



From Matriculation to Graduation: Alignment of Library Data with University Metrics to Quantify Library Value

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This project was funded, in part, from an Academic Library Impact Research Grant awarded by the Association of Colleges & Research Libraries.

To determine which engagement factors contribute to student success at a large, public, research university in the southeast, the university library, along with representatives from Academic Affairs, Student Affairs, and other academic and support units across campus have agreed to collaborate in the alignment and analysis of student data and to contribute their data to a repository that will enable longitudinal study. The study indicates that library, co-curricular, and extracurricular activities have a significant and positive impact on student success in terms of GPA and credit hour completion rates. The model developed for this study is one that is easily transferable to other organizations.

Introduction

Academic libraries are frequently called upon to document their value when competing for university resources. While libraries track data relating to student engagement, it is challenging to quantify a library's overall contribution to student success by virtue of its role as a service unit. Student success, retention, and graduation rates have become critical issues in higher education, with more than 40% of individuals seeking a 4-year degree dropping out within 6-years.¹ Tinto's *social integration theory* posits that students need integration into formal and informal academic and social systems of the university to be successful.² This model holds that engagement in these formal and informal systems strengthens students' academic intentions, goals, and commitment to their institutions, making them more likely to graduate. While higher education institutions are making concerted efforts to retain their students and promote intellectual development through High Impact Practices (HIPs), myriad other factors may be at work which significantly impact student success.³ Through the lens of the *social integration theory*, formal engagement with the university may also include (1) library engagement, (2) use of student academic support services, and (3) participation in co- and extracurricular activities.

To assess which engagement factors significantly contribute to student success, retention, and graduation rates at one large, public research university in the southeast, the university library, along with representatives from Academic Affairs, Student Affairs, and other academic support units across campus have agreed to contribute their co-curricular and extracurricular student data to a repository that will enable a multifaceted and

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evolving longitudinal study. The joint project will not only allow the library to quantify its impact on student success, but also help university leaders identify other critical areas of student engagement. Alignment of student engagement data with measures of student success including GPA, credit hour completion rates, retention, and graduation rates not only involves identifying key student success and engagement metrics, but also requires careful consideration and protection of patron/student privacy. Key findings from this study, along with the processes involved in aligning and analyzing these data, are outlined in this paper.

As such, the objectives for this study are threefold and align closely with key Priority Areas identified in the Association of College & Research Libraries' (ACRL) *Academic Library Impact Report*, which calls for librarians and information professionals to conduct research that will demonstrate library contributions to student learning and success.⁴ The first objective of the study, which aligns with ACRL Priority 3, is to include library data in institutional data collection. The second objective, to quantify the library's impact on student success, aligns with ACRL Priority 4. The third objective, which follows logically from the first two, is to create a transferable model for aligning and assessing university metrics. To meet these objectives, the university library at the University of North Carolina at Charlotte (UNC Charlotte) is leading an initiative to assess student engagement and its impact on student success by forming partnerships with the university's Office of Institutional Research, the Division of Student Affairs, the University Career Center, the University Center for Academic Excellence (UCAE), the Writing Resources Center, and the University Speaking Center to gather, align, and analyze student engagement and success data.

UNC Charlotte is an urban, research institution with the Carnegie Classification Doctoral Universities: Higher Research Activity. With an enrollment of nearly 30,000 FTE (24,000 undergraduates), UNC Charlotte has the third largest undergraduate enrollment among the 17 institutions of the University of North Carolina System (Fall 2018). The university accepts 66% of applicants while incoming classes are 55% new freshmen and 45% transfers. The persistence rate is 80% for the first to the second year. The university emphasizes student participation in research with faculty and in internships in the Charlotte community. Nearly 80% of students participate in internships and other research activities.

This paper represents the third iteration of data analysis and reporting related to this project. Findings from the first iteration were shared in a presentation at the 2018 Assessment Institute in Indianapolis, Indiana, in October, 2018.⁵ The first analysis included student engagement and success data (Cumulative 6-year GPA and Months-to-Graduation) from students who matriculated during the summer or fall 2012, but did not include pre-college/demographic factors such as high school GPA, ACT/SAT scores, Pell grant awards, incoming transfer credits, etc. The second iteration of the study involved the same set of student data, but also included pre-college and demographic factors. Findings from the second round of analysis were presented at the 2018 ARL Library Assessment Conference in December 2018, with the corresponding paper scheduled for publication in the conference proceedings.⁶ In the third iteration of the study, the data set has been expanded three-fold to include undergraduate students who matriculated in the summer or fall 2012, 2013, and 2014. This data set includes the same student engagement and pre-college/demographic factors that were used in the previous studies, but this time uses 4-year cumulative GPA and credit hour completion rates as the dependent variables. With each iteration of analysis and reporting comes a deeper understanding of the data, maturity in analytical techniques, and new insights through the continual synthesis of findings.

Literature Review

Throughout the library and information studies literature, findings from a variety of studies have shown that library usage is positively correlated with academic success.⁷ In a study investigating library usage patterns and

academic achievement of students enrolled in nearly 200 courses at a single university, findings suggested that students who “read” more, measured in terms of borrowing books and accessing electronic resources, achieved better grades.⁸ Likewise, findings from a study of 8,701 library records and GPA revealed statistically significant, positive correlations between GPA and checkouts of library materials.⁹

Other study findings indicated that participation in library instruction is significantly related to students’ GPA.¹⁰ For example, a statistically significant increase in GPA among graduating students who were enrolled in classes that participated in at least one library instruction session (n=1,265) was demonstrated over students who were enrolled in classes that were not exposed to library instruction (n=115).¹¹ Similarly, in a large scale study of 42,624 students across 12 universities for the academic year 2014-2015, findings suggested that the first-year GPA for students whose courses included information literacy instruction was significantly higher than the GPA of students enrolled in courses which did not include such instruction.¹²

More recently, Soria, Fransen, and Nackerud conducted a series of studies in which they examined the relationships between student academic achievement (GPA, degree completion, retention, and student learning outcomes) and library usage, particularly among first-year students, as documented through a variety of variables (e.g., online databases access, electronic book usage, electronic journal logins, library website logins, material borrows, interlibrary loan borrows, library workstation logins, and engagement with library staff through instruction sessions or reference interactions) along with pre-college metrics (e.g., high school GPA, SAT/ACT scores) and demographic factors (e.g., gender, international student, race, first-generation college student, Pell grant, college of enrollment, first year seminar, campus housing, SAT/ACT scores, incoming college credits, and participation in a student academic success program).¹³ The findings from these studies revealed statistically significant regression models that predicted a variety of dependent variables, including students’ academic engagement, academic skills, engagement in scholarship, GPA, continued enrollment or graduation, and learning outcomes.¹⁴ In particular, the results from two of these studies suggested that four types of library services were positively and significantly associated with students’ cumulative GPA: database logins, book loans/renewals, electronic journal logins, and use of library workstations.¹⁵ The model used for Soria, Fransen, and Nackerud’s 2013 and 2014 studies was particularly helpful in designing the current study.¹⁶ Extending these studies further, the present study also includes student engagement variables from other academic support units across the university, High Impact Practice data captured from the university’s participation in the National Survey of Student Engagement (NSSE, 2014, 2016, 2018), and student affairs’ engagement data to include participation in sports clubs and Greek social organizations.

The study addresses three research questions.

1. How can libraries connect their data with student outcomes?
2. What effects do libraries have on success outcomes for different types of students?
3. How can libraries supplement the data collected by other university departments to document student engagement and success?

Methodology

A two-phase, mixed model was designed to include three data collection strategies across two phases. In Phase I, researchers conducted interviews and meetings with university stakeholders to gather insights for Phase II activities. In Phase II, researchers accessed and aligned datasets and conducted statistical analyses (e.g., ANOVA, Regression) to identify significant factors related to student engagement and success. The independent variables were aligned and integrated with the dependent variables to form a transferable model for longitudinal data analysis.

Phase I

Phase I began with a single brainstorming meeting in February 2018 with the key institutional research and assessment personnel (specialists) on campus to discuss the justifications for and viability of the project. The researchers and specialists discussed how we could align data (independent variables) on individual students from many different campus entities and even more systems and connect them to the dependent variables held in the student information system (Banner). Attendees included library dean, library head of assessment, executive director of Office of Assessment & Accreditation, assistant provost for Institutional Research, director of Research Compliance, associate vice chancellor for Students Affairs for research & systems, and divisional director of Student Affairs for research & assessment. The library participants were surprised that a few of the individuals had never met before we brought them together. A few months later they are working together cohesively on a variety of campus projects. During the initial meeting, the group created a list of potential partners, established the goals for the project, identified the dependent variables of interest, and agreed on the initial data alignment and de-identification process for the pilot.

The library agreed to lead the project and recommended as potential partners the academic support services offered in or near the library building: University Career Center, University Center for Academic Excellence (tutoring, supplemental instruction, and affiliated services), Writing Resources Center, and the University Speaking Center. We selected these partners as they are “academic support” or co-curricular services, mostly formal activities, that were already collecting student identifying information during interactions. We wanted to include the most recent results relating to High Impact Practices from the National Survey of Student Engagement (2018) and as many Student Affairs metrics as were available in a compatible format (Greek Life and Sports participation).

The partners would extract data on interactions and participation by student identifier (student ID # or email prefix) from their respective system(s). The library’s head of assessment would gather the data from the partners once they agreed to sign onto the project with one representative from each partner being added to the IRB Protocol. She would align the incoming datasets and deliver them to the assistant provost for Institutional Research who would perform the crosswalk from the independent variables to the available dependent variables. We wanted to connect with as many student demographic measures and indicators of student success (dependent variables) as possible (see Appendix A). The assistant provost for Institutional Research then removed the identifiers and returned the dataset to the library’s head of assessment who agreed to run the analyses for the partners.

After the initial brainstorming conversation with the statistical experts, the library conducted individual meetings with the representatives of each of the targeted partners. In each meeting, we explained the project, discussed the data the partner collected, discussed how to extract it from the system(s) used by the partner, discussed how to format it for delivery to the head of assessment, and worked to gain buy-in. Overall, getting buy-in was easy, though we had many conversations about how to protect student privacy, the benefits of the project to each partner, and how the data would be used in the aggregate. The Writing Resources Center took the most effort to persuade perhaps because they do not work with datasets, statistical tests, and analyses on a regular basis.

The partners asked a variety of questions during the interviews with the partners and provided the following responses.

Question #1: *How do we know that the student’s personal information will be protected?*

Your representative who has been approved through the IRB protocol will gather email usernames or student ID number in your software system(s) along with the independent variables during the regular conduct of your services. On a regular basis (typically the end of the semester or academic year), the representative will

extract reports and/or spreadsheets and send them to the assistant provost for Institutional Research. He will load the data into the Student Information System and run aggregated reports upon request and typically for end of semester or year reporting or for specific research projects.

Question #2: *Who will have access to the PII?*

The Personally Identifiable Information (PII) of students (typically email username and/or student ID number) will be resident in the partner's system(s), but only available to the representative who is listed on the IRB. The partner is responsible for maintaining confidentiality of the information contained in the partner's system(s) according to campus security protocols. The assistant provost for Institutional Research receives data loads from each partner, makes the connections to the Student Information System, and runs the desired reports. He returns the aggregated, de-identified reports. Partners in the project will only have access to PII they interacted with as stored within their own systems and will otherwise see only de-identified data and aggregated reports.

