

2017 CONFERENCE PROCEEDINGS



REFINING OUR ROLES, MAXIMIZING OUR IMPACT

NOVEMBER 18-21, 2017

Westin Jersey City Newport – Jersey City, New Jersey

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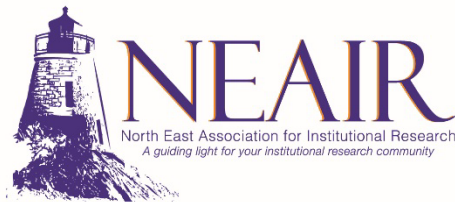
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Dear NEAIR Colleagues,

It is my pleasure to present to you the 2017 Conference Proceedings from the 44th Annual Conference of the North East Association for Institutional Research. The Conference was held on November 18-21, 2017 at the Westin Jersey City Newport Hotel in Jersey City, New Jersey. Our theme this year was: *IR Leadership: Refining Our Roles, Maximizing Our Impact*. There were 359 NEAIR members in attendance.

Our 2017 Jersey City Conference Team, led by Allison Walters, Program Chair, and Wendy Weiler, Associate Program Chair, put together an innovative and comprehensive program to address this theme using a variety of session formats and topics. Many thanks to Allison Walters and Wendy Weiler and the 2017 Jersey City team for their vision and efforts to make this year's conference program an exciting and memorable one.

It was an impressive conference program filled with various types of new formats and topics. In total, there were 80 proposals received resulting in a conference program that consisted of the following types of sessions: 5 panel sessions, 51 speaker sessions, 2 discussion sessions, 11 power talks, and 16 posters. Based on the 2017 Conference Evaluation report, provided by Marcia Finch, our Conference Evaluator, conference attendees expressed their support of, and satisfaction with, the new session format changes introduced this year. Many thanks to JR Bjerklie, the Proposal Review Coordinator, Krisztina Filep, the Poster Coordinator, and the team of Proposal Reviewers, for reviewing the proposals. Thanks to Beth Simpson for assisting with the logistics of the proposal review process using our new website's proposal features.

The 2017 Conference Proceedings include the 8 scholarly paper presentations that were presented at the 2017 NEAIR Conference. Thomas McGuinness, the Publications and & Best Paper Coordinator, has done a great job preparing this document. The 10 authors who conducted the research that resulted in these 8 scholarly papers are to be commended for their work and contribution to the field of Institutional Research. These Proceedings reflect the various issues that were of importance to the NEAIR members in 2017 and cover a range of topics related to students, research, assessment, and the profession of IR.

NEAIR prides itself on being a professional development organization. It is because of our members' dedication and willingness to share their expertise with their NEAIR colleagues that our conferences continue to be a valuable source of information for our members' growth and professional development.

Enjoy reading these Proceedings. I hope that they not only are a source of knowledge but that that they will also inspire you to do great research and maximize your impact in the field of Institutional Research.

Regards,

Ann Marie Senior, Ph.D.,
NEAIR President 2016-2017

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USING ECONOMETRICS TO EXAMINE STUDENT PERSISTENCE UNTIL
GRADUATION: A RESEARCH/CASE STUDY OF SAINT JOSEPH'S UNIVERSITY
STUDENTS

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Abstract

In this paper it is asked, “*What are the factors which contribute to a student leaving Saint Joseph's University (SJU) before graduating?*” 10,740 observations of first semester freshmen and transfers from SJU between 2006-2012 were examined by utilizing econometric modeling methodology. After decision tree analyses, two probit models analyzed the factors of student retention. This paper concludes that first term GPA and credit completion ratio (credits completed/credits taken) were the two most significant and positive predictive variables. Other variables were not as significant as them. While this paper makes advances, more research is needed to develop econometric modeling for universities.

Keywords: Data Analytics, Enrollment Management, Student Retention, Advanced Predictive Modeling

Introduction and Saint Joseph’s University Background

Colleges and universities face many challenges when allocating their money and resources properly to create a positive learning environment that retains students. Applied econometric techniques can assist universities in maximizing retention which contributes to student and university success. Better retention implies the university is earning more consistent tuition revenue, rendering a high-quality student experience, and graduating more students. For the 2013-2014 cohort, the retention ratio for freshmen undergraduates at four-year institutions in the U.S. was 80.5% (**Table 1**). This was a 4% improvement from 2006-2007 and all public, non-profit, and for-profit institutions increased retention in that time (National Center for Education Statistics [NCES], 2015). While an upward trend is present, still only 60% of students who started at an institution finished with a degree from that institution (NCES, 2015).¹

Table 1: Percent of First-Time Undergraduates Retained in the United States (NCES, 2015)

	Percent of first-time undergraduates retained	
	2006 to 2007	2013 to 2014
For Full Time Students		
4-year institutions	76.5	80.5
Public institutions	78	80.8
Nonprofit institutions	79.5	81.4
For-profit institutions	45.4	55.7

This 40% attrition rate is disheartening for students and alarming for universities. From the student perspective, almost half of all college students will incur significant costs without graduating from the university they first enrolled in. For universities, recent reports have stated, “1/3 of all colleges and universities in the United States... are on an unsustainable fiscal path” (Selingo, 2017); and, “Expenses are growing at such a pace that colleges don’t have the cash or

¹ Cohorts are tracked for six years in accordance with the 1990 Student-Right-to-Know Act requiring institutions to report the percentage of students who complete a program at their school in six years or less.

revenue to cover them” (Denneen and Dretler, 2017). Approximately only 500 of the 4,000+ universities in the U.S. are considered fiscally safe at this point. Small private universities are the most “at-risk” institutions since they are consistently closed, merged, or bought more than any other type of school (Selingo, 2017). In response, universities must raise their retention ratios to grow a stable revenue and properly allocate money to service student needs.

Given the background, this paper analyzes undergraduate students at Saint Joseph’s University (SJU). SJU is a private, Jesuit university in Philadelphia, with a full-time traditional undergraduate population of 4,860 in Fall 2016 (SJU, a, 2017). 80% of the first-time, full-time students graduated from SJU within six years (Student Achievement Measurement, 2017). Referencing **Table 1**, SJU students graduate at a comparable percentage to what most private universities retain students from freshmen to sophomore year. SJU is an excellent case study because it currently under-utilizes econometric techniques for enrollment management and has tracked the reasons students transfer/drop-out of the university since 2008.

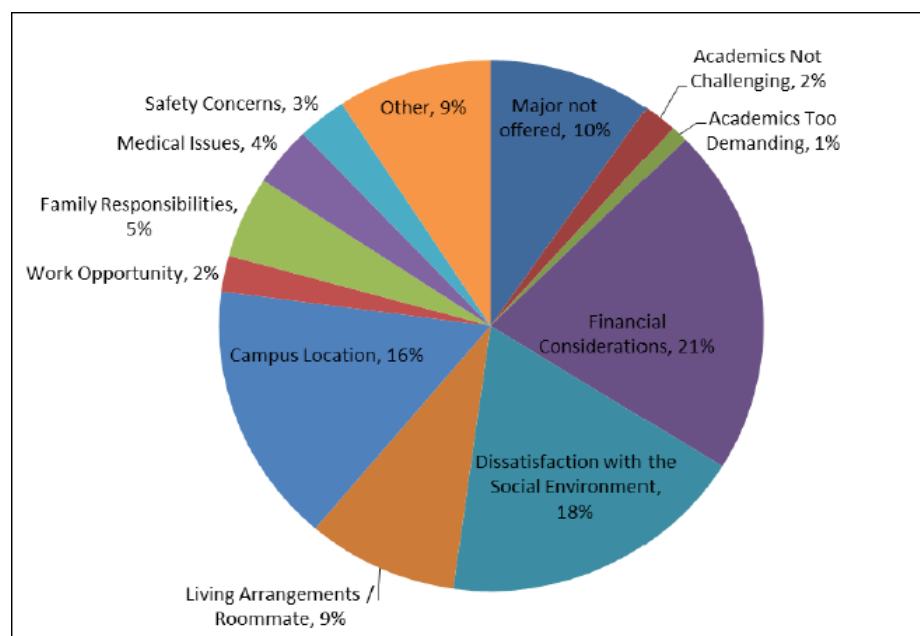
Figure 1: One Question Exit Interview (1QEI) Game Board (Allen-Stuck, 2017)

Desired Major is not Offered	Security/Safety Concerns	Academic Program is too Demanding	Financial Considerations	Medical Issues	Living Arrangements/ Roommate
Campus Location	Full Time Work Opportunity	Dissatisfaction with the Social Atmosphere	Family or Home-Life Responsibilities	Academic Program is not Challenging	Other

SJU’s Office for Student Success has tracked these reason by surveying departing students with the One Question Exit Interview (1QEI) game board (**Figure 1**). Students are asked to weigh the reasons for their withdrawal from SJU by choosing from 12 locations (**Figure 1**) and placing ten chips on the tiles to represent the weight different factors played in their decision to leave. Examining the game results for students who entered SJU in the 2015-2016 academic year and voluntarily withdrew prior to the start of their second year, 55% of the weight

decision to leave was due to a combination of financial considerations, social environment, and campus location (**Graph 1**). Since these statistics were tracked, financial consideration has almost always been the primary reason followed by a dissatisfaction with the social environment. Given that the estimated total expense in 2014-15 for an on-campus student was \$57,021, and the average net price was \$37,191 (College Navigator, 2017), many students struggle to afford its cost. The socially dissatisfied students indicated that they “didn’t get involved,” or they “don’t feel connected” among other reasons (Allen-Stuck, 2017). When campus location was a withdrawal reason, explanations ranged from SJU being too close to home, too far from home, disliking SJU’s urban location, wanting a more urban atmosphere, disliking the cold weather, or other reasons. The 1QEI survey presents a unique opportunity to cross-reference econometric models’ results with empirical evidence. Therefore, the research question asked was, “*What are the factors which contribute to a student leaving SJU before graduating?*” To answer this question, previous literature is reviewed and SJU student data is synthesized to create a predictive model of student outcomes.

Graph 1: Why Fall 2015/Spring 2016 1st Time Students Did Not Return (SJU, b, 2017)



Literature Review

Various institutions and authors have published papers of varying degrees on enrollment analytics related to admissions and retention. SJU's Office of Enrollment Management based their projections model on the "Predictive Modeling: Linking Enrollment and Budgeting" instructional paper by Trusheim and Rylee (2008). The authors introduced a simple model without advanced statistical techniques to estimate future enrollment. Their conceptual framework is based on a function of two variables: new students and continuing students. Their model requires at least three to five years of historical enrollment, developing the retention ratio for continuing students, estimating new student targets for future semesters, and generating predictions. Simply put, their model uses historical retention to predict returning students and adds the target number of freshmen students for each new fall semester.

Trusheim and Rylee's (2008) model has the advantage of being very malleable. It allows for easy comparison between many different enrollment scenarios given changing perceptions of the enrollment environment. However, the model does not examine students on an individual basis and cannot interpret which students are likely to continue with their education. This shortcoming is rooted in the model's inherent assumption that the classes of students are like each other. If the university changes its enrollment strategy or experiences/foresees another change, it is not incorporated into the model unless manually adjusted.

In contrast to Trusheim and Rylee (2008), the next papers use advanced statistical methods for their research. Smith, Lange, and Hudson (2012) built two predictive models to forecast retention outcomes for online community college learners. Their data consisted of 539 fully online students from a *Rio Salado* freshmen-level accounting course during the 2009 summer and fall semesters. The dependent variable was binary with a successful outcome

defined as achieving the letter grade “C” or higher, and an unsuccessful outcome defined as receiving a letter grade below “C” or withdrawing from the class. The authors analyzed ten different measures of online engagement and successful students tended to be more engaged versus their unsuccessful counterparts. Every week in the 14-week online course, significant correlations existed between course outcome and the students’ activity markers. Using the Naïve Bayes classification method to create an accurate risk model,² they found the mean success rate of students in the Low warning group was 70%, 54% in the Moderate warning group, and 34% in the High warning group.³

Titus (2004) took a broader perspective and investigated the factors surrounding student persistence to degree completion. The author used longitudinal data of 5,151 students attending 384 different four-year institutions from the 1996-1998 Beginning Postsecondary Students Survey consisting of background characteristics, college experiences, attitudes, and environmental factors. The dependent variable of persistence is defined as being enrolled/graduated, or not being enrolled/not completing a degree. Using a logistic model, results showed a student’s ability, educational goals, college GPA, on-campus residence, and involvement all positively increased an individual’s persistence. Titus (2004) also found that greater financial need and hours worked per week increased persistence, but remarked that more research is needed for these counter-intuitive findings before concluding anything.

Narrowing the focus to institutional enrollment research, DesJardins (2002) examined an admitted student’s likelihood of attending the university using data and modeling techniques that are very similar to retention models. His study used data from a public institution that enrolls

² The Naïve Bayes method is a probabilistic classification method that generates estimated probabilities of course success.

³ Low warning group: students who have probabilities 70% or above of succeeding in the class

Moderate warning group: students who have probabilities between 70% and 30% of succeeding in the class

High warning group: students who have probabilities below 30% of succeeding in the class

about 3,800 freshmen each fall containing students who were admitted for Fall 1999 (7,603 sample size) and Fall 2001 (6,810 sample size). He used information from their application, their high school transcript, and the *ACT Student Profile Questionnaire*. To observe the validity of his model, he randomly distributed his observations into a “developmental” sample with which he created the model, and a holdout group to validate its predictions against their outcomes. Using a logistic model, he correctly predicted 64.9% of enrollees and 66.49% of non-enrollees.

Individuals whose first choices were the institution, who were state residents, or who were legacy students had respective odds of enrollment 2.0, 2.8, and 1.3 times higher than others.

