = Often 6 = Very often
Found a course so interesting that you did more work than was required	1 = Never 2 = Rarely 3 = Occasionally 4 = Somewhat often 5 = Often 6 = Very often

Table B.6: Dependent Variables: Academic Involvement and Initiative Subfactor
(Academic Engagement) - continued

Variable	Scale
Talked with an instructor outside of class about issue and concepts derived from a course	1 = Never 2 = Rarely 3 = Occasionally 4 = Somewhat often 5 = Often 6 = Very often
Had a class in which the professor knew or learned your name	1 = Never 2 = Rarely 3 = Occasionally 4 = Somewhat often 5 = Often 6 = Very often
Interacted with faculty during lecture class sessions	1 = Never 2 = Rarely 3 = Occasionally 4 = Somewhat often 5 = Often 6 = Very often
Contributed to a class discussion	1 = Never 2 = Rarely 3 = Occasionally 4 = Somewhat often 5 = Often 6 = Very often
Brought up ideas or concepts from different courses during class discussions	1 = Never 2 = Rarely 3 = Occasionally 4 = Somewhat often 5 = Often 6 = Very often
Asked an insightful question in class	1 = Never 2 = Rarely

3 = Occasionally
 4 = Somewhat often
 5 = Often
 6 = Very often

Table B.7: Dependent Variables: Academic Disengagement Factor

Variable	Scale
Participating in student clubs or organizations	0 1 - 5 6 - 10 11 - 15 16 - 20 21 - 25 26 - 30 More than 30
Participating in physical exercise, recreational sports, or physically active hobbies	0 1 - 5 6 - 10 11 - 15 16 - 20 21 - 25 26 - 30 More than 30
Pursuing a recreational or creative interest (arts/crafts, reading, music, hobbies, etc.)	0 1 - 5 6 - 10 11 - 15 16 - 20 21 - 25 26 - 30 More than 30
Watching TV	0 1 - 5 6 - 10 11 - 15 16 - 20 21 - 25

	26 - 30 More than 30
Using the computer for non-academic purposes (games, shopping, email/instant messaging, etc.)	0 1 - 5 6 - 10 11 - 15 16 - 20 21 - 25 26 - 30 More than 30
Attending movies, concerts, sports, or other entertainment events	0 1 - 5 6 - 10 11 - 15 16 - 20 21 - 25 26 - 30 More than 30
Partying	0 1 - 5 6 - 10 11 - 15 16 - 20 21 - 25 26 - 30 More than 30
Socializing with friends	0 1 - 5 6 - 10 11 - 15 16 - 20 21 - 25 26 - 30 More than 30
Turned in a course assignment late	1 = Never 2 = Rarely 3 = Occasionally 4 = Somewhat often

	5 = Often 6 = Very often
On average, how much of your assigned course reading have you completed this academic year?	0 - 10% 11 - 20% 21 - 30% 31 - 40% 41 - 50% 51 - 60% 61 - 70% 71 - 80% 81 - 90% 91 - 100%
Skipped class	1 = Never 2 = Rarely 3 = Occasionally 4 = Somewhat often 5 = Often 6 = Very often
Gone to class without completing assigned reading	1 = Never 2 = Rarely 3 = Occasionally 4 = Somewhat often 5 = Often 6 = Very often
Gone to class unprepared	1 = Never 2 = Rarely 3 = Occasionally 4 = Somewhat often 5 = Often 6 = Very often
Were easy requirements a factor in deciding major?	Yes No
Was allowing time for other activities a factor in deciding major?	Yes No
Community service	0 1 - 5

6 - 10
11 - 15
16 - 20
21 - 25
26 - 30
More than 30

Appendix C

Tables C.1 and C.2: ACT and SAT Concordance Tables

Table 1

Concordance Between ACT Composite Score and Sum of SAT Critical Reading and Mathematics Scores

SAT CR+M (Score Range)	ACT Composite Score	SAT CR+M (Single Score)
1600	36	1600
1540–1590	35	1560
1490–1530	34	1510
1440–1480	33	1460
1400–1430	32	1420
1360–1390	31	1380
1330–1350	30	1340
1290–1320	29	1300
1250–1280	28	1260
1210–1240	27	1220
1170–1200	26	1190
1130–1160	25	1150
1090–1120	24	1110
1050–1080	23	1070
1020–1040	22	1030
980–1010	21	990
940–970	20	950
900–930	19	910
860–890	18	870
820–850	17	830
770–810	16	790
720–760	15	740
670–710	14	690
620–660	13	640
560–610	12	590
510–550	11	530

Table 2

Concordance Between ACT Combined English/Writing Score and SAT Writing Score

SAT Writing (Score Range)	ACT English/Writing Score	SAT Writing (Single Score)
800	36	800
800	35	800
770–790	34	770
730–760	33	740
710–720	32	720
690–700	31	690
660–680	30	670
640–650	29	650
620–630	28	630
610	27	610
590–600	26	590
570–580	25	570
550–560	24	550
530–540	23	530
510–520	22	510
480–500	21	490
470	20	470
450–460	19	450
430–440	18	430
410–420	17	420
390–400	16	400
380	15	380
360–370	14	360
340–350	13	340
320–330	12	330
300–310	11	310

Source: College Board, 2009

Appendix D

Table D.1: Results of Interactions from General Linear Models

Interactions of Independent Variables	Outcome Variable	Times Significant at <.05
CumGPA*Physical Resources	Academic Engagement	1
CumGPA*Spaces	Academic Engagement	1
Discipline*Spaces	Overall Engagement	1
Discipline*Spaces	Academic Disengagement	1
Ethnicity*Spaces	Overall Engagement	1
Gender*Spaces	Academic Engagement	1
Parental Income*Physical Resources	Academic Engagement	1
SAT Score*Physical Resources	Overall Engagement	1
Year*Physical Resources	Academic Engagement	1
Year*Spaces	Overall Engagement	1
Year*Spaces	Academic Engagement	1
CumGPA*Physical Resources	Overall Engagement	2
Ethnicity*Physical Resources	Academic Disengagement	2
Ethnicity*Spaces	Academic Disengagement	2
Library Satisfaction*Spaces	Academic Engagement	2
Parental Income*Physical Resources	Overall Engagement	2
Parental Income*Physical Resources	Academic Disengagement	2
Parental Income*Spaces	Overall Engagement	2
CumGPA*Spaces	Overall Engagement	3
Library Satisfaction*Spaces	Academic Disengagement	3

Library Satisfaction*Physical Resources	Overall Engagement	4
Library Satisfaction*Physical Resources	Academic Engagement	5
Library Satisfaction*Spaces	Overall Engagement	4

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