Question #3: *Who will make the crosswalks?*

The assistant provost for Institutional Research creates the connections from the datasets from each partner to a selected hook in the Student Information System. Only that individual knows what hook (a different identifier than the email username or student ID number provided by the partners) is used to link the records from each partner to the SIS data.

Question #4: *What information do I have to provide, in what form, and to whom?*

The partner will need to present retrospective, current, and future datasets at agreed upon dates to the assistant provost for Institutional Research. The dataset, typically an Excel spreadsheet extracted from the partner's software system(s), should include a column with the email username or student ID number followed by columns for each of the independent variables collected. The specific variables should be discussed in a meeting with the head of assessment of the library and the assistant provost for Institutional Research. Additional variables can be added later.

Question #5: *How will I get reports?*

The partner sets up a schedule in advance of what reports should be generated and when with the assistant provost for Institutional Research. The partner may work with the assistant provost for Institutional Research to produce reports from the partner's dataset that are not part of the current research project. A graduate assistant may be needed to produce reports if the assistant provost for Institutional Research is too busy.

Once it looked like we had sufficient partners to make the project viable, the Office of Research Compliance helped the researchers write the IRB application form and ensure everything related to the study and protection of student data was in place. With IRB approval, the researchers asked each partner to have the primary representative sign on to the IRB.

Phase II

In the first alignment effort for the project, engagement and success data were compiled and aligned from all initial partners (see Appendix A) to include academic years 2012-2013 through 2017-2018, though there are some inconsistencies in the data contributed, as some partners did not have full datasets dating back to 2012. Overall, data from the library, the University Career Center, and the University Center for Academic Excellence was most complete, as these offices provided data for all six years of interest. The University Speaking Center provided data

for the 2016-2017 and 2017-2018 academic years while the Writing Resources Center data included the 2013-2014 to 2017-2018 period. Greek organization and sports teams/clubs membership was included for the two most recent academic years. NSSE data were compiled, consolidated, and included in the study for 2014, 2016, and 2018. At this point, there are over 70,000 individual student records and 375 variables included in the study. The partners plan to include new data for each semester moving forward.

In the first two iterations of data analysis and reporting, the sample of data was comprised of student records from undergraduate students who matriculated into the university in summer or fall 2012. The sample of data was expanded for this current, third round, of the study to include undergraduate students who matriculated into the university in the summer or fall 2012, 2013, and 2014. This sample was selected to generate a data set that included three times as many student records that could answer questions related to students' engagement with the university throughout a 4-year window and to allow for predictions of cumulative GPA and credit hour completion rates after four years. Credit hour completion rates were calculated by dividing the total earned credit hours (all credit hours at UNC Charlotte for which a grade of A, B, C, D, or P were entered) by total attempted hours (all credit hours at UNC Charlotte for which a student was registered at the end of Drop/Add, includes hours for withdrawn courses). In all, there were 15,437 viable records for analysis that met the parameters outlined for the study. Of these, 9,417 students were initially admitted to the university as new freshmen and 6,020 were admitted as new transfer students. A full set of frequency data related to the students' pre-college and demographic variables is outlined in Appendix B.

While cumulative GPA has been a frequently reported measure of student success for decades, the use of credit hour (or course) completion rates is becoming increasingly common not only as a measure of student success, but as a way to assess whether students are meeting the satisfactory academic progress thresholds necessary to maintain financial aid eligibility.¹⁷ In addition, some states, including Tennessee, Ohio, and Indiana, have recently passed legislation that ties higher education funding to factors such as graduation and course completion rates rather than enrollment.¹⁸

Regression and Analysis of Variance (ANOVA) tests were used to predict the two measures of student success identified for this study, 4-year cumulative GPA and credit hour completion rates. Significance thresholds were limited to ($p < .05$). Stepwise multiple regression analysis was used as it allowed the researchers to explore the data for relationships when there was uncertainty as to whether relationships did, in fact, exist.¹⁹ One-way ANOVAs, a statistical test used to compare mean scores within and between groups, were calculated only for those samples meeting a sample size of at least 30, depending upon the number of groups being analyzed. Group size thresholds were established using G*Power 3 using an a priori power analysis.²⁰ In addition, Levene's test for homogeneity of variance was conducted for all ANOVA tests. Assumptions of homogeneity of variance (Levene's test, $p > .05$) were not met for the majority of groups, thus Welch's adjusted ANOVA test, a more robust test that is particularly useful with unequal sample sizes, was used in place of the traditional ANOVA F test. For all significant ANOVAs that included more than two categories for a demographic variable, Games-Howell post hoc analyses were conducted.

Results

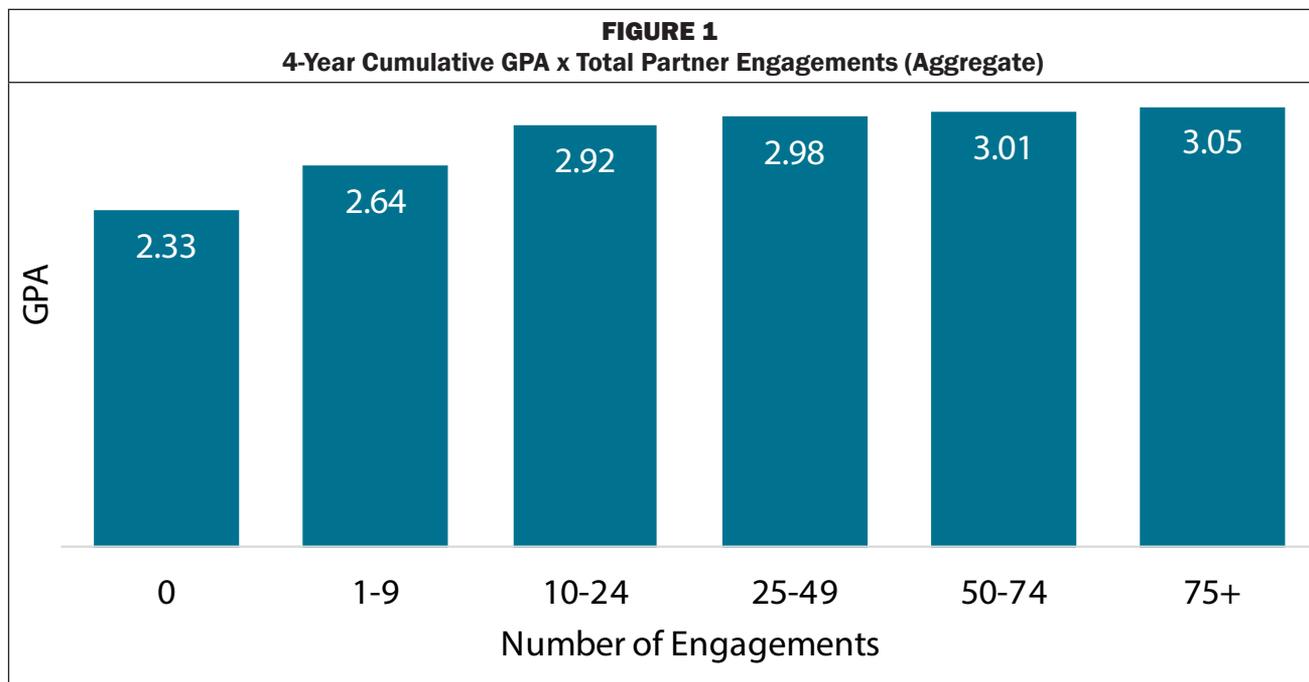
Analysis of Variance

ANOVA tests were run for all categorical variables to see if there were significant and noteworthy differences among groups related to 4-year cumulative GPA and credit hour completion rates. These tests were first conducted in the aggregate and then re-run for students who matriculated as new freshmen and for those who matriculated as new transfers. There were myriad significant ANOVAs (see Appendix C) related to the two de-

pendent variables. Effect sizes, measured using eta squared (η_p^2), largely fell into low (.01–<.05) to medium range (.05–<.10), with one grouping variable falling into the high (.10 +) range (total engagements overall).

4-year Cumulative GPA

Particularly noteworthy among the ANOVAs are findings that suggest 4-year cumulative GPA differs significantly in the aggregate depending on the total number of engagements with university co-curricular and extra-curricular services, with a moderate effect size as illustrated in Figure 1 (Welch's $F_{(5,4532.268)}=140.249$, $p < .01$, $\eta_p^2=.06$). Even stronger findings were revealed when the test was run for the freshmen matriculant subset (Welch's $F_{(5,1519.604)}=145.382$, $p < .001$, $\eta_p^2=.10$). ANOVA findings for students who matriculated as transfers were also significant, though with a small effect (Welch's $F_{(5,2028.277)}=18.294$, $p < .001$, $\eta_p^2=.02$). Post-hoc analysis revealed that students who engaged with the participating units in this study less than 10 times earned significantly lower GPAs than all others (Appendix C—Table 1).



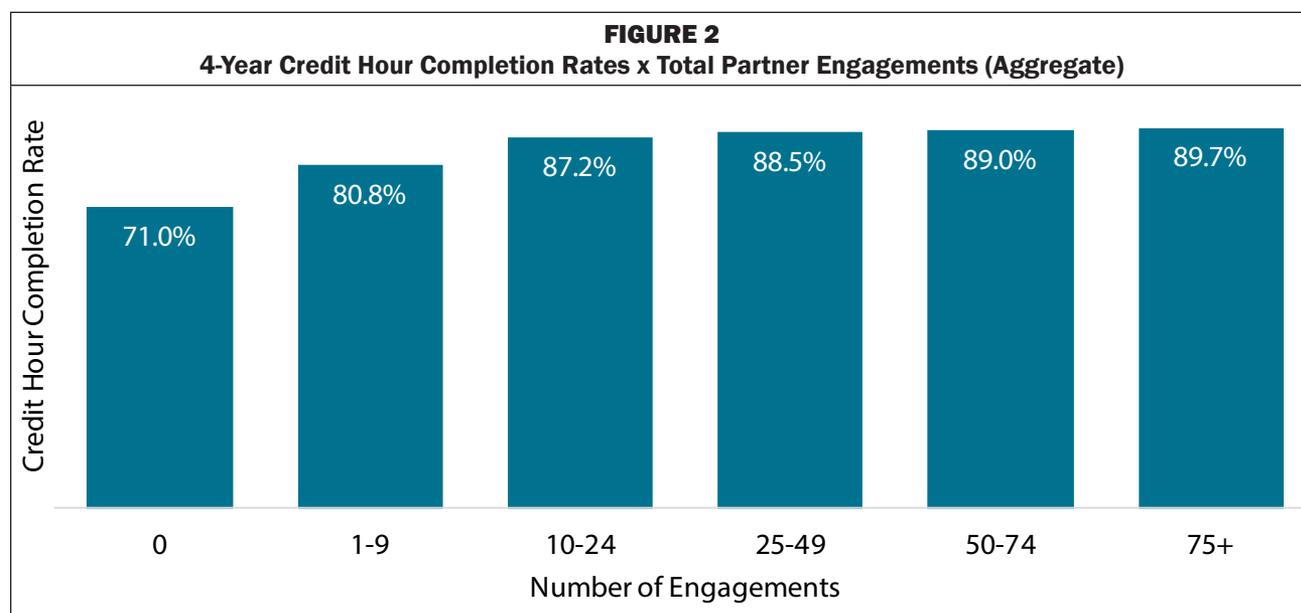
When broken down by particular partner, significantly higher 4-year cumulative GPAs were indicated for students who engaged more frequently with the University Career Center (Welch's $F_{(4,952.23)}=315.29$, $p < .01$, $\eta_p^2=.06$), the University Center for Academic Excellence (Welch's $F_{(4,3580.67)}=71.482$, $p < .001$, $\eta_p^2=.01$), the library (Welch's $F_{(4,6910.978)}=151.417$, $p < .001$, $\eta_p^2=.05$), and the Writing Resources Center (Welch's $F_{(2,1379.898)}=242.059$, $p < .001$, $\eta_p^2=.02$) in the aggregate, for students who matriculated as new freshmen, and for those who matriculated as transfer students. Results relating to the University Speaking Center are not shown, as the sample sizes were too small to be reliable. Overall, ANOVA effect sizes for 4-year cumulative GPAs for partner engagements largely fell into the low range, with the exception of the University Career Center and the library which fell into the medium range for both the aggregate and for new freshman. (See Appendix C—Table 1 for a full listing of ANOVAs and descriptive statistics relating to 4-year cumulative GPA.)