Synco (2013) applied a technique like DesJardins (2002), but examined student outcomes within the context of retention and graduation. Synco (2013) collected and analyzed data for 1,346 full-time undergraduate students beginning in Fall 2007 through Spring 2011. The fifteen variables analyzed were ACT Composite scores, cumulative GPA, ethnicity, advising use, engagement courses, freshmen year experience courses, change of major, campus housing, supplemental instruction, high school GPA, gender, Pell eligibility, unmet financial need, early alerts, and honors participation. Using a logistic model, she measured each variable’s effect every year for the four years the cohort was enrolled at the institution. She found that the first nine variables listed above were statistically significant at different times, while the last six variables were not. Findings indicated that white students were more likely to graduate at all levels and changing majors early in your college career was a positive indicator of retention, but a late change was a negative indicator. The research supports previous findings, but is not widely applicable since it was institution specific.

Jones-White, et al (2010) examined retention and graduation like Synco (2013), but accounted for multiple outcomes. The authors asked what factors were important in student

outcomes and what models were best-suited to explain them. The authors used data from the *National Student Clearinghouse* (NSC) to examine the degree attainment of 15,496 freshmen who began at *University of Minnesota – Twin Cities* (UM-TC). They measured the four dependent variables of graduating with a UM-TC degree, achieving a bachelor's degree from another institution, achieving an associate's degree from another institution, or not achieving a degree. They included independent variables for academic background, demographics, academic performance, geography, social, and financial need.

For their final models, the researchers created a multinomial logit model and a multinomial probit model. Both model results were generally similar, with only small variations in the parameter estimates. They found students who have higher GPAs, successfully complete more courses, and/or withdraw from fewer courses are more likely to complete a degree at another institution or at UM-TC. They found students who were admitted into their first-choice college were more likely to graduate from the host university, underrepresented minorities were relatively less likely to complete a degree, and students who were Pell eligible were not as successful as their wealthier peers. In conclusion, their models reinforce previous findings while successfully analyzing multiple outcomes regarding student success.

Data and Methodology

While the above literature informed this analysis, this paper is distinct because of its differentiated statistical and econometric methodology and unique undergraduate student body dataset from SJU. This analysis examines two different student samples. The Fall 2010 cohort was examined because it was the last cohort outside of the six-year graduation range when this data was pulled. The larger group analysis ranges from Fall 2006 to Fall 2012 examining retention trends within a four-year graduation range. The respective datasets contain 1,214

observations and 10,740 observations. The binary dependent variable is whether a student was awarded a degree or not, without respect to time.

In each dataset, 34 different independent variables are present with the dependent variable of graduation status. Thirteen binary variables are present accounting for fall enrollment, spring enrollment, student-athlete status, student-athlete aid recipient status, Honors Program enrollment, on campus living, the college a student's major is contained in, US citizenship, sex, Hispanic identity, dependency upon parents/guardians, transfer or freshmen status, and legacy status. Eleven nominal variables are present accounting for year, bucketed categories for a student's home address's distance from the university, major, second major, minor, second minor, religious identification, primary ethnicity, mother's highest level of education, and father's highest level of education. Thirteen continuous variables are present measuring credits attempted, financial aid, charges, expected family income/Pell Grant Index (PGI), SAT scores, ACT scores, high school GPA, high school rank, high school size, high school percentile, term GPA, and credit completion ratio. All 34 variables are used in some way in the analyses.

While the datasets contain extensive information, they do have some notable missing variables. For example, student extracurricular involvement, disciplinary records, first college choice, wellness, health status, and disability data were all not obtainable. Involvement could act as a proxy variable for dissatisfaction with the social environment, because uninvolved students may be more dissatisfied. Disciplinary and victim records could potentially show troubled students. If SJU was not a student's first choice, they may have a higher likelihood of leaving. If a student has addiction issues, health issues, or has a disability which severely increases college difficulty, they may be more likely to leave SJU.⁴

⁴ Please note that the list only discusses some examples of multiple variables that could potentially affect the models.

With the available information, the data is analyzed in the following manner. First, the distributions of Graduation Status, Financial Aid, SAT, First Term GPA, PGI, and Distance Category variables are discussed and viewable in **Figures 2** and **4**. Given the 1QEI results and previous literature, the distributions of these five independent variables may enlighten the distribution of graduation status. Secondly, partitioning analysis utilizing the decision tree method is discussed. The data is continually partitioned until a split explains less than 1% of the variation in the student's graduation status (represented by the R squared). Decision tree analysis presents a unique advantage because it can be conducted even with null values as some students do not have information available for every variable.

Lastly, binary probit modeling is employed to examine the collected variables' effects on a student's graduation outcome. The equation is defined as:

$$Pr(Graduation=1, X_n) = \beta_0 + \beta_n X_n + \varepsilon_n$$

where $Pr(Graduation=1, X_n)$ is the estimated probability that a person is attending college given a student's observed characteristics (X_n) and β_0 represents the intercept of the equation. Specific variables were carefully selected for X_n as to eliminate collinearity and sample size concerns. In total, 23 variables were selected for this analysis. Hispanic identity was excluded because of collinearity issues with students who identify as ethnically Hispanic. Major, second major, minor, and second minor were excluded because of the numerous different fields of study and null values in the fields. The binary college variable acts as a broad proxy variable for the student's chosen major. ACT scores were excluded because fewer students took the test than the SATs. Sections taken was excluded because credits taken provides a better depiction of what student's course load was like. High school rank, size, and percentile were excluded because of too many null records, plus high school GPA and SAT scores can serve as proxy variables to all

three. β_n is the marginal effect of interest as it represents the positive or negative percentage point effect certain independent variables have on a student's graduation outcome for a single unit change in the independent variable. ε_n represents the unaccounted-for variation from outside, unobserved inputs, and unmeasurable factors (i.e. unforeseen familial life complications).

The majority of previous papers created logistic regression models which measured variables' odds ratios. This analysis uses probit modeling because it can provide a measurement of a specific variable's marginal effects. For example, probit can say for every single unit change in an independent variable, there is a certain absolute percentage point change in the dependent variable. Both logistic and probit analyses largely present similar results, but in different styles.

Data Analysis

Fall 2010 Cohort Descriptive Statistics and Model Results

The cleaned sample size for the Fall 2010 cohort was 1,214 (**Table 2**) and the graduation rate for this cohort was 80.3%. Reviewing the important characteristics of this dataset (**Figure 2**), over 90% of the sample size received some financial aid totaling \$2,500 or greater. The financial aid distribution was only slightly bimodal with no outliers. The tallest peak occurred around the starting point of the highest quartile at \$21,525. The median financial aid was \$11,246, which is almost \$2,000 less than the mean financial aid of \$13,025. This cohort could expect an average expected family contribution of \$25,093 and a smaller median of \$16,123. The top quartile expected a contribution greater than \$35,872 while the bottom quartile expected a contribution less than \$5,748. 985 observations filed FAFSA forms, which was 229 observations less than the cohort population indicating an overall wealthier population. SAT scores were

normally distributed with the center at 1120. They ranged from 680 to 1500. During the new student's first semester, the average GPA an individual earned was 2.98 and the median was

Table 2: Fall 2010 Summary Statistics and Tabulations

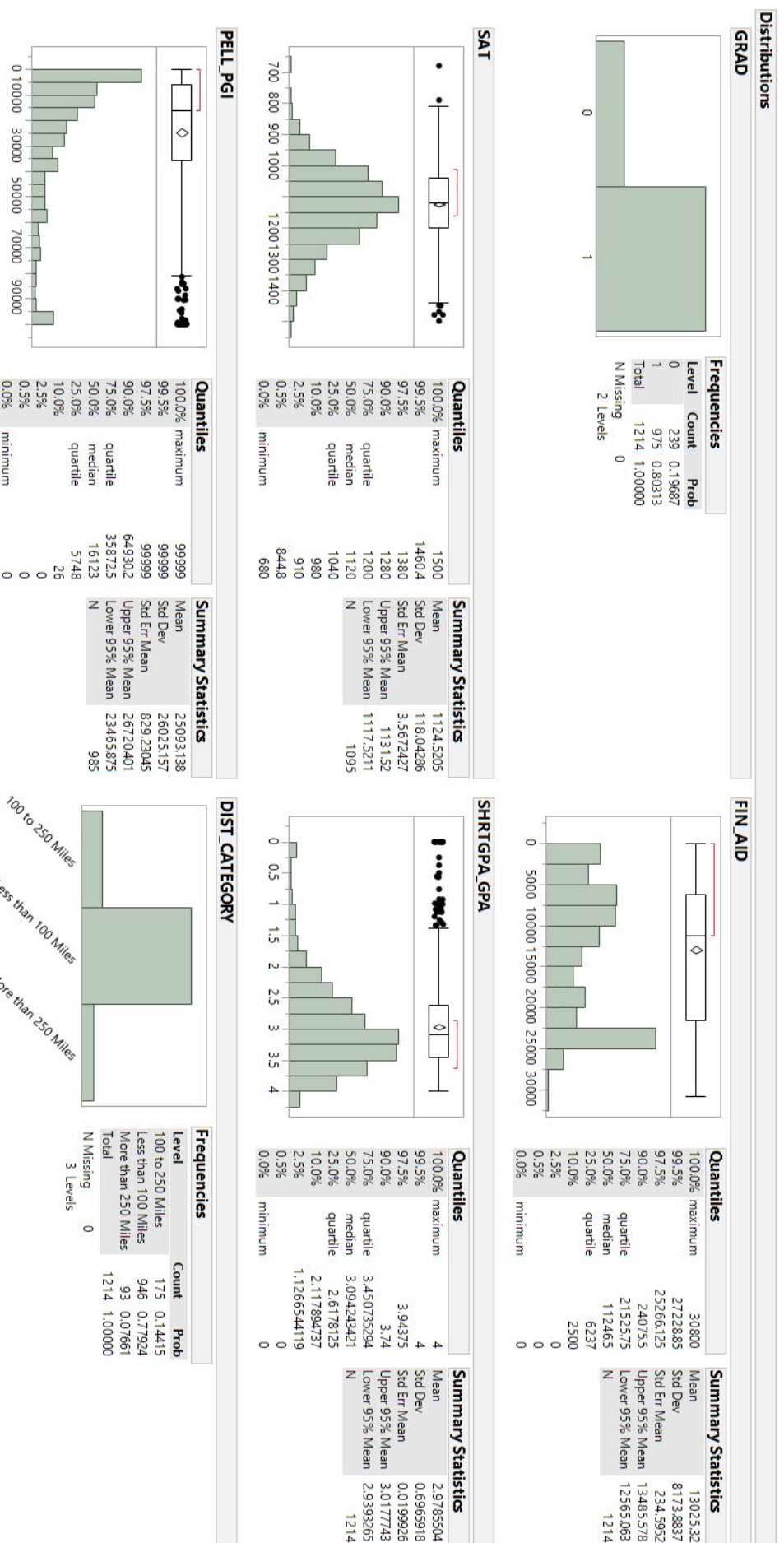
Variable	Obs	Mean	Std. Dev.	Min	Max
Graduation	1,214	0.803	0.398	0	1
Credits Taken	1,214	16.245	1.478	3	20
Student Athlete	1,214	0.113	0.317	0	1
Student Athlete Aid Indicator	1,214	0.046	0.210	0	1
Honors Student	1,214	0.091	0.287	0	1
On Campus	1,214	0.965	0.183	0	1
Financial Aid	1,214	13025.320	8173.884	0	30800
Charges	1,214	23645.630	1389.094	932	27737
Citizen	1,214	0.988	0.111	0	1
Male	1,214	0.463	0.499	0	1
Father's Education	988	2.712	0.539	1	4
Mother's Education	990	2.727	0.507	1	4
Pell Grant Indicator (Expected Family Contribution)	985	25093.140	26025.160	0	99999
Dependent	1,214	0.803	0.398	0	1
Transfer	1,214	0.054	0.227	0	1
SAT	1,095	1124.521	118.043	680	1500
ACT	262	27.153	9.140	13	71
High School GPA	1,146	3.457	0.426	1.61	4
High School Class Rank	471	85.779	78.448	1	450
High School Class Size	471	329.019	188.402	25	1042
High School Percentile	472	72.956	18.980	7	100
Credit Completion Ratio	1,214	0.942	0.150	0	1
Legacy	1,214	0.129	0.335	0	1

3.09. The top 25% of students earned greater than a 3.45 GPA while the bottom 75% earned less than a 2.62 GPA. The class had 76.61% of students come from less than 100 miles away, 14.41% come from 100 to 250 miles away, and 7.66% come from more than 250 miles away.