Finally, when analyzed by particular library activities, logins to library resources via EZ Proxy (Welch's $F_{(5,785.886)}=225.047$, $p < .001$, $\eta_p^2=.05$), participation in library instruction (Welch's $F_{(3,5667.725)}=204.046$, $p < .001$,

$\eta_p^2 = .03$), reservations placed for library study rooms (Welch's $F_{(3,4738.781)} = 334.92$, $p < .01$, $\eta_p^2 = .05$), checkouts of library books (Welch's $F_{(4,2630.137)} = 141.488$, $p < .001$, $\eta_p^2 = .03$), logins to library computers (Welch's $F_{(3,7158.776)} = 81.265$, $p < .01$, $\eta_p^2 = .02$), and checkouts of library laptops (Welch's $F_{(3,2943.09)} = 41.376$, $p < .001$, $\eta_p^2 = .01$) and other materials (Welch's $F_{(4,2325.356)} = 46.661$, $p < .001$, $\eta_p^2 = .01$) had significant and noteworthy findings with respect to 4-year cumulative GPA, not only in the aggregate, but for students who matriculated as new freshmen and new transfers. (See Appendix C—Table 1.) ANOVA results also revealed that 4-year cumulative GPA differed significantly depending upon the number of High Impact Practices a student participated in, as reported on the NSSE, not only for the aggregate (Welch's $F_{(2,381.204)} = 410.376$, $p < .01$, $\eta_p^2 = .02$), but also for students who matriculated as new freshmen (Welch's $F_{(2,227.67)} = 247.224$, $p < .01$, $\eta_p^2 = .02$) and new transfers (Welch's $F_{(2,131.991)} = 160.82$, $p < .01$, $\eta_p^2 = .01$). Similar results were noted for students who participated in Greek organizations and sports clubs. (See Appendix C—Table 1.)

4-year Credit Hour Completion Rates

ANOVA tests were also conducted for all categorical variables to assess for group differences related to credit hour completion rates (Appendix C—Table 2). These results largely mirrored those noted for the 4-year cumulative GPA, with myriad significant and meaningful findings. Particularly noteworthy among the findings were the results relating to total engagements overall (Welch's $F_{(5,4036.026)} = 103.323$, $p < .001$, $\eta_p^2 = .05$), which revealed that students who engaged more frequently with any of the partners achieved significantly higher credit hour completion rates than other students (see Figure 2). Likewise, significant ANOVAs with medium effect sizes were also noted based upon the number of engagements with the University Career Center (freshmen subset—Welch's $F_{(4,634.782)} = 204.711$, $p < .001$, $\eta_p^2 = .07$) and the library (freshmen subset—Welch's $F_{(4,3982.122)} = 92.327$, $p < .001$, $\eta_p^2 = .06$).



Stepwise Regression

Stepwise Regression tests revealed numerous, statistically-significant models that predicted 4-year cumulative GPA (Appendix D—Table 1) and credit hour completion rates (Appendix D—Table 2), not only for the aggregate, but also for students who matriculated either as freshmen or transfer students. For each of the dependent variables, separate regression analyses were run to include:

1. Total of all engagements across all partners;
2. Total engagements X partner;
3. Total engagements X specific partner activities;
4. All specific partner activities X Pre-college/demographic factors
 - a. Weighted high school GPA;
 - b. ACT/SAT scores (standardized);
 - c. Incoming transfer credits (including AP credits);
 - d. Pell grant—total awarded;
 - e. Greek organization and sports clubs/team participation; and
 - f. High Impact Practices (internships, study abroad, learning community, research with faculty, culminating senior experience, etc.).
5. Total library engagements;
6. Engagements in specific library activities (e.g., study room reservations, library instruction, computer logins, book checkouts, etc.);
7. Engagements in specific library activities, *and*
 - a. Weighted high school GPA;
 - b. ACT/SAT scores (standardized);
 - c. Incoming transfer credits (including AP credits);
 - d. Pell grant—total awarded;
 - e. Greek organization and sports clubs/team participation; and
 - f. High Impact Practices (internships, study abroad, learning community, research with faculty, culminating senior experience, etc.).

Of these 42 regression tests, all were statistically significant ($p < .05$).

4-year Cumulative GPA

Overall, the models which only included university partner data (not pre-college or demographic factors) though statistically significant, predicted, at most, 8.7% of the variance in 4-year cumulative GPA. Adding in pre-college/demographic variables and specific partner activities resulted in noticeably higher ability to predict variances in 4-year cumulative GPA. All statistically-significant regression models related to 4-year cumulative GPA are outlined in Appendix D—Table 1. Overall, the model that included all partner activities along with pre-college/demographic factors for freshmen matriculants was the strongest ($F_{(17,8590)}=144.086$, $p < .001$) and explained 22.2% of the variance in 4-year cumulative GPA. When the pre-college/demographic factors were removed, the model still explained 10.1% of the variance in GPA. The regression equation for the full model (pre-college/demographic and specific activities) was:

$$\begin{aligned} \text{Predicted 4-year Cum GPA for Freshmen Matriculants} = & .626 + .514(\text{Weighted HS GPA}) + \\ & .002(\text{Transfer Credits}) + .106(\text{High Impact Practices}) + .142(\text{Greek Life Membership}) + \\ & .067(\text{Career Fairs}) + .013(\text{Career Workshops}) + .062(\text{Library Instruction}) + .008(\text{Library EZ} \\ & \text{Proxy}) + .001(\text{Library Study Room Reservations}) + .005(\text{Library Book Checkouts}) + .001(\text{Li-} \\ & \text{brary Computer Logins}) + .007(\text{UCAE Supplemental Instruction}) + .008(\text{UCAE Tutoring}) + \\ & .016(\text{Writing Center Consultations}) \end{aligned}$$

In a separate regression analysis that included only specific library activities, the model was able to explain 6.6% of the variance in 4-year cumulative GPA for freshmen matriculants (5.6% for aggregate, 3.8% for new

transfers). Adding in the pre-college/demographic factors provided a model that accounted for 17.7% of the variance in GPA for students who matriculated as new freshmen (17.4% for aggregate, 14.5% for new transfers). This library specific regression equation for the freshmen subset is shown below:

$$\text{Predicted 4-year Cum GPA for Freshmen Matriculants} = .588 + .554(\text{Weighted HS GPA}) + .001(\text{Transfer Credits}) + .077(\text{Library Instruction}) + .010(\text{Library EZ Proxy}) + .003(\text{Library Study Room Reservations}) + .005(\text{Library Book Checkouts}) + .001(\text{Library Computer Logins})$$

4-year Credit Hour Completion Rates

Similar to the models used to predict 4-year cumulative GPA, models which included pre-college and demographic factors had greater ability to explain variance in the 4-year credit hour completion rates. It should be noted, however, that a statistically-significant model using only partner engagement data (no pre-college or demographic factors) was able to explain 8.5% of the variance for the new freshman subset ($F_{(12,8910)}=68.579$, $p < .001$). This model suggests that engagement with specific services offered by the University Career Center, the library, the University Center for Academic Excellence, the Writing Resources Center, High Impact Practices, and Greek organizations is positively associated with higher credit hour completion rates. The regression equation for this model for the freshmen subset was:

$$\text{Predicted 4-year Credit Hour Completion Rate for Freshmen Matriculants} = .805 + .023(\text{High Impact Practices}) + .042(\text{Greek organization membership}) + .019(\text{Career Fairs}) + .007(\text{Career Advising}) + .023(\text{Career—Class Presentations}) + .015(\text{Career Workshops}) + .011(\text{Library Instruction}) + .002(\text{Library EZ Proxy}) + .001(\text{Library Book Checkouts}) + .0002(\text{Library Computer Logins}) + .002(\text{UCAE Supplemental Instruction}) + .002(\text{UCAE Tutoring})$$

When pre-college/demographic factors were added into the regression analysis that included specific partner activities, the model was able to predict 12.4% of the variance for the freshmen matriculant subset ($F_{(16,8146)}=72.181$, $p < .001$), 11.9% for the aggregate ($F_{(14,9145)}=88.005$, $p < .001$), and 7.5% for the transfer student subset ($F_{(6,990)}=13.378$, $p < .001$) (Appendix D—Table 2).

In a separate regression analysis that included only specific library activities, the regression equation was able to predict 3.5% of the variance in 4-year credit hour completion rates ($F_{(5,9397)}=63.728$, $p < .001$) for the freshmen subset, with similar findings for the aggregate ($F_{(5,14524)}=93.012$, $p < .001$, $R^2=.031$) and the transfer subset ($F_{(4,5602)}=30.652$, $p < .001$, $R^2=.021$). Including pre-college/demographic factors, the regression model was able to explain 8.2% of the variance in 4-year credit hour completion rates for the aggregate, 8.3% for the freshmen subset, and 6.1% for the transfer subset (see Appendix D—Table 2). The regression equation to predict 4-year credit hour completion rates for the aggregate that included specific library activities and pre-college/demographic factors was:

$$\text{Predicted 4-year Credits Hour Completion Rate for Aggregate} = .617 + .090(\text{Weighted HS GPA}) - .005(\text{ACT/SAT Standardized}) + .014(\text{Library Instruction}) + .002(\text{Library EZ Proxy}) + .0003(\text{Library Study Room Reservations}) + .001(\text{Library Book Checkouts}) + .0003(\text{Library Computer Logins})$$

While the significant findings from the regression analyses conducted to explain variance in 4-year credit hour completion rates are noteworthy, it should be noted that the regression equations relating to 4-year cumulative GPA had slightly greater predictive power. For example, including all engagement metrics and pre-college/

demographic factors into a regression equation explained 17.7% of the variance in 4-year cumulative GPA, while the same factors explained 8.3% of the variance in the 4-year credit hour completion rates among the freshmen matriculant subset.