Examining the decision tree analysis (**Figure 3**), 16.8% of the data variation was explained by seven splits before the partitioning was discontinued. Significant predictors from this analysis were first term GPA, college, credit completion ratio, major, and PGI. Students who

Figure 2: Fall 2010 Distributions

*GRAD = Graduation Indicator; FIN_AID = Amount of Financial Aid; SHRTGPA_GPA = First Term GPA; PELL_PGI = Pell Grant Index or Expected Family Income; DIST_CATEGORY = Distance Category



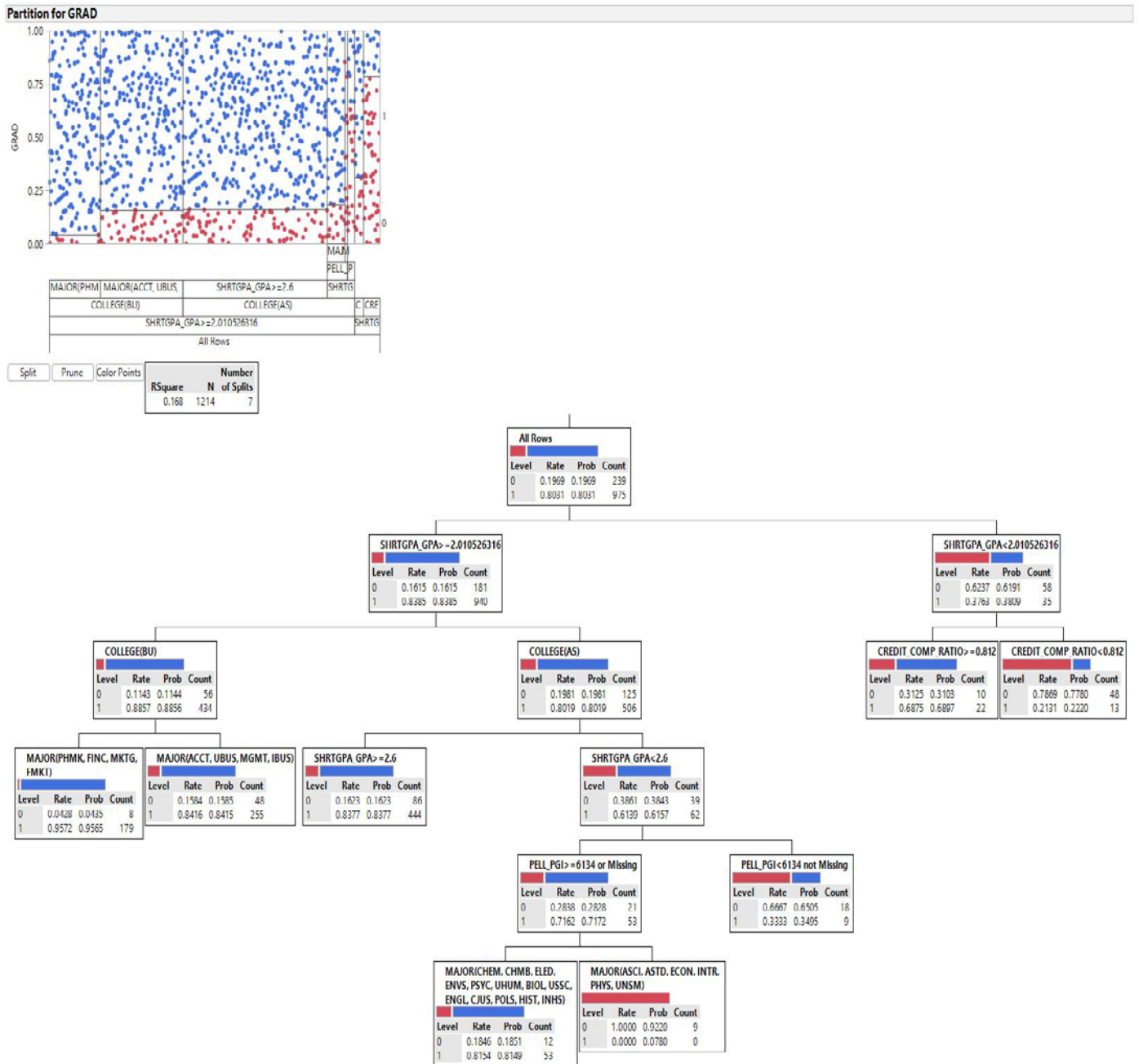
had first term GPAs lower than 2.01 had a 61.91% probability of not graduating, while students with a GPA greater than or equal to 2.01 had only a 16.15% probability of not graduating. Of the students who had lower GPAs than 2.01, those who completed less than 81.2% of their credits had a 77.8% probability of not graduating. Of those students who had higher than or equal to 2.01 GPAs, the students who were in the College of Arts and Sciences (CAS) had a 19.81% probability of not graduating and business students had an 11.44% probability of not graduating. These models are indicative that in-college performance, school of choice, and expenses were the most important predictors for retention.

Examining the marginal effects from the probit analysis (**Table 3**), six variables were statistically significant at the 5% level with two variables significant at the 10% level. The model predicted 17.2% of the variation in the data and, excluding all null fields for variables, utilized 852 observations. Transfer status was not included in this analysis because of collinearity issues with the graduation outcome.⁵ Important indicators of graduation were credits taken, Honors Program participation, college, other religious identification, first term GPA, and credit completion ratio. For every additional credit a student took, they were 2.29 percentage points more likely to graduate. If a student was enrolled in the Honors Program, they were 8.54 percentage points more likely to graduate. A business student was 12.33 percentage points more likely to graduate than students enrolled in the CAS. While no other religion variables were the credits they took, they were 38.94 percentage points more likely to graduate. For every 1.00 increase in first term GPA, a student was 8.17 percentage points more likely to graduate. Significant at the 10% level, every 1.00 increase in high school GPA made a student 6.61 percentage points more likely to graduate. Additionally, significant at the 10% level, a student

⁵ All transfer students from this cohort successfully graduated from university, so they could not be included.

Figure 3: Fall 2010 Decision Tree Analysis

**CREDIT_COMP_RATIO = Credit Completion Ratio*



athlete was 7.88 percentage points more likely to graduate than a non-student-athlete. The results supported most of the findings from the decision tree, and marked student-athlete status as potentially impacting persistence until graduation.

Table 3: Fall 2010 Regression Marginal Effect Results

VARIABLES	Graduation (1)	VARIABLES	Graduation (1)
Credits Taken	0.022879**	Other	-0.340236***
	(0.011)		(0.120)
Student Athlete Indicator	0.078814*	Christian, Non-Catholic	-0.069286
	(0.044)		(0.046)
Student Athlete Aid Indicator	0.062522	Refused Religion	-0.099912
	(0.071)		(0.155)
Honors Student Indicator	0.085354**	Male	0.008997
	(0.042)		(0.030)
On Campus	-0.032200	Father Graduated High School	-0.139094
	(0.221)		(0.138)
Financial Aid (divided by 10000)	-0.028074	Father Graduated College	-0.113852
	(0.021)		(0.093)
Charges (divided by 10000)	0.315948	Unknown Father's Education	-0.111365
	(0.407)		(0.188)
Less than 100 Miles	0.031516	Mother Graduated High School	0.067360
	(0.042)		(0.124)
More than 250 Miles	0.003797	Mother Graduated College	0.113625
	(0.062)		(0.164)
Haub School of Business	0.123320***	Unknown Mother's Education	0.081558
	(0.029)		(0.108)
Black	0.028489	Expected Family Income (divided by 1000)	-0.002473
	(0.086)		(0.006)
Hispanic	0.091910	Dependent	-0.027852
	(0.067)		(0.094)
Other Race	0.102045	SAT	-0.000136
	(0.094)		(0.000)
White	0.077230	High School GPA	0.066096*
	(0.090)		(0.040)
Citizenship Status	0.137251	First Term GPA	0.081674***
	(0.180)		(0.030)
Jewish	-0.092940	Credit Completion Ratio	0.389400***
	(0.223)		(0.131)

Non-Christian, Non-Jewish, Other	0.064238	Legacy	-0.017284
	(0.136)		(0.045)
Observations		852	
Pseudo R Squared		0.172	
Log Likelihood		-346.7	
(Standard errors in parentheses) • *** p<0.01, ** p<0.05, * p<0.10 • Base Variables: Catholic and Asian Race			

Fall 2006 - Fall 2012 Descriptive Statistics and Model Results

For this analysis, all first-time enrollees from Fall 2006 to Fall 2012 were included. The cleaned sample size for the population was 10,740 (**Table 4**) and had a graduation rate of 80.7%. Reviewing the important characteristics of this dataset (**Figure 4**), over 90% of the sample size received some financial aid totaling \$2,500 or greater. The financial aid distribution was bimodal with the tall peak occurring around \$5,000, and the lower peak occurring around \$20,000. The median financial aid of \$9,983 was almost \$2,000 less than the mean financial aid of \$11,760. The population could expect an average family contribution of \$25,731 with a smaller median of \$17,810. The top quartile expected a contribution greater than \$35,775 with the bottom quartile expecting less than \$6,410. 7,950 observations filed FAFSA information, or 2,790 observations

Table 4: 2006-2012 Summary Tables and Tabulations

Variable	Obs	Mean	Std. Dev.	Min	Max
Graduation	10,740	0.807	0.394	0	1
Fall Semester	10,740	0.973	0.161	0	1
Spring Semester	10,740	0.027	0.161	0	1
Credits Taken	10,740	15.818	2.060	0	22
Student Athlete	10,740	0.106	0.308	0	1
Student Athlete Aid Indicator	10,740	0.049	0.215	0	1
Honors Student	10,740	0.079	0.270	0	1
On Campus	10,740	0.842	0.364	0	1
Financial Aid	10,740	11760.190	7949.729	0	42500
Charges	10,740	21100.060	3860.844	0	28665.15

Citizen	10,740	0.985	0.121	0	1
Male	10,740	0.481	0.500	0	1
Father's Education	8,010	2.713	0.527	1	4
Mother's Education	8,027	2.715	0.507	1	4
Pell Grant Indicator (Expected Family Contribution)	7,950	25731.520	26214.940	0	228163
Dependent	10,740	0.738	0.440	0	1
Transfer	10,740	0.070	0.256	0	1
SAT	10,017	1137.055	121.724	670	1600
ACT	1288	26.654	8.485	13	86
High School GPA	10,209	3.374	0.441	1	4.84
High School Class Rank	2889	86.694	76.967	1	511
High School Class Size	2890	326.556	178.096	25	1126
High School Percentile	2890	72.818	18.993	3	100
Credit Completion Ratio	10,654	0.943	0.154	0	1
Legacy	10,740	0.178	0.382	0	1

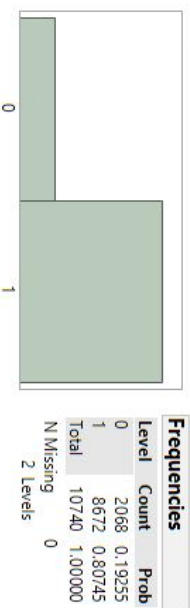
less than the total sample. SAT scores ranged from 670 to 1600 and were normally distributed around the center between 1130 and 1140. During the new student's first semester, the average GPA an individual earned was 2.94 and the median was 3.06. The top 25% of students earned greater than a 3.46 GPA and the bottom 25% of students earned less than a 2.57 GPA. The sample had 78.25% of students come from less than 100 miles away, 13.50% come from 100 to 250 miles away, and 8.25% come from more than 250 miles away. The combined populations represent an image like the previous analyzed cohort.

Examining the decision tree analysis (**Figure 5**), 14.3% of the data variation was explained by six splits before the partitioning was discontinued. Significant predictors from this analysis were first term GPA, charges, credit completion ratio, and high school GPA. Students who had first term GPAs lower than 1.77 had a 70.69% probability of not graduating while students with a GPA greater than or equal to 1.77 had a 16.01% probability of not graduating. The students with a GPA less than 0.75 were almost guaranteed to not graduate with a 95.57%