Discussion

The findings from the study suggest that engagement with various university resources, including the library, has a statistically significant impact on student success across multiple analysis techniques. In addition to quantifying the library's role in student success, study findings revealed other significant, key areas of engagement for students, including those associated with the University Career Center, the University Center for Academic Excellence, the Writing Resources Center, and the University Speaking Center. These categories of engagement, along with participation in Greek organizations, sports clubs and teams, and High Impact Practices, all lend support to Tinto's theory of social integration, which suggests that academic, co-curricular, and extracurricular engagements all help to increase the chances of student success and the likelihood of graduation.²¹

Aligning co-curricular and extracurricular student engagement metrics with measures of student success can provide powerful insights for universities as they seek ways to promote deep, rich learning while increasing student retention and graduation rates. Creating a central data repository with the right structure and rapid updates would increase the ability to understand what activities and services have a positive influence on student success. The repository should include not only measures of student engagement and success, but also pre-college and demographic variables, as the disaggregation of data is necessary to understand particular categories of students. While the analysis for this study involved disaggregating data according to original admission status (freshman or transfer), it is only a first step in understanding our university population. The model developed for this study, which involved inviting other university constituents to form a partnership, share ideas, make mutually-beneficial decisions, outline responsibilities, work together to identify key metrics, and collaborate to align and analyze complex student data is one that is easily transferable to other organizations. The power of the model to explain our impact on student success will intensify as new partners are identified and brought into the study.

Study Limitations

Although every attempt was made to conduct a thorough and comprehensive exploration of the co-curricular and extracurricular factors relating to undergraduate students' engagement and success, the study was subject to numerous limitations. These limitations relate primarily to the dataset, which had many missing or inconsistent variables that had to be ignored or imputed. Transitioning from the full dataset to the portion with the most complete and reliable data actually improved our ability to explain variations in the data, despite the smaller number of records. Moving forward, the current partners now have a clearer understanding of the categories of data they need to collect and methods for doing so that will make future alignment and analysis much easier and more accurate.

Through this analysis, the researchers realized the advantage of recruiting additional partners, particularly those departments or units responsible for directly managing the High Impact Practices across the university, including those that arrange programs for study abroad, undergraduate research, learning communities, internships, and more. The most significant limitation to the study was relying upon self-report data from the NSSE surveys related to High Impact Practices since completion of NSSE is voluntary and subject to significant inaccuracies inherent in self-reporting. With this third iteration of data analysis and synthesis, the researchers continued to develop a deeper understanding of the dataset and maturity in analyzing the data to tell the most

accurate story of how student engagement and success align. As new partners are identified and additional student engagement data are ingested into the repository, it is anticipated that the ANOVA effect sizes and the ability to explain more variance in the dependent variables through regression analyses will continue to increase.

Conclusions

The study indicates that library, co-curricular, and extracurricular activities have a significant and positive impact on student success in terms of 4-year cumulative GPA and credit hour completion rates. Future studies will emphasize integrating data from additional partners, more consistent gathering of activity metrics, testing other demographic and pre-college factors, and comparing the pre-existing and activity variables to other student success measures. With a greater variety and accuracy of data, we hope to achieve deeper understanding of the relationship between library use and other aspects of student life and student success and graduation.

The study represents one of the first efforts documented in the library and information studies literature in which the library has taken the lead in developing a transferable model for aligning and assessing university student activity and success metrics and in order to quantify the value of the academic library. Too often, we are not aware of what other units across our campuses are doing in support of our mutual goal to promote student learning, success, and graduation. By building relationships and collaborating on the development of an institutional repository of student engagement and success data, campus units may find themselves less focused on competing for valuable campus resources, and more focused on working together for the success of our students.

Appendix A. Variables 2012-2013 to 2017-2018

Library & University Engagement & Success Over Time 2012-2013 to 2017-2018

Library	Student Affairs	University Speaking Center	Writing Resources Center	University Center for Academic Excellence	University Career Center
<p>Primary Keys</p> <ul style="list-style-type: none"> • 800# • Userid <p>Engagement Metrics</p> <ul style="list-style-type: none"> • Study Hall Check-In (Greek) • Library Instruction • Study Room Reservations • After Hours Access • Computer Logins in Library • # Checkouts <ul style="list-style-type: none"> • Books • Laptops • Other Items • Special Collections Access 	<p>Primary Key</p> <ul style="list-style-type: none"> • 800# <p>Engagement Metrics</p> <ul style="list-style-type: none"> • NSSE Data (2014 & 2016 Seniors) <ul style="list-style-type: none"> • HIP Engage (Q 11 & 12) • Intern/Field Exp • Study Abroad • Culm Sr Exp • Lrng Comm • Svc Learning • Res w/ Fac • Club Membership (#/yr) • Greek Life (Yes/No) • Sports Clubs (#/yr) • Recreational Activities (#/yr) • On/Off Campus Housing 	<p>Primary Keys</p> <ul style="list-style-type: none"> • Names & Majors <p>Engagement Metrics</p> <ul style="list-style-type: none"> • Individual consultations • Workshop attendance • Classroom presentations 	<p>Primary Key</p> <ul style="list-style-type: none"> • 800# <p>Engagement Metrics</p> <ul style="list-style-type: none"> • Individual consultations • Workshop attendance 	<p>Primary Key</p> <ul style="list-style-type: none"> • 800# <p>Engagement Metrics</p> <ul style="list-style-type: none"> • Workshop Attendance • Seminars • Mentoring • Classroom Presentations • Tutoring Visits • Supplemental Instruction Attendance 	<p>Primary Key</p> <ul style="list-style-type: none"> • 800# <p>Engagement Metrics</p> <ul style="list-style-type: none"> • Career Fair • Workshops • Class Presentations • Individual consultations

Academic Affairs - Banner

Primary Key: 800#

Demographic Variables: Gender, Age, Major, College, Year in School, On-Campus v Off-Campus Housing, Original Admit Status, First Generation

Dependent Variables:

Per Academic Year (2012-13 through 2017-18) - GPA, Year to Year Retention, Graduation, Time to Graduation

Appendix B. Participant Demographics

	Aggregate n (%)	Entered as Freshmen n (%)	Entered as Transfers n (%)
Original Admit Status	15,437 (100)	9,417 (61.0)	6,020 (39.0)
Matriculation Year (Sum/Fall Matriculants)			
2012-2013	5,072 (32.9)	3,047 (32.4)	2,025 (33.6)
2013-2014	5,100 (33.0)	3,078 (32.7)	2,022 (33.6)
2014-2015	5,265 (34.1)	3,292 (35.0)	1,973 (32.8)
Gender			
Male	7,953 (51.5)	4,900 (52.0)	3,053 (50.7)
Female	7,455 (48.3)	4,510 (47.9)	2,945 (48.9)
High School GPA (Weighted)			
1-2.50	144 (.9)	10 (.1)	134 (2.2)
2.51-3.00	605 (3.9)	329 (3.5)	276 (4.6)
3.01-3.50	2,470 (16.0)	2,116 (22.5)	354 (5.9)
3.51-4.00	3,884 (25.2)	3,574 (38.0)	310 (5.1)
4.01+	3,175 (20.6)	2,973 (31.6)	202 (3.4)
HS Standardized Test Score (SAT/ACT) Standardized to ACT (Max Pts Poss. 36)			
10-15	295 (1.9)	12 (.1)	283 (4.7)
16-20	1,872 (12.1)	906 (9.6)	966 (16)
21-25	7,077 (45.8)	6,204 (65.9)	873 (14.5)
26-30	1,966 (12.7)	1,678 (17.8)	288 (4.8)
31+	219 (1.4)	179 (1.9)	40 (.7)
Incoming Credits (Transfer, AP, etc.)			
0	5,062 (32.8)	5,041 (53.5)	21 (.3)
1-9	2,592 (16.8)	2,550 (27.1)	42 (.7)
10-24	1,461 (9.5)	1,138 (12.1)	323 (5.4)
25-39	1,592 (10.3)	303 (3.2)	1,289 (21.4)
40-59	1,652 (10.7)	148 (1.6)	1,504 (25)
60+	3,078 (19.9)	237 (2.5)	2,841 (47.2)
Pell Recipient			
Yes	7,264 (47.1)	3,888 (41.3)	3,376 (56.1)
No	8,173 (52.9)	5,529 (58.7)	2,644 (43.9)
Sports Club Membership			
Yes	845 (5.5)	688 (7.3)	157 (2.6)
No	14,592 (94.5)	8,729 (92.7)	5,863 (97.4)
Greek Organization Membership			
Yes	1,638 (10.6)	1,429 (15.2)	209 (3.5)
No	13,799 (89.4)	7,988 (84.8)	5,811 (96.5)
Total High Impact Practices			
0	14,923 (96.7)	9,104 (96.7)	5,819 (96.7)
1-2	269 (1.7)	137 (1.5)	132 (2.0)
3-6	245 (1.6)	176 (1.9)	69 (1.1)

Appendix C. ANOVAs & Descriptive Statistics

TABLE 1						
4 Year Cumulative GPA – ANOVAs & Descriptive Statistics						
Independent Variables	F	df	Sig. (<i>p</i>)	Effect (η_p^2)	Post Hoc Sig. Results	Descriptives (Group: N, Mean, SD)
Total Engagements Overall						
Aggregate	140.249	5, 4532.268	< .01	.06	1-9 > 0 10-24 > 0 10-24 > 1-9 25-49 > 0 25-49 > 10-24 50-74 > 0 50-74 > 1-9 50-74 > 10-24 75+ > 0 75+ > 1-9 75+ > 10-24 75+ > 25-49	0: 848, 2.33, 1.42 1-9: 4,696, 2.64, .96 10-24: 3,694, 2.92, .70 25-49: 2,892, 2.98, .61 50-74: 1,261, 3.01, .59 75+: 2,003, 3.05, .56
New Freshmen	145.382	5, 1519.604	< .001	.10	1-9 > 0 10-24 > 0 10-24 > 1-9 25-49 > 0 50-74 > 0 50-74 > 1-9 50-74 > 10-24 75+ > 0 75+ > 1-9 75+ > 10-24 75+ > 25-49	0: 180, 1.97, 1.28 1-9: 2,631, 2.58, .95 10-24: 2,445, 2.96, .67 25-49: 1,974, 3.04, .58 50-74: 857, 3.07, .56 75+: 1,316, 3.13, .53
New Transfers	18.294	5, 2028.277	< .001	.02	1-9 > 0 10-24 > 0 10-24 > 1-9 25-49 > 0 25-49 > 1-9 50-74 > 0 50-74 > 1-9 75+ > 0 75+ > 1-9	0: 668, 2.42, 1.45 1-9: 2,065, 2.72, .98 10-24: 1,249, 2.84, .75 25-49: 918, 2.84, .66 50-74: 404, 2.90, .61 75+: 687, 2.89, .59
University Career Center						
Aggregate	315.291	4, 952.23	< .01	.06	1-2 > 0 3-5 > 0 3-5 > 1-2 6-10 > 0 6-10 > 1-2 6-10 > 3-5 11+ > 0 11+ > 1-2 11+ > 3-5	0: 7,588, 2.64, .96 1-2: 4,735, 2.95, .66 3-5: 2,214, 3.10, .55 6-10: 717, 3.22, .46 11+: 140, 3.24, .46