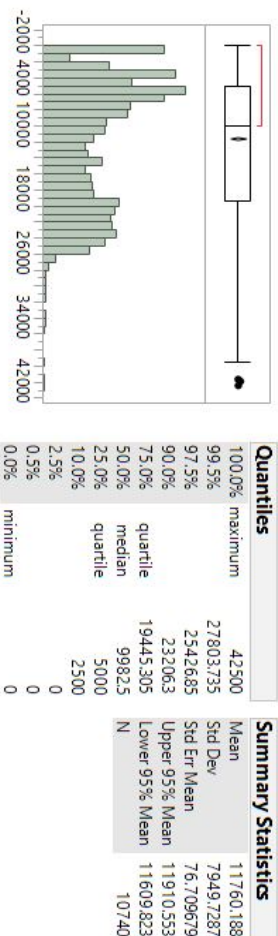
Figure 4: 2006-2012 Distributions

Distributions

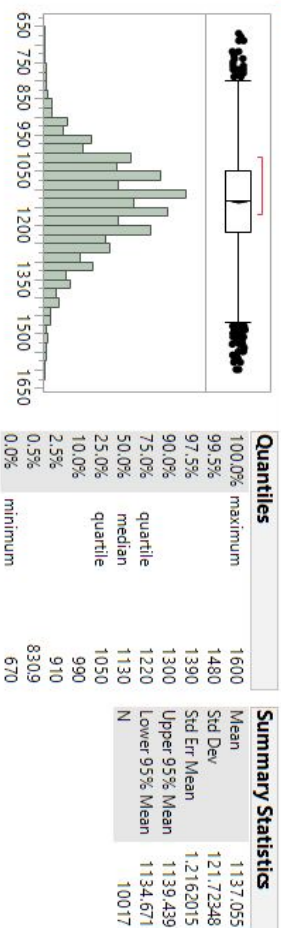
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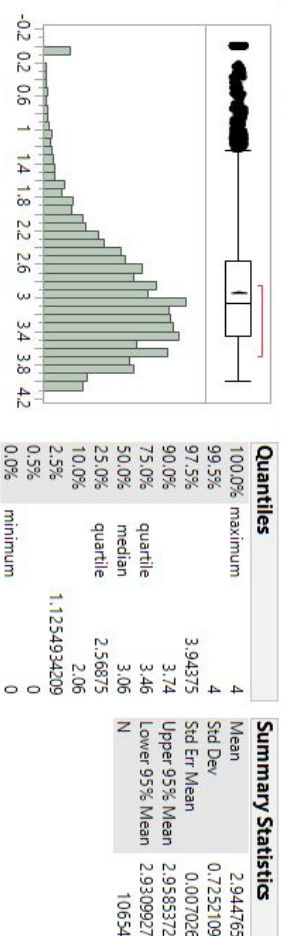
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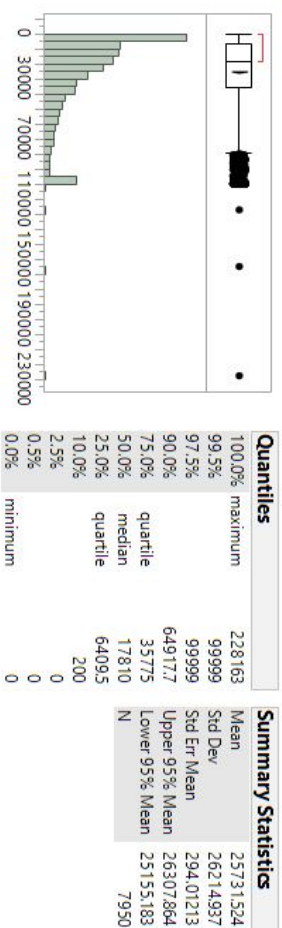
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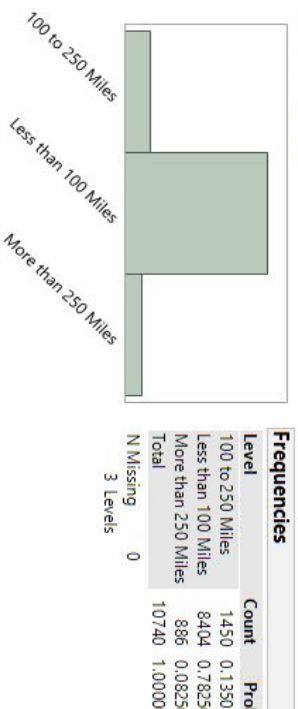
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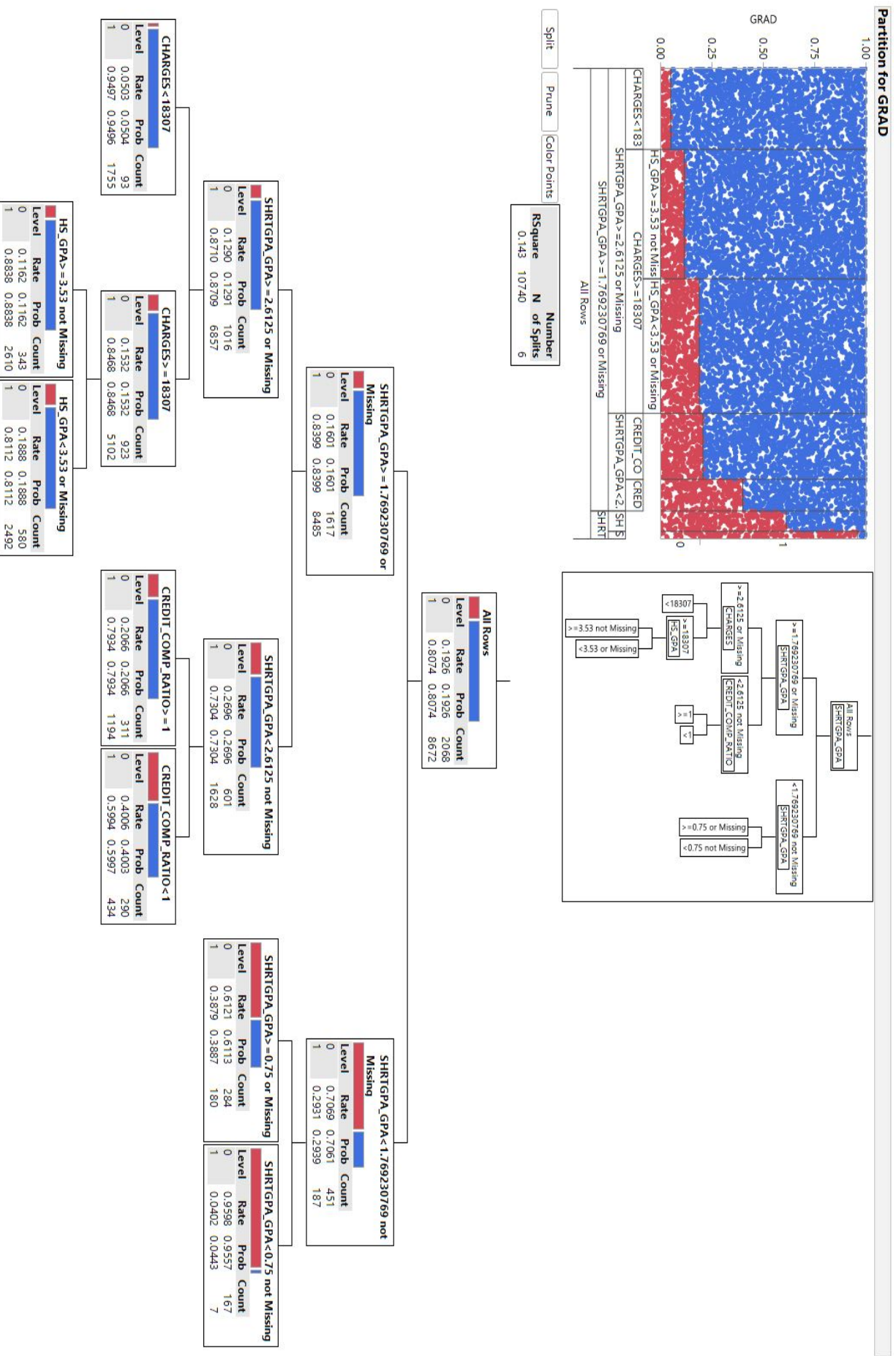
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probability. Students who had less than a 2.61 GPA and completed less than 100% of their credits had a 40.03% probability of not graduating. If a student fell under the same GPA criteria but completed all their credits, then their probability of not graduating fell to 20.66%. Students who had better than or equal to first term GPAs of 2.61 and had charges exceeding \$18,307 had a 15.32% probability of not graduating. Students with the same GPAs who owed less saw their probability of not graduating reduced to 5.04%. The analysis reflects that in-school performance and financial burdens are key determinants of graduation outcomes.

Examining the marginal effects from the probit analysis (**Table 5**), fifteen variables were statistically significant at the 5% level and five variables were statistically significant at the 10% level. The model predicted 17.1% of the variation in the data and, excluding null fields, utilized 7,204 observations. This model also included a fall semester variable that measured the difference in graduation outcomes for students who entered in the fall as opposed to the spring. Important indicators of graduation were Honors Program participation, financial aid, charges, distance, college, semester entered, certain religions, expected family income, high school GPA, first term GPA, and credit completion ratio. If a student was enrolled in the Honors Program, they were 6.28 percentage points more likely to graduate. If a student was given an additional \$10,000 in financial aid, they were 3.08 percentage points less likely to graduate. If a student were charged an additional \$10,000, they were 10.46 percentage points less likely to graduate. Compared to students who lived 100 to 250 miles away, students who lived less than 100 miles away were 7.46 percentage points more likely to graduate and students who lived more than 250 miles away were 2.94 percentage points more likely to graduate (respectively significant at the 10% level). A student who was enrolled in the business school was 5.93 percentage points more likely to graduate. A student who enrolled in the fall semester as opposed to the spring semester

Figure 5: 2006-2012 Decision Tree Analysis
**CHARGES = Tuition Charges; HS_GPA = High School GPA*



was 20.98 percentage points more likely to graduate. Muslim students, students of another religion, non-Catholic Christian students, and students who refused to identify their religion, were all respectively 55.47, 15.52, 4.92, and 10.81 percentage points less likely to graduate than Catholic students. If a student had an additional \$10,000 in expected family income, they were 0.45 percentage points less likely to graduate. For every 1.00 increase in high school GPA and first term GPA, a student was respectively 7.1 and 8.63 percentage points more likely to graduate. If a student completed all the credits they took, they were 47.81 percentage points more likely to graduate. Legacy students were 2.81 percentage points more likely to graduate than non-legacy students.

Credits taken, race, citizenship status, and a student's father's education level were all significant at the 10% level. For each additional credit taken amounted to a 0.66 percentage point increase in the likelihood of graduation was noted. White/Caucasian was the only race variable which was significant, and it had a negative 7.68 percentage points effect as compared to students of American Indian ethnicity. However, American Indian students only amounted to four observations and white had the second smallest effect of ethnicity variables included. All other ethnicity variables except Other Race had a larger negative marginal effect. A student who was a citizen was 11.24 percentage points more likely to graduate. Students with fathers who graduated college were 6.88 percentage points more likely to graduate. In closing, these results provide further evidence to reinforce the previous 2010 cohort model's findings. All previous significant variables except student-athlete status were significant in this model (**Table 3**). When measured in a larger sample, it seems that a multitude of factors beyond those listed in the first analysis like race, citizenship, parental education, and semester entered could affect a student's persistence until graduation.

Table 5: 2006-2012 Regression Marginal Effect Results

VARIABLES	Graduation (1)	VARIABLES	Graduation (1)
Credits Taken	0.006586*	Non-Christian, Non-Jewish, Other	-0.019918
	(0.004)		(0.067)
Student Athlete Indicator	0.017851	Other	-0.155175***
	(0.018)		(0.033)
Student Athlete Aid Indicator	0.018972	Christian, Non-Catholic	-0.049208***
	(0.026)		(0.016)
Honors Student Indicator	0.062814***	Refused Religion	-0.108062**
	(0.017)		(0.042)
On Campus	-0.010619	Unknown Religion	-0.018487
	(0.021)		(0.023)
Financial Aid (divided by 10000)	-0.030772***	Male	0.008282
	(0.007)		(0.010)
Charges (divided by 10000)	-0.104644***	Father Graduated High School	0.049975
	(0.020)		(0.032)
Less than 100 Miles	0.074631***	Father Graduated College	0.068842*
	(0.015)		(0.039)
More than 250 Miles	0.029411*	Unknown Father's Education	-0.025491
	(0.018)		(0.050)
Haub School of Business	0.059309***	Mother Graduated High School	-0.045809
	(0.010)		(0.054)
Asian	-0.151242	Mother Graduated College	-0.051276
	(0.095)		(0.046)
Black	-0.102667	Unknown Mother's Education	-0.051142
	(0.086)		(0.071)
Hispanic	-0.135681	Expected Family Income (divided by 1000)	-0.004498**
	(0.090)		(0.002)
Other Race	-0.072137	Dependent	-0.009249
	(0.093)		(0.034)
Refused	-0.161277	Transfer	0.028300
	(0.135)		(0.033)
White	-0.076805*	SAT	-0.000058

	(0.044)		(0.000)
Fall Semester	0.209834***	High School GPA	0.070701***
	(0.076)		(0.013)
Citizenship Status	0.112413*	First Term GPA	0.086253***
	(0.065)		(0.010)
Jewish	-0.111929	Credit Completion Ratio	0.478066***
	(0.072)		(0.044)
Muslim	-0.554745**	Legacy	0.028069**
	(0.247)		(0.012)
Pseudo R Squared		0.171	
Log Likelihood		-2889	
Observations		7,204	
(Standard errors in parentheses) • *** p<0.01, ** p<0.05, * p<0.10 • Base Variables: Catholic and American Indian			

Conclusion

In both datasets presented, the summary statistics presented a similar picture and both graduation rates were around 80%. Examining both models, it was clear first semester GPA and credit completion ratios are the two most decisive factors for predicting a first semester new student's graduation outcome. In every decision tree analysis, first term GPA was the variable that explained the most variation in the data because all other factors followed its initial partitioning of the data. That variable also had a significant positive marginal effect for every single unit increase in both models. Credit completion ratio was also involved in both decision tree analyses and was significant in both probit models. Though it never was the first split variable for the partitioning analysis like first term GPA, it divided large subsets of data in both decision trees. If students completed all their credits during their first semesters, their likelihood of graduating significantly improved. However, the more credits they dropped, the more they were at risk of leaving the university before graduating. Both results were expected and confirm

typical rationality. The worse a student does academically, the more likely it is that they will leave the university. These findings can reinforce proactive outreach strategies via email communications or meetings to help struggling students utilize university resources designed to help them succeed.

In addition to those two variables semester of entry, college, distance from university, monetary factors, Honors participation, and high school GPA seem to clearly affect a student's graduation outcome. Semester of entry was strongly significant in the last probit model. It is possible that students who enter in the fall find it easier to acclimate and get comfortable because most other students are going through the same transition period. Therefore, it is also possible that first term spring semester students may have a harder time adjusting because their "cohort" going through the same transition period is much smaller.

College was significant in both probit models, with more business students graduating than CAS students. Perhaps students were retained better in the business school because lower student enrollment allowed for more individualized attention. Business students could also be more likely to stay due to SJU's business programs' rankings. Their notoriety raises the probability that SJU was the first-choice university for more business students. Additionally, in **Graph 1**, 10% of departing students said their major was not offered so it is possible this occurs more often in the CAS. More research is required to identify the specific causal factor between the correlation of college choice and graduation.

Students whose home ranged from 100 to 250 miles from the university were less likely to graduate than the other two buckets. In **Graph 1**, 16% said they were leaving because of campus location. With the other two distance buckets, SJU is only either too close or too far

from home. For students in the middle bucket, SJU's campus is potentially too close or too far from home giving them more reasons to leave.

Monetary factors affected these analyses in variety of ways. Financial aid, charges (tuition fees/costs), and expected family income were all significant at various points in the analyses. They were sometimes partitioned sub-populations in the decision tree analysis and all three were significant in the final analysis. Interestingly when the variables were significant, they all had negative marginal effects. It intuitively makes sense as to why charges would have this relationship because as charges increase, the student must pay more to attend the college. Therefore, financial aid increases and expected family contribution increases should raise a person's probability of graduating from SJU because the university becomes more affordable. However, students who are receiving the most financial aid may need it the most because they cannot pay for SJU otherwise. Unfortunately, even with increased financial aid, they may still be unable to afford SJU's high attendance costs and must transfer or drop out. Additionally, expected family income is consistently skewed by wealthy families. For wealthier students, switching school costs are lower since they can afford it. For poorer students, transferring may be too expensive of a process to execute. Regardless, the marginal effect of expected family income is relatively small in the models.