TABLE 1
4 Year Cumulative GPA – ANOVAs & Descriptive Statistics

Independent Variables	F	df	Sig. (p)	Effect (η_p^2)	Post Hoc Sig. Results	Descriptives (Group: N, Mean, SD)
New Freshmen	258.954	4, 597.348	< .01	.09	1-2 > 0 3-5 > 0 3-5 > 1-2 6-10 > 0 6-10 > 1-2 6-10 > 3-5 11+ > 0 11+ > 1-2 11+ > 3-5	0: 4,119, 2.65, .99 1-2: 3,176, 3.00, .63 3-5: 1,524, 3.15, .52 6-10: 498, 3.28, .41 11+: 86, 3.29, .42
New Transfers	64.871	4, 344.874	< .01	.03	1-2 > 0 3-5 > 0 3-5 > 1-2 6-10 > 0 6-10 > 1-2 11+ > 0 11+ > 1-2	0: 3,469, 2.64, 1.04 1-2: 1,559, 2.86, .70 3-5: 690, 3.00, .61 6-10: 219, 3.10, .52 11+: 54, 3.17, .52
University Center for Academic Excellence						
Aggregate	71.482	4, 3580.67	< .01	.01	3-5 > 0 3-5 > 1-2 6-20 > 0 6-20 > 1-2 6-20 > 3-5 21+ > 0 21+ > 1-2 2+ > 3-5 21+ > 6-20	0: 5,170, 2.77, .98 1-2: 4,289, 2.77, .82 3-5: 2,731, 2.89, .71 6-20: 2,640, 2.96, .63 21+: 564, 3.12, .58
New Freshman	85.532	4, 2608.894	< .01	.03	1-2 > 0 3-5 > 0 3-5 > 1-2 6-20 > 0 6-20 > 1-2 6-20 > 3-5 21+ > 0 21+ > 1-2 21+ > 3-5 21+ > 6-20	0: 1,985, 2.72, .91 1-2: 2,803, 2.80, .82 3-5: 2,117, 2.95, .69 6-20: 1,970, 3.04, .61 21+: 428, 3.20, .53
New Transfers	5.869	4, 839.437	< .01	.003	0 > 1-2 0 > 3-5 21+ > 1-2 21+ > 3-5	0: 3,185, 2.80, 1.02 1-2: 1,386, 2.69, 0.82 3-5: 614, 2.70, 0.73 6-20: 670, 2.75, 0.66 21+: 136, 2.89, 0.64
Writing Resources Center						
Aggregate	242.059	2, 1379.898	< .01	.02	1 > 0 2+ > 0 2+ > 1	0: 13,707, 2.80, .01 1: 960, 3.05, .63 2+: 727, 3.21, .52
New Freshman	203.62	2, 963.90	< .01	.02	1 > 0 2+ > 0 2+ > 1	0: 8,222, 2.85, .79 1: 704, 3.06, .63 2+: 477, 3.29, .47

TABLE 1
4 Year Cumulative GPA – ANOVAs & Descriptive Statistics

Independent Variables	F	df	Sig. (p)	Effect (η_p^2)	Post Hoc Sig. Results	Descriptives (Group: N, Mean, SD)
New Transfers	53.929	2, 409.377	< .01	.008	1 > 0 2+ > 0	0: 5,485, 2.74, .93 1: 256, 3.02, .61 2+: 250, 3.05, .56
University Speaking Center						
Aggregate	7.04	1, 110.289	.009	.0002	1+ > 0	0: 15,288, 2.84, .83, 1+: 106, 2.95, .45
New Freshmen			Not signif.			0: 9,318, 2.88, .77 1+: 85, 2.97, .42
New Transfers			Not signif.			0: 5,970, 2.76, .91 1+: 21, 2.89, .52
High Impact Practices						
Aggregate	410.376	2, 381.204	< .01	.02	1-2 > 0 3-6 > 0 3-6 > 1-2	0: 14,881, 2.82, .83 1-2: 269, 3.23, .50 3-6: 244, 3.50, .39
New Freshmen	247.224	2, 227.67	< .01	.025	1-2 > 0 3-6 > 0 3-6 > 1-2	0: 9,090, 2.87, .77 1-2: 137, 3.28, .44 3-6: 176, 3.48, .38
New Transfers	160.82	2, 131.991	< .01	.01	1-2 > 0 3-6 > 0 3-6 > 1-2	0: 5,791, 2.74, .91 1-2: 132, 3.19, .55 3-6: 68, 3.56, .41
Greek Life Membership						
Aggregate	345.411	1, 3044.881	<.001	.01	Yes > No	No: 13,757, 2.81, .86 Yes: 1,637, 3.07, .48
New Freshmen	220.956	1, 3071.896	< .001	.01	Yes > No	No: 7,957, 2.85, .81 Yes: 1,428, 3.08, .48
New Transfers	42.284	1, 268.43	< .001	.002	Yes > No	No: 5,782, 2.75, .92 Yes: 209, 2.98, .47
Sports Club Membership						
Aggregate	32.068	1, 1030.188	< .001	.001	Yes > No	No: 14,549, 2.83, .84 Yes: 845, 2.96, .83
New Freshmen	25.025	1, 875.714	< .001	.002	Yes > No	No: 8,715, 2.88, .78 Yes: 688, 3.00, .61
New Transfers			Not signif.			No: 5834, 2.76, .92 Yes: 157, 2.77, .66
Library Total Engagements						
Aggregate	151.417	4, 6910.978	<.001	.05	3-9 > 0-2 10-24 > 0-2 10-24 > 3-9 25-74 > 0-2 25-74 > 3-9 75+ > 0-2 75+ > 3-9 75+ > 10-24 75+ > 25-74	0-2: 3,854, 2.53, 1.23 3-9: 3,407, 2.83, .78 10-24: 3,150, 2.96, .67 25-74: 3,355, 2.98, .60 75+: 628, 3.03, .57

TABLE 1
4 Year Cumulative GPA – ANOVAs & Descriptive Statistics

Independent Variables	F	df	Sig. (p)	Effect (η_p^2)	Post Hoc Sig. Results	Descriptives (Group: N, Mean, SD)
New Freshmen	158.738	4, 4204.027	< .001	.09	3-9 > 0-2 10-24 > 0-2 10-24 > 3-9 25-74 > 0-2 75+ > 0-2 75+ > 3-9 75+ > 10-24 75+ > 25-74	0-2: 1,892, 2.44, 1.06 3-9: 2,173, 2.87, 0.73 10-24: 2,065, 3.02, 0.63 25-74: 2,234, 3.05, 0.56 75+: 1,039, 3.11, 0.53
New Transfers	18.54	4, 2579.224	< .001	.01	3-9 > 0-2 10-24 > 0-2 25-74 > 0-2 25-74 > 3-9 75+ > 0-2 75+ > 3-9	0-2: 1,962, 2.62, 1.19 3-9: 1,234, 2.76, 0.85 10-24: 1,085, 2.85, 0.73 25-74: 1,121, 2.85, 0.64 75+: 589, 2.89, 0.59
Library Study Room Reservations						
Aggregate	334.92	3, 4738.781	< .01	.05	1-5 > 0 6-15 > 0 6-15 > 15 16+ > 0 16+ > 1-5 16+ > 6-15	0: 8,807, 2.68, .94 1-5: 3,429, 2.98, .61 6-15: 1,641, 3.06, .58 16+: 1,517, 3.16, .54
New Freshmen	260.331	3, 3360.855	< .01	.07	1-5 > 0 6-15 > 0 6-15 > 1-5 16+ > 0 16+ > 1-5 16+ > 6-15	0: 4,836, 2.69, .94 1-5: 2,344, 3.03, .58 6-15: 1,139, 3.10, .55 16+: 1,084, 3.20, .52
New Transfers	68,646	3, 1339.642	< .01	.023	1-5 > 0 6-15 > 0 6-15 > 1-5 16+ > 0 16+ > 1-5	0: 3,971, 2.67, 1.00 1-5: 1,085, 2.88, .67 6-15: 502, 2.97, .63 16+: 433, 3.07, .59
Library Book Checkouts						
Aggregate	141.488	4, 2630.137	< .001	.03	1 > 0 2-3 > 0 4-10 > 0 4-10 > 1 11+ > 0 11+ > 2-3 11+ > 4-10	0: 11,047, 2.76, .88 1: 1,160, 2.97, .66 2-3: 1,125, 3.00, .67 4-10: 1,276, 3.16, .62 11+: 840, 3.16, .62
New Freshmen	123.976	4, 1797.084	< .01	.04	1 > 0 2-3 > 0 4-10 > 0 4-10 > 1 11+ > 0 11+ > 2-3 11+ > 4-10	0: 6,443, 2.79, 0.81 1: 760, 3.00, 0.63 2-3: 780, 3.09, 0.63 4-10: 877, 3.11, 0.60 11+: 543, 3.23, 0.57
New Transfers	24.472	4, 826.188	< .01	.01	1 > 0 2-3 > 0 4-10 > 0 11+ > 0 11+ > 2-3	0: 4,604, 2.71, 0.96 1: 346, 2.88, 0.71 2-3: 345, 2.83, 0.72 4-10: 399, 2.95, 0.64 11+: 297, 3.03, 0.68

<p align="center">TABLE 1 4 Year Cumulative GPA – ANOVAs & Descriptive Statistics</p>						
Independent Variables	F	df	Sig. (p)	Effect (η_p^2)	Post Hoc Sig. Results	Descriptives (Group: N, Mean, SD)
Library Instruction						
Aggregate	204.046	3, 5667.725	<.01	.03	1 > 0 2 > 0 2 > 1 3+ > 1 3+ > 2	0: 6,737, 2.69, .95 1: 4,856, 2.89, .74 2: 2,162, 2.97, .66 3+: 1,639, 3.13, .60
New Freshmen	119.778	3, 4326.086	<.01	.03	1 > 0 2 > 0 2 > 1 3+ > 0 3+ > 1 3+ > 2	0: 2,971, 2.75, .89 1: 3,412, 2.86, .74 2: 1,690, 2.95, .66 3+: 1,330, 3.16, .59
New Transfers	84.751	3, 1065.538	<.01	.033	1 > 0 2 > 0 3+ > 0	0: 3,776, 2.63, .99 1: 1,444, 2.95, .75 2: 472, 3.03, .63 3+: 309, 3.02, .67
Library EZ Proxy						
Aggregate	225.047	5, 785.886	<.001	.05	1-5 > 0 6-10 > 0 6-10 > 1-5 11-20 > 0 11-20 > 1-5 21-30 > 0 21-30 > 1-5 31+ > 0 31+ > 1-5 31 > 6-10 31+ > 21-30	0: 9,751, 2.69, .92 1-5: 1,757, 3.03, .55 6-10: 629, 3.13, .53 11-20: 474, 3.21, .54 21-30: 172, 3.21, .60 31+: 164, 3.44, .52
New Freshman	165.831	5, 591.089	<.001	.06	1-5 > 0 6-10 > 0 6-10 > 1-5 11-20 > 0 11-20 > 1-5 21-30 > 0 21-30 > 1-5 21-30 > 6-10 31+ > 0 31+ > 1-5 31+ > 6-10 31+ > 11-20	0: 5,395, 2.71, .87 1-5: 1,359, 3.04, .53 6-10: 504, 3.15, .51 11-20: 378, 3.20, .53 21-30: 137, 3.31, .46 31+: 108, 3.42, .45
New Transfers	52.883	5, 175.591	<.001	.03	1-5 > 0 6-10 > 0 11-20 > 0 11-20 > 1-5 31+ > 0 31+ > 1-5 31+ > 6-10 31+ > 21-30	0: 4356, 2.66, .98 1-5: 398, 2.98, .61 6-10: 125, 3.05, .58 11-20: 96, 3.26, .57 21-30: 35, 2.84, .87 31+: 56, 3.48, .65