High school GPAs and Honors Program participation were significant in multiple different models and both were significant in the final large model. They are both possible indicators of pre-college preparation. A higher GPA could mean that a student is more educated or of higher ability making the rigors of college more manageable. Participating in the Honors Program may be indicative of a student's commitment to academia and willing to invest in and persevere through academic challenges SJU presents.

Regarding other variables, it is uncertain if transfer status, race, religion, legacy citizenship status, parental education, and student-athlete status play a large factor in retention until graduation. Transfer status was excluded from the Fall 2010 cohort analysis because of collinearity and was not significant elsewhere. Transfers may not want to leave the university again, or may be likelier to transfer again since they know the process. Race and religion have certain variables significant at different points, but they are not very telling. A student's experience of SJU may be significantly different from others depending on their ethnicity/race and religion. Legacy was significant in the last analysis, and it's possible a legacy student may be more familiar with SJU and feel comfortable there. However, they also may want to go somewhere new. Citizenship status and parental education were only significant at the 10% level in the last analysis, so their effects need further examination. U.S. citizens may have an easier time navigating the challenges and culture of American college. As students' fathers' education progressed, they had higher correlation with positive graduation outcomes. With men traditionally as the primary wage-earners, the better educated a student's father is, the more they earn and can afford SJU. However, this factor could weigh most heavily on a student's decision to attend college in the first place. Students whose parents are uneducated typically have less resources to help them successfully apply to and enroll in college, but once a student is enrolled in the university, those specific barriers are no longer an issue. Student-athlete status was only significant in the Fall 2010 analysis. While student-athletes may be more invested in the school through a sport, the individual may also transfer to another school for a sport. More research is needed on these variables.

There were five variables that did not display any significant marginal effects. These variables include student-athlete aid status, on-campus status, sex, dependency, and SAT scores.

Student-athlete aid status was never significant because many student-athletes are walk-ons and do not receive aid, and those that receive aid are a smaller population. A student's on-campus status never affected their probability of graduation. SJU has a policy that requires students to live on campus their first two years, so that blanket effect may eliminate any correlation that could exist if students had the option to choose on or off-campus places of residence for their first two years. A student's sex was never significant and being a woman or man had little to do with retention until graduation. A student's dependency status was never significant, so even if a student was living independent of guardians it did not significantly affect their outcome. Lastly and somewhat surprisingly, the SAT score was not strongly significant in the analyses. SAT distributions across both population were very similar, but its standardization indicated no clear patterns. It is odd that a college preparation test did not predict a student's graduation outcome since it is intended to be an indicator of their ability. More research is required to investigate this.

While the results illustrated some significant findings, there are many areas for future research and improvement. First, the analysis only utilized data that was directly available from SJU's central database rendering an incomplete picture of the SJU student. It does not account for many other factors that could affect students. Second, other statistical/econometric analyses and tests may be utilized to better analyze the data. Cluster analyses, factor analyses, mean comparisons, logistic regressions, and other tests could provide different insights into the data. Third, transfer students and drop-outs are not distinguishable with a binary dependent variable because the factors that weigh in each groups' decision may be entirely different. For example, a transfer student may have a higher GPA and want to attend a more challenging school. Meanwhile a drop-out with a lower GPA decides to get a job. As evidence, 25% of departed students from UM-TC obtained success at another higher education institution (Jones-White,

2010). Finally, the graduation variable is not restricted on time. For the analysis, it did not matter how long a student took so long as they graduated. A freshman in Fall 2006 could have taken six years to graduate, but their outcome would still be successful despite the large amount of time invested. Future work could examine different outcomes in relation to time. Different variables could significantly change in how they affect a student's four or six-year graduation outcome. Adding time could provide insights into how to best help students graduate more efficiently.

In conclusion, the analysis provides a framework for how to apply econometric modeling techniques to enrollment management. With its unique dataset and econometric methodology, the results provide indicators of what and how various factors affect a student's retention until graduation. Econometric techniques offer opportunities for universities to gain better insight into their students and has provided a foundation for future research at SJU. More accurate knowledge regarding retention will help propel a better informed and more prepared university system into the future.

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ENGAGING STUDENTS AND FACULTY IN STUDENT ASSESSMENT

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Abstract

While many higher education professionals are engaged in assessing student outcomes, students themselves have little knowledge of why assessment is important and how assessment works. Additionally, faculty involvement and interest in assessment is often difficult to generate and sustain. This paper introduces a unique strategy to involve students and faculty in the development of an indirect measure of student outcomes.

Engaging Students and Faculty in Student Assessment

There is no doubt that higher education is immersed in a culture of assessment. Mandates for assessment emanate from regional accreditors (New Leadership Alliance for Student Learning and Accountability, 2012), specialized accreditors (Association of Specialized and Professional Accreditors, 2016), federal government (U.S. Department of Education, 2017b), and perhaps most importantly, accountability to consumers. Assessment is critical to demonstrating institutional fulfillment of stated mission and outcome objectives. As a self-study, the process is autonomous, using the mission and culture of an institution to develop an assessment process. Because of this autonomy, higher education assessment reflects a wide array of methods.

Despite this variety, most institutions depend on faculty and students to carry out assessment. As an example, the Multistate Collaborative developed as a cooperative effort between the State Higher Education Officers Association (SHEEO) and the American Association of Colleges and Universities (AAC&U), uses student artifacts submitted by faculty to assess many common general education learning outcomes (MSC, 2017). Without faculty and student cooperation, an institution cannot complete comprehensive assessment.

The purpose of this paper is to demonstrate how theories of student and faculty engagement can enhance assessment efforts. Specifically, this paper describes the development of a process integrating both faculty and students in the assessment process within the classroom. The paper also describes how assessment enhanced the learning environment. This collaborative process created opportunities for critical student-faculty interaction, produced a survey instrument measuring student learning outcomes within an academic department, and fostered student commitment to the assessment process. Finally, the results of the survey provided required and critical assessment feedback to the department about the relative strengths and weaknesses of the student experience.

Theoretical and Conceptual Framework

The theoretical framework for this study focuses on student involvement. One of the most basic theories of student involvement by Astin (1984) defines involvement as physical and psychological energy put forth by students toward the academic experience. The theory posits many avenues for student involvement and varying levels of involvement. Extensive empirical evidence (Pascarella & Terenzini, 2005) supports the strong positive relationship between greater student involvement and enhanced learning and development. Within his theory, Astin recognizes the contribution of the educational policies and practices of the environment. Institutions creating opportunities and spaces for students to be involved, both physically and psychologically, foster greater student learning and development. A fundamental environmental condition for student involvement is engagement with faculty (Astin, 1984). Along with other factors, when faculty and students interact, both within and beyond the classroom, students demonstrate greater involvement and subsequent learning (Astin, 1984; Strauss & Terenzini, 2005).

The conceptual framework (see Figure 1) for the study operates in the current environment for assessment in higher education. The framework recognizes the interactions of faculty and students within the classroom, producing the assessment instrument. The resulting data from the survey is fed back into the curriculum, further enhancing the conditions for student learning and development.

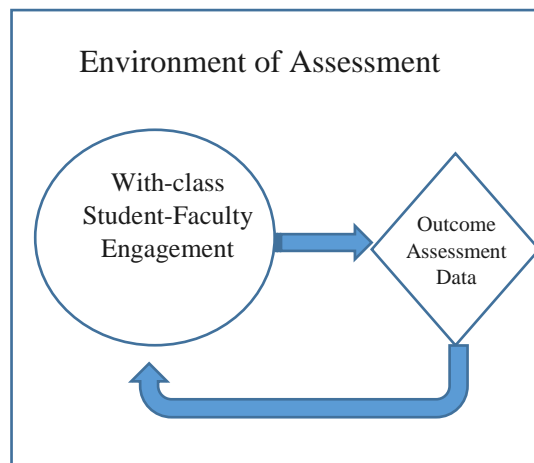


Figure 1. Conceptual framework of the impact of student-faculty engagement on outcome assessment within an environment of assessment.

Literature Review

Faculty Engagement

This paper highlights a strategy to leverage student-faculty interaction to maximize the critical contributions of faculty and students in assessment in higher education. The benefits of student-faculty interaction are well established by researchers (Chen, Lattuca, & Hamilton, 2008; Chickering & Gamson, 1999; Kezar & Maxey, 2014; Umbach & Wawrzynski, 2005). Chen, Lattuca, and Hamilton (2008) introduce the term “faculty engagement” demonstrating the critical

role of faculty creating environments fostering student engagement. Faculty engagement takes many forms including active and collaborative learning (Chickering & Gamson, 1999), within course interactions (Umbach & Wawrzynski, 2005), and out-of-class experiences (Strauss & Terenzini, 2005). Curricular reform benefits from student-faculty interactions as these interactions can result in growing awareness of student characteristics in the learning environment (Chen, Lattuca, & Hamilton, 2008; Lattuca & Stark, 2009).

Strong empirical evidence exists to support the relationship between student engagement and student-faculty interactions. Lattuca, Terenzini, and Volkwein (2006) and Lambert, Terenzini, and Lattuca (2007) found evidence of direct effects of increased student-faculty interactions and student learning in undergraduate engineering students. Specifically, faculty emphasis on foundational knowledge and active learning techniques improved student learning. The Faculty Survey of Student Engagement (FSSE) (Kuh, Laird, & Umbach, 2004) found three similar conclusions about the influence of student-faculty interactions on student engagement. First, when faculty emphasize certain practices, students are more likely to engage in these practices. When a faculty member engages students in critical questions, formulating beliefs, or applying content to real-world problems, students are more likely to do so. Hence, achieving desired student outcomes can be directly impacted by faculty behavior. Second, students who are more engaged report more learning gains. While engagement can include joining clubs, organizations, and attending events, student-faculty interaction is a strong measure of engagement as well (Pascarella & Terenzini, 2005). Finally, Kuh et al. (2004) point out the relationship of faculty characteristics to behaviors fostering student engagement. In their study, the researchers found that faculty who were of color, women, fulltime, and more recently hired, were more likely to engage students. Hence, there is variability in the extent faculty engage

students, suggesting opportunities for faculty to develop the capacity for engagement. Overall, this research emphasizes the importance of faculty engagement in fostering student engagement, but also points to the ability of individual faculty to create positive environments for student learning.

Creating positive learning environments is a key to successful achievement of desired student learning outcomes but it is assessment that allows institutions to demonstrate this success. With the growing role of assessment in higher education culture, leveraging positive relationships between faculty and students can also promote activities to document the achievements of students and establish the value of post-secondary education.

Need for Assessment in Higher Education

Documenting student learning is driven by the accountability movement in higher education. With increasing financial investments in higher education, stakeholders increasingly demand evidence of the value of post-secondary studies. At public institutions declining state funding (SHEEO, 2016) and increasing competition for state revenue result in increases in tuition. These increases often preclude access to needy students. States engaging in tuition free incentives, pass costs along to taxpayers. Private institutions face similar fiscal issues.

Declining enrollments due to demographic shifts (Long, 2016; Farber, 2016) and increased competition for tuition discounts, make the selection to enroll at private institutions an exercise in comparison shopping and negotiation for students and families (NACUBO, 2016). The results of these rising financial burdens are often increased student debt (Redd, 2016), reinforcing the demands of assurances of quality for the initial investment. Consequently, when asked what value is included for the investment, institutions frequently turn to assessment data.

Also driving the need for quality assessment is growing demand for and access to information. Long-standing rankings, such as U.S. News and World Report, are used by students to compare institutions on important metrics such as cost, financial aid, entrance criteria, and graduation rates. The College Scorecard (U.S. Department of Education, 2017a) allows students and families to create a cohort of comparison institutions. Much of this data, and certainly the results, circle back to the efforts of faculty in the classroom to impact student learning reported through assessment results.

In addition to mandates for accountability, institutions face increasing demands by society at large. Institutions now incorporate social issues such as immigration, free speech, and sexual assault awareness into mission statements and campus initiatives (Ganim & Black, 2015, Thomason, 2017; Zelizer & Keller, 2017). Demonstrating student learning related to these complex issues can be challenging, yet vitally important. By incorporating good assessment practices, institutions can demonstrate the value added of attending college on important societal issues (Gaston, 2013).

Hallmarks of Good Assessment

The ability of institutions to conduct all aspects of assessment relies on engaging in sound assessment processes. Fortunately, there are many resources guiding higher education professionals to good practices of assessment techniques. These included books (Banta & Palomba, 2014), as well as professional publications (American Association of Colleges & Universities, 2017). Increasingly professional organization provide resources for assessment including the New England Educational Assessment Network (NEEAN) and the Association for Institutional Research (AIR), both of which share and educate higher education professionals on

foundations of assessment. A recent inventory on the AIR web page revealed six publications on assessment within specific disciplines.

Fortunately, there is consensus about the elements of good assessment. There are four major elements of assessment described below. First assessment must be anchored to specific clear and measurable outcomes (Banta & Palumba, 2014; ABET, 2017; MSC, 2017). Second assessment begins and ends with faculty. Faculty establish student outcomes, provide artifacts of student work, and ultimately score student work. Third, the assessment instruments and processes must be applicable to the local culture, reliable, and valid. Finally, all of these efforts carry little meaning if institutions fail to use results for continuous feedback for improvement.

The first hallmark of good assessment is linking outcomes established by faculty to broader institutional goals. Institutional strategic plans articulate desired student outcomes for the institution. Programmatic learning outcomes reflect broader outcomes, but focus on specific content knowledge as well. Academic programs requiring specialized accreditation illustrate this relationship. For example, ABET's student learning outcome 3(h), states "... the broad education necessary to understand the impact of engineering solutions in a global, economic, environmental, and societal context" (ABET, 2017). A prominent engineering department states a strategic objective "Develop...curricula...that respond to current and emerging global needs of society..." (Penn State, College of Engineering, 2017). Both focus on global needs in society, which is more broadly reflecting in the institutional foundation "Enhancing Global Engagement" (Penn State University, 2017).

Second, the assessment process should involve faculty. At the onset, the academic program learning outcomes need to be developed by the faculty as content experts. While programs outcomes should reflect institutional outcomes, the decisions regarding the specific

skills and knowledge gained within a course of study are ultimately the decision of the faculty (Lattuca & Stark, 2009). While faculty teach within the classroom, they also dictate the nature of student work. This work, provided by faculty, is often the basis for direct measures of student work provided as a primary source for assessing student outcomes (MSC, 2017). These direct pieces of evidence of student learning can be capstone requirements, final portfolios, or creative projects. For example, a course project requiring a student to correctly analyze a dataset and communicate the results is an assignment designed by a faculty member. This assignment may satisfy a requirement for a course, graded by the faculty member. Independent of grading the same student work might be assessed to determine a communication or quantitative literacy outcome. The faculty member carries out two separate functions, grading the assignment and assessing student learning outcomes. Grading provides direct feedback to the student and the assessment provide overall feedback to the program, institution, and external agencies for accountability purposes.

The third hallmark of good assessment is clear and objective assessment evaluation tools. The use of well-developed rubrics provides opportunities to evaluate student work from various sources. An exemplar of the use of rubrics to evaluate student learning is the Multi-State Collaborative Value Added rubrics (MSC, 2017). These rubrics, developed by faculty, provide assessment information to programs and institutions on common general education outcomes of student learning.

Lastly, but most essential is ongoing feedback of assessment results into the curriculum. A feedback loop for assessment results is a requirement of all six of the regional accrediting bodies (Middle States Commission on Higher Education, New England Association of Schools and Colleges, Southern Association of Colleges and Schools Commission on Colleges, Western

Association of Schools and Colleges, Higher Learning Commission, and Northwest Commission on Colleges and Universities). For example, the New England Association of Schools and Colleges (2017) states in standard two “2.8 The institution has a demonstrable record of success in using the results of its evaluation activities to inform planning, changes in programs and services, and resource allocation.”

Institutions must specify how assessment results will be used and also must document changes that were made using these results. For example, a nursing program might have patterns of low scores on a subscale of the nursing NCLEX certification exam. The program can examine these patterns and modify course content or curricular requirements. Subsequent assessments would document the efficacy of these changes, or identify further areas for improvement.

Assessment cannot and should not occur without careful planning and implementation, including faculty and students in the process. The challenge many institutions face is motivating and incentivizing involvement to yield high quality on-going assessment. The efforts described in this paper are an example of meeting standards of good assessment, delivering course content, and leveraging student-faculty engagement to produce a quality enduring assessment process. By engaging students and faculty in the assessment process, the legacy of the activity continues to serve as a motivator for future involvement and investment in the assessment process.

Method

Setting

The process highlighted in this paper occurred in a statistics department at a large research institution. The undergraduate statistics major requires all graduating students to

complete a senior capstone course in statistical consulting, a course offered once a semester typically enrolling about 25 students. This course was taught by a faculty member with expertise in assessment and survey design. The content included increasingly challenging projects for students. During each project, students developed, refined, and mastered the ability to solve problems, conduct appropriate statistical procedures, and communicate results in writing.

In response to an assessment mandate, the faculty member was tasked to develop an assessment process for the undergraduate statistics program. Using the opportunity to integrate the development of the survey as part of a class project, the faculty member engaged students from the planning to piloting of the survey.

Process

Beginning in the first class of the semester, the instructor outlined the scope of designing an assessment instrument. Next, the instructor followed the foundational steps of assessment and survey development. Students reviewed the mission and outcomes of the program, were informed of the purpose of the assessment, and were introduced to the critical role of assessment for the future of the major. These steps were accomplished by, discussing program mission, learning outcomes, and good assessment practices.

The second step of the process integrated survey development material into the course. Survey fundamentals were introduced from Dillman, Smyth, and Christisan (2014), and students developed questions reflecting specific outcomes. Students used their own phenomenological experiences, discussing the importance of different outcomes at different points in the curriculum. With preliminary questions, the students studied question response sets, such as open-ended, ranking, and Likert scales.

After compiling a pool of items, two additional faculty members served as content validity experts. Meetings between the students and faculty occurred sequentially, revising items after each visit. These meetings were important as both faculty had a long history in the department and a broad range of teaching experiences. With a final draft, the survey was submitted to the department chair for approval.

With a completed survey, the students engaged several program alumni to pilot the survey. Pilot subjects completed the survey and commented on the questions, the length of the survey, technical jargon, and any overall comments. Upon completion, the final survey was produced and the survey questions are included in Appendix A.

The following spring, a new cohort of graduating seniors completed the survey for assessment purposes. As an introduction, the course instructor shared the origins of the survey. The students were enthusiastic about completing the survey when they were told it was developed by their peers as part of the same course they were enrolled in. The survey administration continued to include three years of students for a total of 51 responses.

Results

The result of this project was the actual survey (see Appendix A). The survey items reflect the program structure, (specific courses), learning outcomes (communication, ethics), and self-ratings of learning (dealing with outliers and selecting the correct model). Using a student centered process ensures the language used for the survey items is familiar to students.

One example of the survey results is a six item scale designed to measure communication skills. The six items reflect multiple communication skills, such as communicating to non-statisticians, presenting statistical results, writing, and using PowerPoints. Combining the six

items produced a “communication” scale with an alpha of .775. As shown in Table 1, with a mean of 4.24 on a true 5 point Likert scale, students reported comfort and confidence in their overall communication skills. Additionally, the mean scores across the three cohorts included in this data were compared and demonstrated no significant changes over time ($F=.120$, $p>.05$). These results suggest curricular efforts in the program were producing stable positive communication skill learning outcomes.

Table 1

Mean and Standard Deviation for the Communication Scale

	N	M (SD)
Communication Scale	51	4.2474 (.57847)

A different picture was painted for a second major outcome, ethics. At the time, the institution had a strategic emphasis on the development of ethical knowledge and the application of ethical principles in practice. Reflecting this mission, the survey contained 2 items related to ethics. While these two items did not form a reliable scale, following the pattern of these two items over time revealed positive trends toward meeting the institutional priority to integrate ethics into all academic programs. Importantly, the efforts to increase ethical understanding did not detract from communication or quantitative skills (see Figure 2).

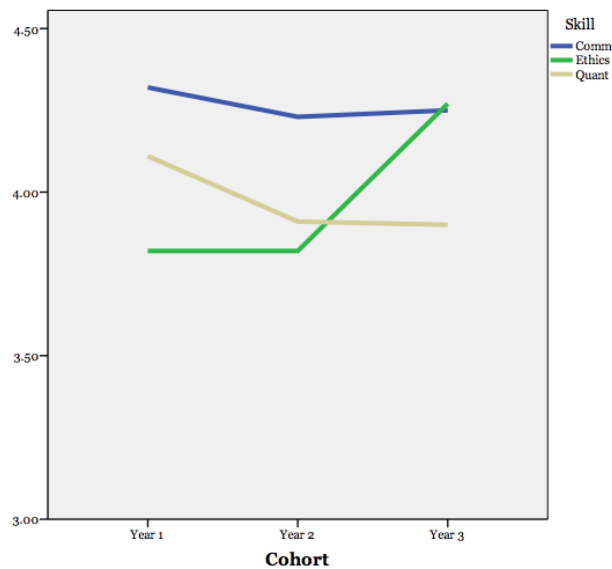


Figure 2. Trend for ethics, communication, and quantitative abilities over time.

In addition to understanding students learning, the results of the survey were used for curricular improvement, a core course (Analysis of Variance) was redesigned to integrate statistical theory with application. However, the results of this curricular change are not reflected in the current data. Subsequent cohorts of data are needed to determine the impact of this curricular change on student learning outcomes.

Discussion

While planning and implementing assessment efforts most often occurs without direct student involvement, the innovative approach described in this paper integrated a course experience with the development of an indirect measure of student learning authored and developed collaboratively between students and faculty. This experience was beneficial in many ways.

First, student engagement with faculty was improved. Based on the knowledge of student engagement theory and the empirical evidence supporting student-faculty engagement as a conduit for student engagement, the process described in this paper contributed to increased student learning by involving students with the course instructor and faculty outside the course. Students engaged in technical knowledge acquisition and content skills related to the course and to the broader statistics curriculum.

Secondly, the faculty member was able to integrate efforts to support assessment within the structure of the course. Leveraging the opportunity to use the instruction of assessment fundamentals as appropriate course content contributed to the department's assessment efforts and provided a real-life learning experience for the students. These efforts augmented the efforts of the faculty member to meet stated course learning outcomes.

Finally, the department benefitted from a locally developed but sound assessment instrument. The added benefit of continued motivation to complete the instrument assisted in issues of student participation in assessment efforts. This endeavor created a unique culture of assessment within the department.

Unfortunately, a limitation of this process is the lack of empirical evidence testing possible connections between student-faculty engagement and learning outcomes. However, given the previously reviewed body of support, the level of engagement met most criteria, and it is assumed this experience positively influenced student outcomes, although this could be an area for future research.

While extremely beneficial to the specific setting and department, the specifics of this process are not directly applicable to all academic units at all institutions. However, there are valuable lessons any unit can benefit from to take advantage of opportunities for assessment.

First, identify opportunities within or beyond the classroom that may meet assessment needs and simultaneously foster student engagement. The example in this paper used a statistics course. However, there may be other courses, such as psychology or sociology that might include fundamental assessment skills. Other possibilities are capstone projects or even graduate student work. English students and faculty may be able to develop processes and materials for other academic units to assess written communication. The possibilities are as broad as academic disciplines are diverse.

Academic leaders can identify faculty expertise to lead student-engaged assessment processes. At the heart of the academic institution is teaching. Providing faculty with opportunities to use their expertise in creative academic initiatives incentivizes rather than burdens faculty involvement in assessment. If faculty are aware that assessment can be part of, rather than on top of other responsibilities, they may be more likely to willingly engage in assessment efforts on campus.

Assessment efforts can occur outside the classroom. Students participate in many co-curricular activities. Internship or co-op placements may include opportunities to participate in assessment activities. Students can integrate these experiences with initiatives on-campus. Students may participate in community service or other volunteer activities associated with grants or other reporting that can be used to support student learning outcomes.

Faculty and administrators can work together to find these opportunities. Faculty may be engaged in many curricular or co-curricular activities having the potential to contribute. Administrators should welcome opportunities to explore discipline specific expertise of faculty to use to advance assessment. Asking education faculty who develop rubrics for course assignments to provide sample of these rubrics for others involved in assessment is an opportunity to develop clear objective rubrics, developed by talented faculty. To extend this example one step further, to the conceptual framework of the study, involve students in the development of these rubrics.

It is often said that assessment is here to stay. Given that, making assessment part of the culture, by providing opportunities for student-faculty engagement will not only demonstrate the commitment to quality, but enhance the learning environment for both students and faculty.

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Appendix A

Survey Questions

I AM ABLE TO MAKE CONNECTIONS BETWEEN THE MATERIAL I LEARNED IN MY THEORY COURSES AND THE MATERIAL IN MY APPLIED COURSES

STAT 414 PREPARED ME FOR CAREER/GRADUATE EDUCATION?

STAT 415 PREPARED ME FOR CAREER/GRADUATE EDUCATION?

STAT 416 PREPARED ME FOR CAREER/GRADUATE EDUCATION?

IF YOU DID NOT TAKE THE ACTUARIAL EXAM (EXAM P) THEN SKIP THESE 4 QUESTIONS

THE MATERIAL I LEARNED IN STAT 414/415 PREPARED ME FOR THE
ACTUARIAL EXAM (EXAM P)

HOW MANY TIMES DID YOU TAKE IT?

I PASSED THE ACTUARIAL EXAM (EXAM P)?

HOW LONG IN BETWEEN TAKING STAT 414/415 AND TAKING THE ACTUARIAL EXAM
(EXAM P) FOR THE FIRST TIME

THE REQUIRED MATH COURSES (140, 141, 220, 230)OR EQUIVALENT (AP CREDITS, EC.) PREPARED
ME FOR THE MATHEMATICS REQUIRED IN STAT 414

THE STATISTICS CURRICULUM PREPARED ME TO WRITE PROOFS?

I AM ABLE TO APPLY MY MATHEMATICAL BACKGROUND TO APPLIED PROBLEMS?

RATE THE AMOUNT OF MATH REQUIRED BY THE STAT PROGRAM

RATE THE EMPHASIS ON APPLIED PROBLEMS IN THE STAT CURRICULUM

RATE THE EMPHASIS ON ETHICS IN THE STAT CURRICULUM

I AM COMFORTABLE LEARNING NEW STATISTICAL PACKAGES

WHICH INTRODUCTORY COMPUTER PROGRAMMING COURSE DID YOU TAKE?