TABLE 1
4 Year Cumulative GPA – ANOVAs & Descriptive Statistics

Independent Variables	F	df	Sig. (p)	Effect (η_p^2)	Post Hoc Sig. Results	Descriptives (Group: N, Mean, SD)
Library After Hours Visits						
Aggregate	36.942	3, 1010.387	< .001	.004	1 > 0 2-5 > 0 6+ > 0 6+ > 1 6+ > 2-5	0: 13,427, 2.82, .86 1: 871, 2.94, .54 2-5: 796, 2.94, .55 6+: 300, 3.05, .52
New Freshmen	23.155	3, 768.79	< .001	.004	1 > 0 2-5 > 0 6+ > 0 6+ > 2-5	0: 7,930, 2.86, .81 1: 645, 2.98, .64 2-5: 604, 2.97, .52 6+: 224, 3.08, .50
New Transfers	6.249	3, 241.685	< .001	.05	6+ > 0	0: 5,497, 2.75, .93 1: 226, 2.83, .54 2-5: 192, 2.85, .63 6+: 76, 2.97, .55
Library Computer Logins						
Aggregate	81.265	3, 7158.776	< .01	.02	1-10 > 0 11-30 > 0 11-30 > 1-10 31+ > 0 31+ > 1-10	0: 3,684, 2.64, 1.12 1-10: 6,380, 2.86, .77 11-30: 2,958, 2.94, .62 31+: 2,362, 2.96, .59
New Freshmen	104.342	3, 4151.492	< .01	.04	1-10 > 0 11-30 > 0 11-30 > 1-10 31+ > 0 31+ > 1-10	0: 1,916, 2.58, 1.03 1-10: 4,172, 2.92, .73 11-30: 1,903, 3.00, .58 31+: 1,412, 3.05, 0.55
New Transfers	5.701	3, 2,927.041	< .01	.003	11-30 > 0 31+ > 0	0: 1,778, 2.70, 1.20 1-10: 2,208, 2.76, .84 11-30: 1,055, 2.82, .68 31+: 950, 2.82, .62
Library Laptop Checkouts						
Aggregate	41.376	3, 2943.09	< .001	.01	1 > 0 2-10 > 0 11+ > 0	0: 11,166, 2.80, .90 1: 1,126, 2.95, .64 2-10: 1,970, 2.94, .62 11+: 1,132, 2.92, .56
New Freshmen	38.089	3, 2123.264	< .001	.01	1 > 0 2-10 > 0 11+ > 0	0: 4,781, 2.75, .97 1: 317, 2.85, .69 2-10: 1,428, 3.00, .59 11+: 351, 2.76, .55
New Transfers			Not signif.			0: 4781, 2.75, .97 1: 317, 2.85, .69 2-10: 542, 2.80, .66 11+: 351, 2.76, .55
Library Other Checkouts						
Aggregate	46.661	4, 2325.356	< .001	.01	1 > 0 2-3 > 0 4-10 > 0 11+ > 0	0: 11,486, 2.79, .88 1: 1,259, 2.97, .64 2-3: 912, 2.99, .64 4-10: 889, 2.98, .65 11+: 848, 2.93, .61

TABLE 1						
4 Year Cumulative GPA – ANOVAs & Descriptive Statistics						
Independent Variables	F	df	Sig. (<i>p</i>)	Effect (η_p^2)	Post Hoc Sig. Results	Descriptives (Group: N, Mean, SD)
New Freshmen	39.903	4, 1617.66	< .001	.01	1 > 0 2-3 > 0 4-10 > 0 11+ > 0	0: 6,713, 2.83, .82 1: 865, 3.01, .61 2-3: 623, 3.04, .63 4-10: 634, 3.04, .61 11+: 568, 3.00, .59
New Transfers	6.530	4, 701.275	< .001	.003	1 > 0 2-3 > 0	0: 4,773, 2.74, .96 1: 394, 2.88, .69 2-3: 289, 2.88, .65 4-10: 255, 2.85, .73 11+: 280, 2.78, .63

Significance threshold at $p < .05$. Welch’s ANOVA test used due to prevalence of unequal sample sizes. Games-Howell test used for post hoc analysis.

TABLE 2						
4-year Credit Hour Completion Rates ANOVAs & Descriptive Statistics						
Independent Variables	F	df	Sig. (<i>p</i>)	Effect (η_p^2)	Post Hoc Sig. Results	Descriptives (Group: N, Mean, SD)
Total Engagements Overall						
Aggregate	103.323	5, 4036.062	< .001	.05	1-9 > 0 10-24 > 0 10-24 > 1-9 25-49 > 0 25-49 > 1-9 25-49 > 10-24 50-74 > 0 50-74 > 1-9 50-74 > 10-24 75+ > 0 75+ > 1-9 75+ > 10-24	0: 671, 71.0%, .36 1-9: 4,137, 80.8%, .25 10-24: 3,602, 87.2%, .18 25-49: 2,866, 88.5%, .15 50-74: 1,258, 89.0%, .14 75+: 1,996, 89.7%, .13
New Freshmen	83.251	5, 1259.040	< .001	.07	1-9 > 0 10-24 > 0 10-24 > 1-9 25-49 > 0 25-49 > 1-9 25-49 > 10-24 50-74 > 0 50-74 > 1-9 50-74 > 10-24 75+ > 0 75+ > 1-9 75+ > 10-24 75+ > 25-49	0: 141, 64.7%, .36 1-9: 2,252, 80.1%, .25 10-24: 2,402, 88.0%, .17 25-49: 1,958, 89.8%, .13 50-74: 855, 90.2%, .12 75+: 1,315, 91.1%, .11
New Transfers	22.282	5, 1891.316	< .001	.03	1-9 > 0 10-24 > 0 10-24 > 1-9 25-49 > 0 25-49 > 1-9 50-74 > 0 50-74 > 1-9 75+ > 0 75+ > 1-9	0: 530, 72.7%, .36 1-9: 1,855, 81.6%, .26 10-24: 1,200, 85.6%, .20 25-49: 908, 85.8%, .18 50-74: 403, 86.7%, .16 75+: 681, 86.8%, .15

TABLE 2
4-year Credit Hour Completion Rates ANOVAs & Descriptive Statistics

Independent Variables	F	df	Sig. (<i>p</i>)	Effect (η_p^2)	Post Hoc Sig. Results	Descriptives (Group: N, Mean, SD)
University Career Center						
Aggregate	254.955	4, 985.036	< .001	.05	1-2 > 0 3-5 > 0 3-5 > 1-2 6-10 > 0 6-10 > 1-2 6-10 > 3-5 11+ > 0 11+ > 1-2	0: 6,840, 80.7%, .25 1-2: 4,632, 88.1%, .17 3-5: 2,202, 91.1%, .13 6-10: 716, 93.7%, .09 11+: 140, 92.7%, .09
New Freshmen	204.711	4, 634.782	< .001	.07	1-2 > 0 3-5 > 0 3-5 > 1-2 6-10 > 0 6-10 > 1-2 6-10 > 3-5 11+ > 0 11+ > 1-2 11+ > 3-5	0: 3,704, 81.3%, .23 1-2: 3,115, 89.0%, .152 3-5: 1,520, 92.1%, .114 6-10: 498, 94.7%, .074 11+: 86, 94.2%, .064
New Transfers	56.772	4, 351.938	< .001	.03	1-2 > 0 3-5 > 0 3-5 > 1-2 6-10 > 0 6-10 > 1-2 11+ > 0	0: 3,136, 80.0%, .264 1-2: 1,517, 86.1%, .19 3-5: 682, 88.8%, .14 6-10: 218, 91.3%, .12 11+: 54, 90.3%, .12
University Center for Academic Excellence						
Aggregate	42.563	4, 3601.811	< .001	.01	3-5 > 0 3-5 > 1-2 6-20 > 0 6-20 > 1-2 6-20 > 3-5 21+ > 0 21+ > 1-2 21+ > 3-5	0: 4,765, 83.4%, .242 1-2: 3,995, 84.5%, .21 3-5: 2,626, 86.8%, .18 6-20: 2,593, 88.1%, .15 21+: 561, 89.7%, .13
New Freshman	47.456	4, 2654.014	< .001	.02	1-2 > 0 3-5 > 0 3-5 > 1-2 6-20 > 0 6-20 > 1-2 6-20 > 3-5 21+ > 0 21+ > 1-2 21+ > 3-5 21+ > 6-20	0: 1,833, 83.0%, .28 1-2: 2,693, 85.5%, .2 3-5: 2,034, 87.9%, .17 6-20: 1,938, 89.5%, .14 21+: 425, 91.3%, .11
New Transfers			Not signif.			0: 2,932, 83.7%, .25 1-2: 1,302, 82.3%, .22 3-5: 582, 82.7%, .21 6-20: 655, 83.6%, .18 21+: 136, 84.8%, .17
Writing Resources Center						
Aggregate	214.772	2, 1492.422	< .001	.01	1 > 0 2+ > 0 2+ > 1	0: 12,869, 84.65, .21 1: 938, 89.9%, .15 2+: 723, 92.8%, .10

TABLE 2
4-year Credit Hour Completion Rates ANOVAs & Descriptive Statistics

Independent Variables	F	df	Sig. (p)	Effect (η_p^2)	Post Hoc Sig. Results	Descriptives (Group: N, Mean, SD)
New Freshman	156.388	2, 1052.834	< .001	.01	1 > 0 2+ > 0 2+ > 1	0: 7,765, 89.6%, .00 1: 684, 90.3%, .144 2+: 474, 94.0%, .09
New Transfers	61.166	2, 34.730	< .001	.01	1 > 0 2+ > 0	0: 5,104, 82.7%, .24 1: 254, 89.4%, .15 2+: 249, 90.7%, .12
University Speaking Center						
Aggregate	60.125	1, 14528.00	< .001	.001	1+ > 0	0: 14,423, 85.3%, .01 1+: 107, 91.6%, .08
New Freshmen	45.928	1, 95.546	< .001	.001	1+ > 0	0: 8,838, 86.7%, .19 1+: 85, 92.1%, .07
New Transfers			Not signif.			0: 5,585, 83.3%, .23 1+: 22, 89.5%, .11
High Impact Practices						
Aggregate	339.795	2, 416.382	< .001	.01	1-2 > 0 3-6 > 0 3-6 > 1-2	0: 14,017, 85.0%, .21 1-2: 268, 93.5%, .10 3-6: 246, 96.5%, .07
New Freshmen	277.712	2, 256.939	< .001	.01	1-2 > 0 3-6 > 0 3-6 > 1-2	0: 8,610, 86.3%, .19 1-2: 137, 94.6%, .08 3-6: 176, 96.9%, .06
New Transfers	89.201	2, 138.205	< .001	.01	1-2 > 0 3-6 > 0	0: 5,407, 82.9%, .23 1-2: 131, 92.4%, .11 3-6: 69, 95.6%, .10
Greek Life Membership						
Aggregate	451.038	1, 3730.931	< .001	.01	Yes > No	No: 12,901, 84.6%, .21 Yes: 1,629, 91.4%, .10
New Freshmen	289.644	1, 4001.855	< .001	.01	Yes > No	No: 7,501, 85.8%, .20 Yes: 1,422, 91.7%, .10
New Transfers	43.698	1, 258.653	< .001	.003	Yes > No	No: 5,400, 83.1%, .23 Yes: 207, 89.5%, .13
Sports Club Membership						
Aggregate	30.517	1, 1054.181	< .001	.01	Yes > No	No: 12,901, 84.6%, .21 Yes: 1,629, 91.4%, .10
New Freshmen	22.162	1, 908.624	< .001	.003	Yes > No	No: 7,501, 85.8%, .20 Yes: 1,422, 91.7%, .10
New Transfers			Not Signif.			No: 5,400, 83.1%, .23 Yes: 207, 89.5%, .13
Library Total Engagements						
Aggregate	114.184	4, 6672.966	< .001	.04	3-9 > 0-2 10-24 > 0-2 10-24 > 3-9 25-74 > 0-2 25-74 > 3-9 75+ > 0-1 75+ > 3-9	0-2: 3,262, 77.8%, .29 3-9: 3,229, 85.0%, .20 10-24: 3,080, 88.2%, .17 25-74: 3,337, 88.6%, .15 75+: 1,622, 89.3%, .13

TABLE 2
4-year Credit Hour Completion Rates ANOVAs & Descriptive Statistics

Independent Variables	F	df	Sig. (p)	Effect (η_p^2)	Post Hoc Sig. Results	Descriptives (Group: N, Mean, SD)
New Freshmen	92.327	4, 3982.122	< .001	.06	3-9 > 0-2 10-24 > 0-2 10-24 > 3-9 25-74 > 0-2 25-74 > 3-9 75+ > 0-1 75+ > 3-9	0-2: 1,553, 77.1%, .28 3-9: 2,073, 85.7%, .19 10-24: 2,035, 89.6%, .14 25-74: 2,224, 89.9%, .13 75+: 1,038, 86.7%, .12
New Transfers	23.705	4, 2503.512	< .001	.02	3-9 > 0-2 10-24 > 0-2 25-74 > 0-2 75+ > 0-1 75+ > 3-9	0-2: 1,709, 78.5%, .30 3-9: 1,156, 83.8%, .22 10-24: 1,045, 85.6%, .20 25-74: 1,113, 86.0%, .17 75+: 584, 86.8%, .15
Library Study Room Reservations						
Aggregate	205.439	3, 4917.736	< .001	.03	1-5 > 0 6-15 > 0 6-15 > 1-5 16+ > 0 16+ > 1-5	0: 8,027, 82.0%, .24 1-5: 3,364, 88.7%, .15 6-15: 1,628, 90.1%, .13 16+: 1,511, 90.9%, .12
New Freshmen	137.927	3, 3471.839	< .001	.04	1-5 > 0 6-10 > 0 16+ > 0 16+ > 1-5	0: 4,402, 82.8%, .23 1-5: 2,310, 89.8%, .14 6-15: 1,131, 90.8%, .12 16+: 1,080, 91.6%, .12
New Transfers	52.470	3, 1378.605	< .001	.02	1-5 > 0 6-15 > 0 16+ > 0 16+ > 1-5	0: 3,625, 81.0%, .26 1-5: 1,054, 86.3%, .18 6-15: 497, 84.7%, .15 16+: 431, 89.2%, .14
Library Book Checkouts						
Aggregate	84.39	4, 2728.545	< .001	.02	1 > 0 2-3 > 0 4-10 > 0 4-10 > 1 11+ > 0 11+ > 1 11+ > 2-3	0: 10,185, 83.7%, .23 1: 1,106, 88.3%, .16 2-3: 1,125, 88.5%, .16 4-10: 1,275, 89.8%, .14 11+: 839, 90.8%, .14
New Freshmen	74.835	4, 1903.512	< .001	.02	1 > 0 2-3 > 0 4-10 > 0 4-10 > 1 11+ > 0 11+ > 1 11+ > 2-3	0: 5,964, 84.8%, .21 1: 760, 89.1%, .14 2-3: 780, 90.0%, .14 4-10: 876, 91.1%, .12 11+: 543, 92.4%, .11
New Transfers	13.943	4, 834.396	< .001	.01	1 > 0 2-3 > 0 4-10 > 0 11+ > 0	0: 4,221, 82.2%, .25 1: 346, 86.5%, .18 2-3: 345, 85.3%, .19 4-10: 399, 86.9%, .17 11+: 296, 87.7%, .17

TABLE 2
4-year Credit Hour Completion Rates ANOVAs & Descriptive Statistics

Independent Variables	F	df	Sig. (<i>p</i>)	Effect (η_p^2)	Post Hoc Sig. Results	Descriptives (Group: N, Mean, SD)
Library Instruction						
Aggregate	132.657	3, 5698.625	< .001	.02	1 > 0 2 > 0 2 > 1 3+ > 0 3+ > 1 3+ > 2	0: 6,186, 82.1%, .24 1: 4,616, 86.6%, .18 2: 2,101, 88.2%, .17 3+: 1,627, 91.0%, .14
New Freshmen	69.740	3, 4285.933	< .001	.02	1 > 0 2 > 0 2 > 1 3+ > 0 3+ > 1 3+ > 2	0: 2,744, 84.1%, .22 1: 3,222, 86.3%, .18 2: 1,636, 87.9, .17 3+: 1,321, 91.6%, .13
New Transfers	58.089	3, 1073.761	< .001	.02	1 > 0 2 > 0 2 > 1 3+ > 0 3+ > 1 3+ > 2	0: 3,442, 80.5%, .26 1: 1,394, 87.2%, .19 2: 465, 89.3%, .15 3+: 306, 88.3%, .17
Library EZ Proxy						
Aggregate	127.215	5, 817.761	< .001	.03	1-5 > 0 6-10 > 0 6-10 > 1-5 11-20 > 0 11-20 > 1-5 21-30 > 0 21-30 > 1-5 21-30 > 6-10 31+ > 0 31+ > 1-5 31+ > 6-10	0: 8,907, 82.2%, .24 1-5: 1,754, 88.5%, .14 6-10: 628, 90.2%, .11 11-20: 474, 91.8%, .11 21-30: 171, 92.9%, .09 31+: 163, 93.3%, .11
New Freshman	115.664	5, 632.374	< .001	.04	1-5 > 0 6-10 > 0 6-10 > 1-5 11-20 > 0 11-20 > 1-5 21-30 > 0 21-30 > 1-5 21-30 > 6-10 31+ > 0 31+ > 1-5 31+ > 6-10	0: 4,922, 83.0%, .22 1-5: 1,357, 89.2%, .13 6-10: 503, 91.2%, .10 11-20: 378, 93.0%, .09 21-30: 137, 94.5%, .08 31+: 108, 94.2%, .08
New Transfers	12.823	5, 179.36	< .001	.01	1-5 > 0 6-10 > 0 11-20 > 0 31+ > 0	0: 3985, 81.3%, .26 1-5: 397, 86.2%, .16 6-10: 125, 86.4%, .14 11-20: 96, 87.2%, .17 21-30: 34, 86.6%, .13 31+: 55, 91.6%, .16

TABLE 2
4-year Credit Hour Completion Rates ANOVAs & Descriptive Statistics

Independent Variables	F	df	Sig. (<i>p</i>)	Effect (η_p^2)	Post Hoc Sig. Results	Descriptives (Group: N, Mean, SD)
Library After Hours Visits						
Aggregate	40.231	3, 1047.158	< .001	.004	1 > 0 2-5 > 0 6+ > 0	0: 12563, 84.9%, .22 1: 871, 88.5%, .12 2-5: 796, 88.4%, .12 6+: 300, 89.1%, .12
New Freshmen	23.832	3, 798.612	< .001	.004	1 > 0 2-5 > 0 6+ > 0	0: 7450, 86.2%, .20 1: 645, 89.2%, .12 2-5: 604, 89.3%, .11 6+: 224, 89.9%, .11
New Transfers	6.990	3, 347.375	< .001	.002	1 > 0 2-5 > 0	0: 5113, 83.0%, .24 1: 226, 86.4%, .14 2-5: 192, 85.8%, .15 6+: 76, 86.5%, .12
Library Computer Logins						
Aggregate	74.533	3, 6800.293	< .001	.02	1-10 > 0 11-30 > 0 11-30 > 1-10 31+ > 0 31+ > 1-10	0: 3201, 80.1%, .28 1-10: 6069, 86.0%, .20 11-30: 2912, 87.7%, .16 31+: 2348, 88.2%, .14
New Freshmen	69.830	3, 3955.609	< .001	.03	1-10 > 0 11-30 > 0 11-30 > 1-10 31+ > 0 31+ > 1-10	0: 1645, 80.1%, .27 1-10: 3986, 87.1%, .18 11-30: 1883, 89.1%, .14 31+: 1409, 90.1%, .12
New Transfers	12.849	3, 2756.956	< .001	.01	1-10 > 0 11-30 > 0 31+ > 0	0: 1556, 80.1%, .29 1-10: 2083, 83.8%, .22 11-30: 1029, 85.1%, .19 31+: 939, 85.5%, .17
Library Laptop Checkouts						
Aggregate	42.771	3, 3010.887	< .001	.01	1 > 0 2-10 > 0 11+ > 0	0: 10302, 84.4%, .23 1: 1126, 87.6%, .16 2-10: 1970, 88.0%, .13 11+: 1132, 88.1%, .13
New Freshmen	36.587	3, 2172.378	< .001	.01	1 > 0 2-10 > 0 11+ > 0	0: 5905, 85.4%, .21 1: 809, 88.5%, .15 2-10: 1428, 89.5%, .14 11+: 781, 89.3%, .13
New Transfers	4.034	3, 822.507	.007	.001	11+ > 0	0: 4397, 82.9%, .25 1: 317, 85.2%, .18 2-10: 542, 84.1%, .19 11+: 351, 85.3%, .13
Library Other Checkouts						
Aggregate	36.523	4, 2374.649	< .001	.01	1 > 0 2-3 > 0 4-10 > 0 11+ > 0	0: 10623, 84.3%, .22 1: 1259, 88.0%, .16 2-3: 912, 88.6%, .16 4-10: 888, 88.3%, .16 11+: 848, 87.8%, .14

TABLE 2
4-year Credit Hour Completion Rates ANOVAs & Descriptive Statistics

Independent Variables	F	df	Sig. (<i>p</i>)	Effect (η_p^2)	Post Hoc Sig. Results	Descriptives (Group: N, Mean, SD)
New Freshmen	28.340	4, 1657.519	< .001	.01	1 < 0 2-3 < 0 4-10 < 0 11+ < 0	0: 6233, 85.5%, .20 1: 865, 89.3%, .14 2-3: 623, 90.2%, .14 4-10: 634, 89.6%, .14 11+: 568, 88.8%, .14
New Transfers	6.074	4, 709.555	< .001	.003	1 > 0 11+ > 0	0: 4390, 82.6%, .25 1: 394, 86.1%, .18 2-3: 289, 85.4%, .18 4-10: 254, 85.1%, .18 11+: 280, 85.6, .14
Library Special Collections						
Aggregate	12.795	1, 69.288	.001	.0002	1+ > 0	0: 14462, 85.4%, .21 1+: 68, 90.1%, .11
New Freshman	17.677	1, 53.781	< .001	.0004	1+ > 0	0: 14462, 85.4%, .21 1+: 68, 90.1%, .11
New Transfers			Not Signif.			0: 5591, 83.3%, .23 1+: 16, 84.5%, .15

Significance threshold at $p < .05$. Welch's ANOVA test used due to prevalence of unequal sample sizes. Games-Howell test used for post hoc analysis.