I AM PREPARED TO WRITE NEW CODE

GIVEN A P VALUE I CAN MAKE CONCLUSIONS ABOUT A HYPOTHESIS TEST

I CAN GIVE AN ACCURATE DEFINITION OF A P VALUE

I AM ABLE TO COMPARE DIFFERENT STATISTICAL TESTS

GIVEN A PROBLEM I CAN FORMULATE AN APPROPRIATE STATISTICAL HYPOTHESIS

I AM ABLE TO CHECK IF THE ASSUMPTIONS OF A MODEL ARE MET

IN GENERAL, I UNDERSTAND THE LOGIC BEHIND USING CERTAIN STATISTICAL TESTS

I UNDERSTAND THE SCIENTIFIC METHOD

I AM ABLE TO IDENTIFY TYPES OF DATA

I AM ABLE TO IDENTIFY TYPES OF VARIABLES IN AN APPLIED PROBLEM

I AM ABLE TO DESCRIBE DATA

I UNDERSTAND THE TWO TYPES OF ERRORS (TYPE I AND TYPE II)

I AM ABLE TO INCREASE THE POWER OF A STATISTICAL TEST

I AM ABLE TO DRAW CONCLUSIONS FROM A STATISTICAL ANALYSIS

I AM ABLE TO DETERMINE AN APPROPRIATE MODEL FOR A GIVEN STATISTICAL PROBLEM

I AM ABLE TO DISTINGUISH BETWEEN RANDOM AND FIXED EFFECTS

I AM COMFORTABLE USING TECHNICAL LANGUAGE WHEN COMMUNICATING WITH OTHER STATISTICIANS

I AM COMFORTABLE WITH MY STATISTICAL KNOWLEDGE WHEN WORKING WITH SUPERVISORS/FACULTY ON PROJECTS

I AM COMFORTABLE WITH MY STATISTICAL KNOWLEDGE WHEN WORKING WITH MY PEERS ON PROJECTS

I AM COMFORTABLE WITH MY STATISTICAL KNOWLEDGE WHEN WORKING WITH CLIENTS ON PROJECTS

I AM COMFORTABLE COMMUNICATING STATISTICAL RESULTS TO NON-STATISTICIANS

I AM COMFORTABLE MAKING A PRESENTATION TO A GROUP

I AM COMFORTABLE WITH MY ABILITY TO COMMUNICATE MY STATISTICAL FINDINGS IN WRITING

I KNOW HOW TO DEAL WITH OUTLIERS

IN GENERAL I AM ABLE TO SET UP DIFFERENT STATISTICAL MODELS (SUCH AS ANOVA, REGRESSION, ETC)

MY COURSES INTRODUCED ME TO THE ETHICAL CONSIDERATIONS WHEN WORKING WITH DATA

IN GENERAL I AM ABLE TO USE GRAPHS (SUCH AS SCATTER PLOTS, BOX PLOTS,
HISTOGRAMS) TO PRESENT DATA

I AM ABLE TO USE SLIDESHOWS TO PRESENT THE RESULTS OF MY STATISTICAL ANALYSIS

I AM ABLE TO DERIVE CONCLUSIONS BASED ON MY DATA

I AM ABLE TO TAILOR PRESENTATIONS TO FIT THE NEEDS OF MY AUDIENCE?

IF I COULD START ALL OVER AT XX I WOULD MAJOR IN STATISTICS

THE EFFECTS OF FIRST-GENERATION STATUS ON STUDENT ENGAGEMENT AND
OUTCOMES AT LIBERAL ARTS COLLEGES (NEAIR 2017 Conference Presentation)

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Abstract

While considerable research has been conducted on first-generation college students, a limited number of studies systematically examined their college experiences and outcomes. Using data collected through the Higher Education Data Sharing Consortium (HEDS) Senior Survey, this study compared their engagement, satisfaction, and outcomes with those of second-generation students at 16 liberal arts colleges (N=7,611). First-generation status demonstrated positive effects on interactions with diversity, participation in student/campus government, satisfaction with career services, and institutional preparation for career path, but negative effects on likelihood of study abroad. Additionally, on several variables, factor interaction was found between first-generation status and gender and/or race/ethnicity.

Promoting the success of disadvantaged students remains an important goal of colleges and universities and a prominent theme in national dialogues on higher education. One important segment of this population—first-generation college students—tends to face many significant challenges. Compared with their second-generation peers, they are more likely to come from low-income families, be constrained by the cost of attending college and lack of financial assistance in college choice, report significant concerns about financing college, receive less familial financial support to cover college expenses (Aenz, Hurtado, Barrera, Wolf, & Yeung, 2007; Choy, 2001; DeAngelo, 2010; Eagan, Stolzenberg, Bates, Aragon, Suchard, & Rios-Aguilar, 2015; Chen & Carroll, 2005; Nuñez & Cuccaro-Alamin, 1998; Terenzini, Springer, Yaeger, Pascarella, & Nora, 1996), and accumulate debt upon graduation (Chen & Wiederspan, 2014). Pascarella, Pierson, Wolniak, and Terenzini (2004) also approached the potential effects of first-generation status on college experiences through the lenses of cultural and social capital;

theoretical perspectives suggest that compared to their peers, first-generation students are “more likely to be handicapped in accessing and understanding information and attitudes relevant to making beneficial decisions” (p. 252) about college choice and how to get the most out of college. In turn, this may translate into smaller gains in terms of growth and outcomes.

For the past decade, first-generation students have remained a sizable proportion of the undergraduate population: nationally, of the fall 2005 first-year cohorts, 20.1% were first-generation students (defined as students whose parents had no college experience); for fall 2015, 17.2% (Eagan, Stolzenberg, Ramirez, Aragon, Suchard, & Rios-Aguilar, 2016). Although the proportion of first-generation students overall has remained relatively stable or slightly declined in some years (Eagan et al. 2016), the profile of this group has evolved substantially. American undergraduate population has witnessed a significant increase in racial/ethnic diversity, with the largest growth occurring in the Hispanic student group (Eagan et al., 2016; IPEDS 12-Month Enrollment, 2017), a group which tends to be associated with lower household income (US Census Bureau, 2016) and lower academic preparation (Eagan et al., 2016). This increase carries important implications for the first-generation student profile, since research (Aenz et al., 2007) showed that first-generation students were disproportionately from the historically under-represented racial/ethnic groups, and Hispanics had the highest proportion of first-generation students. Furthermore, for the past 15 years, first-generation students as a group has experienced the biggest drop in the level of family resources to help pay for college (Eagan et al., 2016). With the projected continued decline in White students and growth in students of color, most notably Hispanic students (Bransberger & Michelau, 2016), the racial/ethnic and socio-economic profile of first-generation students will continue to evolve, and interest in their access to and success in college will remain high.

In recent decades, with the ever rising tuition and student loan debt, American undergraduate education has come under increased public scrutiny. The growing demand for accountability calls for more empirical evidence of the benefits and value of a college degree, especially outcomes for socio-economically disadvantaged students such as first-generation students. To support these groups, institutions have invested a great deal of financial resources and launched various programs. Recent years have witnessed an enhanced recognition of the imperative to support socio-economically disadvantaged students and growing national efforts to promote success of this population. However, to what extent these efforts are delivering results remains largely unexplored.

Literature Review

Quite a bit of research has been conducted on first-generation college students. However, most research focused on their persistence and degree attainment. First-generation students tended to face significant challenges in transitioning to college (Terenzini, Rendon, Upcraft, Millar, Allison, Gregg, & Jalomo, 1994; Terenzini et al., 1996; Yee, 2016) and were less likely to persist and graduate (Berkner, He, Cataldi, & Knepper, 2002; Billson & Terry, 1982; Chen & Carroll, 2005; Choy, 2001; Horn, 1998; Ishitani, 2003; Ishitani, 2006; Lohfink & Paulsen, 2005; Nunez & Cuccaro-Alamin, 1998; Warburton, Bugarin, & Nunez, 2001; Yue & Fu, 2017). Previous studies on first-generation student experiences and outcomes fall into three major categories: those on first-year students; those on upper-level students; and those on mixed samples. Findings were reviewed below by category.

First-year Students

In perhaps the first systematic study of first-generation students, Terenzini et al. (1996) found several significant differences between first-generation students and their counterparts at

the end of their first year; for example, they worked more hours per week, were less likely to perceive that faculty were concerned about students and teaching, and made smaller gains on a standardized measure of reading comprehension. Focusing on academic engagement and social involvement, Nunez and Cuccaro-Alamin (1998) and Porter (2006) concluded that first-generation first-year (FGFY) students were significantly disadvantaged: They reported lower frequencies of interactions with faculty or advisor, attending academic or career-related lectures, or attending study groups or social interactions with peers. Pike and Kuh (2005) also found that FGFY students reported significantly lower levels of academic and social engagement; additionally, they were less likely to perceive the college environment as being supportive, less likely to integrate diverse college experiences, and reported significantly smaller gains in terms of learning and intellectual development.

More recently, using National Survey of Student Engagement (NSSE) data, Pike, Kuh, McCormick, Ethington, and Smart (2011a) found that being a FGFY student was negatively related to two out of the five engagement benchmarks: active and collaborative learning and participation in enriching educational experience (e. g., internships, undergraduate research, study abroad, other high-impact practices, diversity experiences); however, no relationship was found on academic challenge, student-faculty interaction, and perceptions of supportiveness of institutional environments. Pike, Kuh, and McCormick (2011b) reached same conclusions on active and collaborative learning, academic challenge, and perceptions of supportiveness of institutional environments, but different conclusions on the other two benchmarks: Contrary to Pike et al. (2011a), being a FGFY student was also negatively related to student-faculty interaction, and no relationship was found with regard to participation in enriching educational experience (diversity experiences). In term of outcomes, being a FGFY student was actually

positively related to cognitive and non-cognitive gains (2011a), a conclusion contradicting Pike and Kuh (2005). Padgett, Johnson and Pascarella (2012) reported mixed results on four outcomes measured through standardized instruments: Level of parental education had no effect on critical thinking or moral reasoning; however, FGFY students reported significantly lower levels of intercultural effectiveness/openness to diversity and psychological well-being.

Beyond First Year

Lamenting that “surprisingly little is known about their [first-generations students’] college experiences or their cognitive and psychosocial development during college” (p. 250), Pascarella et al. (2004) conducted a follow-up investigation to their 1996 research using a longitudinal design (tracking sophomores and juniors). They found that first-generation students had a “somewhat different experience of college than their peers” (p. 265): They reported significantly lower levels of extracurricular involvement in the second year of college, and significantly lower levels of non-course-related interactions with peers in the third year of college. In terms of cognitive skills measured through standardized tests (science reasoning, writing skills, reading comprehension, and critical thinking), however, first-generation students were largely similar to other students, with one exception: first-generation status had a significant, negative impact on second year science reasoning; on psychosocial growth measured through survey self-reports, significances were found only in “isolated areas” (p. 265), and “even then the direction of the effects is inconsistent” (p. 265).

Toutkoushian and Smart (2001) made somewhat similar discoveries as Pascarella et al. (2004) on outcomes: Focusing on self-reported gains in five areas: interpersonal skills, learning/knowledge, tolerance/awareness, graduate school preparation, and communication skills, they found that first-generation seniors did not differ from their second-generation peers

except for interpersonal skills and tolerance/awareness on which they actually reported larger gains. More recently, Pike et al. (2011a) and Pike et al. (2011b) identified a negative relationship between being a first-generation senior and two out of the five NSSE engagement benchmarks: student-faculty interaction and enriching educational experience (2011a)/diversity experience (2011b); however, different from Pike et al (2011a), Pike et al. (2011b) also observed the same pattern of relationship for academic challenge as measured by coursework emphasizing higher-order thinking skills as well as on active and collaborative learning. Additionally, being a first-generation senior was positively related to cognitive and non-cognitive gains (Pike et al., 2011a).

Mixes Samples

Using a combined sample of four class levels, Pike, Kuh, and Gonyea (2003) found that being a first-generation student was “negatively related to social involvement and had negative indirect effects on both integration and gains” (p. 254) in general education, communications, interpersonal skills, and intellectual skills. More recently, however, Lundberg, Schreiner, Hovaguimian, and Miller (2007) discovered that first-generation status had a positive effect on student learning in terms of academic gains (e. g., analytical thinking), but a negative effect on involvement and engagement (e. g., faculty interactions).

Summary of literature Review

Despite the increased research comparing first- and second-generation students, the issue of inconclusive findings persists. This is partly due to the fact that the definition of a first-generation student and the selection of indicators representing engagement and outcomes (e. g., standardized/criterion-referenced measures *vs.* self-reports) often varied. These variations also make it somewhat problematic to make comparisons across already a small number of studies. Limitations in student sample selection also constrain the generalizability of findings. For one,

only an extremely small number of studies included seniors. For another, all of the studies reviewed above treated race/ethnicity as a dichotomous variable, an approach potentially masking the differences between racial/ethnic subgroups. Finally, over the years, the concepts of engagement and outcome have continued to evolve. For example, few studies addressed first-generation students' gains on career path preparation.

To sum up, there is a limited amount of empirical research systematically addressing the differences and similarities between first- and second-generation students on engagement, satisfaction, and outcomes. The issue of inconsistencies/inconclusiveness and limitations of the existing body of research indicate the need for additional studies to replicate, extend, or revise previous findings and reveal the complex ways in which first-generation status interacts with other background variables to affect college experiences. This study aimed to provide an expanded and nuanced understanding of first-generation students' experiences and outcomes, with the ultimate goal of identifying the successes and shortfalls in institutional efforts.

Method

Data Source, Major Variables and Participants

Findings of this study were based on analysis of a subset of an existing dataset collected through a consortium survey: the HEDS Senior Survey (hereafter the Survey) administered annually to all May graduating seniors. The design of the Survey instrument was informed by findings from the Wabash National Study of Liberal Arts Education (WNSLAE) on effective teaching practices and by the Association of American Colleges & Universities' (AAC&U) Liberal Education and America's Promise (LEAP) Essential Learning Outcomes (HEDS, 2017). This study was guided by Astin's (1993) conceptual framework for assessment: the Input—Environment—Output model. Astin's model assumes that students' background characteristics at

the point of entering college (Input) can influence their college experiences (Environment), which, in turn, can subsequently influence their gains from college (Output).