Appendix D: Significant Regression Models

Independent Variables	Aggregate (B)	Entered as Freshman (B)	Entered as Transfers (B)
Total of All Engagements			
Constant	2.776	2.801	2.370
Total Engagements	.002 $R^2 = .015$ $F_{(1,15392)} = 236.744$ $p < .001$.002 $R^2 = .027$ $F_{(1,9401)} = 259.37$ $p < .001$.001 $R^2 = .005$ $F_{(1,5989)} = 27.889$ $p < .001$
Total Engagements x Partner			
Constant	2.678	2.684	2.669
Career Center	.059	.061	.056
Library	.001	.001	—
Univ Ctr for Acad Excel.	.004	.006	—
Writing Center	.025	.028	.021
Speaking Center	—	—	—
High Impact Practices Total	.169	.144	.228
Greek Life Membership	.184	.161	.152
Sports Clubs Membership	—	—	—
	$R^2 = .063$ $F_{(6,15387)} = 173.66$ $p < .001$	$R^2 = .087$ $F_{(6,9396)} = 149.404$ $p < .001$	$R^2 = .035$ $F_{(4,5986)} = 53.818$ $p < .001$
Total Engagements x Activity			
Constant	2.586	2.585	2.574
Student Affairs	.150	.128	.208
High Impact Practices	.121	.125	—
Greek Life Membership	.073	.081	.062
Career Center	.036	.032	.048
Career Fairs	.081	.070	.120
Advising	.066	.081	—
Class Presentations	.079	.063	.127
Workshops	.010	.010	.012
Library	.002	.002	.002
Instruction	.005	.007	—
EZ Proxy	.011	.011	.009
Study Room Reserv.	—	.009	—
Book Checkouts	.081	—	—
Univ Ctr for Acad Excel.	.019	.023	—
Supplemental Instruction	$R^2 = .101$	$R^2 = .101$	$R^2 = .066$
Workshops	$F_{(12,15381)} = 144.215$	$F_{(12,15381)} = 144.215$	$F_{(8,5982)} = 52.692$
Classroom Presentations	$p < .001$	$p < .001$	$p < .001$
Writing Resources Center			
Individual Consults			

TABLE 1
4 Year Cumulative GPA Significant Regression Models

Independent Variables	Aggregate (B)	Entered as Freshman (B)	Entered as Transfers (B)
Pre-College/Demographic Variables & All Activities			
Constant	.763	.626	1.031
Pre-College/Demographics	.475	.514	.368
HS GPA	—	—	—
ACT/SAT Standardized	—	—	—
Pell—Total Awarded	.003	.002	.005
Non UNCC Credits	.105	.106	—
Student Affairs	.140	.142	—
High Impact Practices	—	—	—
Greek Life Membership	.063	.067	—
Sports Club Membership	.030	—	.076
Career Center	.075	—	.176
Career Fairs	.054	.013	—
Advising	.066	.062	.123
Class Presentations	.008	.008	.014
Workshops	.001	.001	.003
Library	.005	.005	—
Instruction	.001	.001	—
EZ Proxy	.007	.007	.014
Study Room Reserv.	.012	—	—
Book Checkouts	—	—	—
Library Computer Logins	.007	.008	—
Univ Ctr for Acad Excel.	—	.016	—
Supplemental Instruction Workshops	$R^2 = .217$ $F_{(17,9652)} = 157.089$ $p < .001$	$R^2 = .222$ $F_{(17,8950)} = 144.086$ $p < .001$	$R^2 = .166$ $F_{(8,1053)} = 26.213$ $p < .001$
Classroom Presentations			
Tutoring			
Writing Resources Center			
Individual Consults			
Total Library Engagements			
Constant	2.792	2.824	2.736
Total Library Engagements	.001	.002	.004
	$R^2 = .011$ $F_{(1,15392)} = 172.411$ $p < .001$	$R^2 = .019$ $F_{(1,9401)} = 185.053$ $p < .001$	$R^2 = .004$ $F_{(1,5989)} = 23.394$ $p < .001$
Specific Library Activities			
Constant	2.675	2.698	2.651
Library Instruction	.097	.079	.128
Library EZ Proxy	.012	.012	.013
Library Study Room Reserv.	.003	.004	.003
Library Book Checkouts	.006	.007	.003
Library Computer Logins	.001	.001	—
	$R^2 = .056$ $F_{(5,15388)} = 180.844$ $p < .001$	$R^2 = .066$ $F_{(5,9397)} = 133.113$ $p < .001$	$R^2 = .038$ $F_{(4,5986)} = 58.935$ $p < .001$

TABLE 1
4 Year Cumulative GPA Significant Regression Models

Independent Variables	Aggregate (B)	Entered as Freshman (B)	Entered as Transfers (B)
Pre-College/Demographic Variables & Specific Library Activities			
Constant	.722	.588	.993
Pre-College/Demographics	.515	.554	.385
HS GPA	—	—	.000009
Pell—Total Awarded	.003	.001	.005
Non UNCC Credits	.080	.077	.125
Library	.010	.010	.015
Instruction	.003	.003	.004
EZ Proxy	.005	.005	—
Study Room Reserv.	.001	.001	—
Book Checkouts	$R^2 = .174$	$R^2 = .177$	$R^2 = .145$
Computer Logins	$F_{(7,9662)} = 291.755$ $p < .001$	$F_{(7,8600)} = 236.362$ $p < .001$	$F_{(6,155)} = 29.918$ $p < .001$

Significance level $p < .05$. Stepwise Regression used to determine which variables make a significant and meaningful contribution to GPA.

TABLE 2
4 Year Credit Hour Completion Rates Significant Regression Models

Independent Variables	Aggregate (B)	Entered as Freshman (B)	Entered as Transfers (B)
Total of All Engagements			
Constant	.841	.851	.824
Total Engagements	.0003	.0004	.0002
	$R^2 = .011$	$R^2 = .016$	$R^2 = .005$
	$F_{(1,14528)} = 156.826$ $p < .001$	$F_{(1,8921)} = 141.564$ $p < .001$	$F_{(1,5605)} = 28.879$ $p < .001$
Total Engagements x Partner			
Constant	.817	.823	.811
Career Center	.013	.013	.013
Library	.0001	.0002	—
Univ Ctr for Acad Excel.	.0005	.001	—
Writing Center	.004	.003	.005
High Impact Practices Total	.053	.025	.038
Greek Life Membership	.053	.047	.049
Sports Clubs Membership	.016	.017	—
	$R^2 = .063$	$R^2 = .063$	$R^2 = .027$
	$F_{(6,15387)} = 173.66$ $p < .001$	$F_{(7,8915)} = 85.236$ $p < .001$	$F_{(4,5602)} = 38.125$ $p < .001$

TABLE 2
4 Year Credit Hour Completion Rates Significant Regression Models

Independent Variables	Aggregate (B)	Entered as Freshman (B)	Entered as Transfers (B)
Total Engagements x Activity			
Constant	.798	.805	.791
Student Affairs	.026	.023	.036
High Impact Practices	.041	.042	.037
Greek Life Membership	.020	.019	.022
Career Center	.007	.007	.007
Career Fairs	.026	.023	.034
Advising	.012	.015	—
Class Presentations	.016	.011	.027
Workshops	.002	.002	.001
Library	.0002	—	—
Instruction	.001	.001	—
EZ Proxy	.0001	.0002	—
Study Room Reserv.	.002	.002	.002
Book Checkouts	—	.002	—
Computer Logins	$R^2 = .069$	$R^2 = .085$	$R^2 = .045$
Univ Ctr for Acad Excel.	$F_{(12,14517)} = 89.784$	$F_{(12,8910)} = 68.579$	$F_{(3,5598)} = 32.981$
Supplemental Instruction	$p < .001$	$p < .001$	$p < .001$
Tutoring			
Pre-College/Demographic Variables & All Activities			
Constant	.620	.578	.679
Constant	.082	.087	.076
Pre-College/Demographics	-.005	-.004	-.007
HS GPA	—	.0004	—
ACT/SAT Standardized	.019	.020	—
Non UNCC Credits	.041	.041	—
Student Affairs	—	.015	—
High Impact Practices	.017	.017	.015
Greek Life Membership	.006	.006	—
Sports Club Membership	.024	.023	.053
Career Center	.012	.012	—
Career Fairs	.011	.011	.025
Advising	.001	.002	—
Class Presentations	.001	.001	—
Workshops	—	.0002	.0003
Library	.001	.001	—
Instruction	.002	.002	—
EZ Proxy	$R^2 = .119$	$R^2 = .124$	$R^2 = .075$
Book Checkouts	$F_{(14,9145)} = 88.005$	$F_{(16,8146)} = 72.181$	$F_{(6,990)} = 13.378$
Library Computer Logins	$p < .001$	$p < .001$	$p < .001$
Univ Ctr for Acad Excel.			
Supplemental Instruction			
Tutoring			
Total Library Engagements			
Constant	.844	.855	.826
Total Library Engagements	.0003	.0003	.0002
	$R^2 = .008$	$R^2 = .011$	$R^2 = .004$
	$F_{(1,114528)} = 116.672$	$F_{(1,8921)} = 101.618$	$F_{(1,5605)} = 25.042$
	$p < .001$	$p < .001$	$p < .001$

TABLE 2
4 Year Credit Hour Completion Rates Significant Regression Models

Independent Variables	Aggregate (B)	Entered as Freshman (B)	Entered as Transfers (B)
Specific Library Activities			
Constant	.821	.832	.808
Library Instruction	.020	.015	.028
Library EZ Proxy	.002	.002	.001
Library Study Room Reserv.	.0005	.0005	.0004
Library Book Checkouts	.001	.001	—
Library Computer Logins	.0003	.0003	.0002
	$R^2 = .031$	$R^2 = .035$	$R^2 = .021$
	$F_{(5,14524)} = 93.102$	$F_{(5,9397)} = 63.728$	$F_{(4,5602)} = 30.652$
	$p < .001$	$p < .001$	$p < .001$
Pre-College/Demographic Variables & Specific Library Activities			
Constant	.617	.580	.687
Pre-College/Demographics	.090	.096	.080
HS GPA	-.005	-.005	-.007
ACT/SAT—Standardized	—	—	—
Pell—Total Awarded	—	-.0004	—
Non UNCC Credits	.014	.013	.026
Library	.002	.002	—
Instruction	.0003	.0003	—
EZ Proxy	.001	.001	—
Study Room Reserv.	.0003	.0003	.0004
Book Checkouts	$R^2 = .082$	$R^2 = .083$	$R^2 = .061$
Computer Logins	$F_{(7,9152)} = 116.639$	$F_{(8,8154)} = 92.111$	$F_{(4,992)} = 16.11$
	$p < .001$	$p < .001$	$p < .001$

Significance level $p < .05$. Stepwise Regression used to determine which variables make a significant and meaningful contribution to predicting the credit hour completion rates.

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