Upon receiving the standard dataset (compiled by the HEDS staff; containing data from three graduating classes: 2014, 2015, and 2016; response rate ranging from 21% to 96%), I performed procedures to generate the final sample for this study. This study defined a “first-generation” student as one from a family where neither parent had any college experience. The Survey contained a question: “What is the highest level of education completed by either of your parents or the person/people who raised you?” (Response Options: 1=Did not complete high school; 2=High school diploma; 3=Postsecondary school other than college; 4=Some college or associate's degree; 5=Bachelor's degree; 6=Graduate school; 7=Do not know). Students who checked the response option 1, 2, or 3 were coded as first-generation students; those who checked the response option 4, 5, or 6, second-generation students. 19 students with missing values on any of the demographic variables (parental education level, race/ethnicity, gender, major) were deleted. Five control variables measuring institutional characteristics were then added using a school's most recent IPEDS data: size (based on 12-month enrollment), selectivity (based on acceptance rates), institutional wealth (based on per student endowment), and student body socio-economic profile (based on percent of Pell recipients). A variable on college rank was also created based on a school's 2016 US News Best Colleges Rankings.

Data reduction through factor analysis was then performed on scales of Survey items to generate composite measures as dependent variables (environmental and outcome variables). This study employed 18 environmental variables measuring engagement and satisfaction (six satisfaction variables). The construct of engagement was measured by the following variables: (a) perceptions of faculty interest in/concern for students; (b) high-quality/impactful non-

classroom interactions with faculty; (c) level of academic challenge (faculty and peer challenge in the classroom and frequency of undertaking challenging exams and assignments emphasizing higher-order thinking skills); (d) interactions with diversity (including conversations with peers and faculty/staff with different political, social, or religious opinions and conversations on intergroup relations and different lifestyles or customs); and (e) participation in and gains from three High Impact Practices (HIPS: study abroad, faculty-mentored research, internships) and leadership experience (student or campus government), a total of eight variables based on single items: four on participation, and four on gains. Variables (a), (b), and (d) were newly created composite variables based on components derived from factor analysis. Variable (c) was a scale measure developed by the Center of Inquiry at Wabash College and validated in the WNSLAE (HEDS, 2017).

Outcome variables focused on student self-reported gains as a result of their undergraduate education. The construct of outcome was represented by a broad set of indicators addressing the cognitive, psycho-social, career-related, and personal development dimensions (a total of seven variables): (a) intellectual development (careful reading; critical thinking; creative thinking; information literacy; effective writing); (b) problem solving (quantitative literacy; teamwork; problem solving); (c) social and civic engagement (civic engagement; intercultural knowledge and competence; ethical reasoning); (d) development of effective speaking (single item); and (e) institutional preparation for career path, graduate school, and interpersonal relationships and family living (three single items). Variables (a), (b), and (c) were newly created composite variables based on components derived from factor analysis performed on the learning outcome items. For each engagement and outcome composite variable, its value was the average score of the single items included in the measure.

Except for the four variables on gains from HIPs and leadership experiences (as students not participating in an activity were not asked to indicate the impact) and the six satisfaction variables (as the Survey had a response option “Not relevant”), cases with missing values (7.00% out of the total sample of 8184 students) on any of the 15 remaining engagement and outcome measures were deleted (range of missing cases by item: 35-192 or 0.43%-2.35%; average number of missing cases by item: 71 or 0.87%). These missing cases were compared with other students on first-generation status, gender, race/ethnicity, and each of the 15 aforementioned variables, which indicated no systematic difference, except for a slightly higher proportion of men among missing students (44.33% *vs.* 39.73%), and a slightly higher percentage of missing cases participating in student or campus government (37.94% *vs.* 32.70%). The final sample included 7,611 students, 800 (10.51%) of whom were first-generation students, and 6,811 (89.49%), second-generation students. These students represented 16 private liberal arts colleges varying in location, size, selectivity, institutional wealth, student body social-economic profile, and rank. 10.27% of the sample were attending small schools (enrollment: <1,500); 35.13%, medium-sized schools (enrollment: 1,500 to 2,500); and 54.59%, large schools (enrollment: 2,500 to 3,500). 66.89% of the sample was attending schools ranked top 50; 20.37%, schools ranked 51st to 100th; and 12.72%, schools ranked lower than 100th.

Data Validity and Reliability

This study relied on student self-reports for analyses. For decades, self-reports have been widely used in studies of college students. Many researchers have generally agreed on the credibility of self-reports (e. g., Anaya, 1999; Ewell & Jones, 1993; Pace, 1985; Pike, 1995; Pike, 1996; Pike, 2011; Pike et al. 2011b). Researchers (e. g., Kuh, 2002; Umbach & Kuh, 2006) generally agree that self-reports are likely to be valid when the respondents understand the

information being requested on the survey, and think that the questions are worded clearly, cover recent activities, deserve a thoughtful and honest response, and do not explore socially undesirable, embarrassing, or personally sensitive behaviors. Taken as a whole, the Survey fulfilled these conditions. For example, for each of the 13 learning outcome items, the Survey provided a clear and concise definition (e. g., critical thinking: Examination of ideas, evidence, and assumptions before accepting or formulating a conclusion).

Additionally, most of the engagement and outcome variables used in this study appeared to be similar to those in other national surveys, e. g., NSSE and the WNSLAE, both of which had demonstrated validity. The fact that the learning outcome items on the Survey were informed by the AAC&U LEAP outcomes further added to their content validity. Regarding construct validity, the measures for the engagement and outcome constructs in this study reflected multiple dimensions and key features identified in the literature. Construct validity was also indicated by the strong empirical relationships found between the measures of the constructs as indicated by factor analysis showing common conceptual structures.

Lastly, reliability analysis by the HEDS staff as well as my own testing yielded strong evidence of internal consistency of the measures representing two major constructs: engagement and outcomes. For the three engagement scales (interactions with faculty; level of academic challenge; interactions with diversity) and one outcome scale (civic and social engagement) as part of the original dataset from the HEDS staff, their analysis based on data collected from all participating institutions showed Cronbach alpha scores of .90, .89, .87, and .81 respectively. Based on the final sample used in this study, the Cronbach alpha scores for the aforementioned three engagement scales (interactions with diversity scale slightly revised from a six-item scale to a four-item scale) were .90, .88, and .86, respectively, and for the newly created learning

outcomes scale (11 items; effective speaking and integrative thinking were dropped from the scale for low item loadings), .88.

Major Research Questions

1. Do first-generation students differ from their second-generation peers on background characteristics (gender, race/ethnicity, family socio-economic status, and major)?

2. Are there significant differences for levels of engagement, satisfaction, and outcomes between first- and second-generation students, after controlling for student-level (gender, race/ethnicity, major) and institutional-level (size, selectivity, institutional wealth, student body socio-economic profile, rank) characteristics and random effects of nested data (i. e., individual students nested within schools)?

3. Does first-generation status interact with gender and/or race/ethnicity in its effects on levels of engagement, satisfaction, and outcomes?

Methods of Data Analysis

To address Question 1, Chi-Square tests (and post-hoc Z-tests for background variables with more than two levels) were performed to identify significant association between first-generation status and a select background variable. For Question 2, binary logistic regression was used to investigate whether first-generation status significantly predicted likelihood of participation in each of the four activities (three HIPs and leadership experience), while controlling for the effects of (individual) covariates; if significant, the same test was used to identify significant association between first-generation status and participation rate within each of the racial/ethnicity groups (addressing part of Question 3). For the remaining dependent variables examined in Questions 2 and 3, multilevel regression modeling (linear mixed models using restricted maximum likelihood estimation with Kenward-Roger adjustment) was employed

to determine the fixed effects of first-generation status (including its interactions with gender and race/ethnicity), while holding constant the effects of covariates (individual and gender*race/ethnicity interaction), and the random effects of nested data. If interaction between first-generation status and gender or race/ethnicity was not significant, the main effects of first-generation status were then interpreted; in the presence of significant interaction, the main effects of first-generation status were not interpreted, as it was problematic to do so, given that it worked together with gender or/and race/ethnicity to affect the dependent variable; instead, follow-up analyses (tests of effects slices/ or tests of simple effects based on least squares means) were performed to identify which first-generation subgroup by gender or/and race/ethnicity differed from its second-generation counterpart.

Results

Significant Differences on Background Characteristics

There was no significant difference on gender composition between the first- and second-generation groups. Compared with their second-generation peers, first-generation students were more likely to come from each of the following three groups: Asian, African-American/Black, and Hispanic/Latino; they were less likely to be White students; first- and second-generation groups were similar on the proportion of multi-racial students. Additionally, first-generation students were more likely to borrow money to finance their college education. Borrowers from these two groups reported similar ranges of loan debt, with two exceptions: first-generation borrowers were more likely to accumulate loan debt at or above \$40K but below 60K, but less likely to borrow \$60k or more. Lastly, first-generation student group reported a higher percentage of education majors. Table 1 provided details.

Table 1.

Frequency Distributions of Participants by Select Demographic Characteristics

Characteristic	Percentage (%)		Sig. Difference	
	First-generation (n=800)	Second-generation (n=6,811)	Chi-Square	p
Gender			2.79	.095
Men	37.00	40.05		
Women	63.00	59.95		
Race/ethnicity			578.28	<.001
Asian and PI	7.63	2.41		
African-American/Black	10.38	2.95		
Hispanic/Latino	20.88	4.38		
Multi-racial	5.13	3.39		
White	56.00	86.87		
Accumulated Loan Debt to Finance Undergraduate Education?			270.94	<.001
Yes	87.11	56.97		
(Survey Question: <i>What is the total amount that you and/or your family have borrowed to finance your undergraduate education?</i> (Those who indicate No loan was coded as “No”))				
Amount of Loan Debt (Borrowers)			18.47	.002
Below \$10K	14.85	14.96		
At or Above \$10K but <\$20k	20.96	18.91		
At or Above \$20K but <\$30K	22.44	23.03		
At or Above \$30K but <\$40K	10.89	11.01		
At or Above \$40K but <\$60K	17.99	13.35		
At or Above \$60K	12.87	18.73		
Major			38.56	.001
Biological Sciences	11.38	12.66		
Business and Management	7.13	6.03		
Communications	2.25	1.64		
Education	1.88	0.57		
Engineering	1.38	1.22		
Fine and Performing Arts	4.75	3.46		
Health Sciences	3.63	2.53		
Humanities	9.38	11.23		
Physical Sciences, Math, and Computer Science	5.25	6.92		
Social Sciences	27.13	25.55		
Other	4.00	3.07		
Double Major	21.88	25.12		

Effects of First-generation Status on Levels of Engagement

Levels of Academic Engagement and Interactions with Diversity. On perceptions of faculty interest in/concern for students and high-quality/impactful non-classroom interactions with faculty, no significant factor interaction or main effect was found for first-generation status. For level of academic challenge, there was a significant two-way (first-generation status*gender) and three-way interaction (first-generation status*gender*race/ethnicity); specifically, compared with their second-generation counterparts, first-generation men, as a whole, reported a lower level of academic challenge; this unfavorable difference was most pronounced for first-generation multi-racial men who reported a lower level of academic challenge than their second-generation counterparts. Lastly, first-generation status yielded a significant main effect on interactions with diversity, with first-generation students reporting a higher frequency of interactions with diversity than their second-generation peers; on average, being a first-generation student (as opposed to second-generation) was associated with a .46 unit rise in the predicted scale score for this measure, holding all other variables constant.

Participation in and Gains from Three HIPs and Leadership Experiences. First-generation status was a significant, negative predictor for likelihood of study abroad; further analysis by race/ethnicity revealed that first-generation White students were less likely to study abroad than their second-generation counterparts. A different pattern, however, was found on student/campus government: First-generation status had a significant, positive effect on likelihood of participation in this activity; further analysis by race/ethnicity revealed that first-generation White students were more likely to participation in this activity than their second-generation counterparts. Overall, first-generation status did not predict the likelihood of participation in internships or working with faculty on research.

First-generation status interacted with race/ethnicity in its effect on gains from faculty-mentored research, with first-generation African-American/Black students and multi-racial students both reporting significantly higher impact than their second-generation counterparts. Regarding gains from study abroad, there were a significant three-way interaction among first-generation status, gender, and race/ethnicity: first-generation Asian men and Hispanic/Latino women both reported a lower impact than their second-generation counterparts. No factor interaction or main effects of first-generation status reached the level of statistical significance for gains from internships or from participation in student or campus government.

Effects of First-generation Status on Satisfaction

First-generation status did not yield any significant factor interaction or main effects on satisfaction with first-year advising, major advising, or quality of campus social life. However, it demonstrated significant main effect on satisfaction with career services, with first-generation students reporting a higher level of satisfaction than their second-generation peers; on average, being a first-generation student (as opposed to second-generation) was associated with a .28 unit rise in the predicted score for this variable, holding all other variables constant. Additionally, a significant two-way interaction was found between first-generation status and race/ethnicity on satisfaction with financial aid package and sense of community on campus: Compared with their second-generation counterparts, first-generation Asian, African-American/Black, and Hispanic/Latino students all reported a higher level of satisfaction with financial aid package; first-generation Hispanic/Latino students and multi-racial students both reported a lower level of satisfaction with sense of community.

Effects of First-generation Status on Outcomes

First-generation status did not demonstrate any significant factor interaction or main effects on intellectual development, problem solving, social and civic engagement, institutional preparation for graduate school, or institutional preparation for interpersonal relationships and family living. However, significant main effects were found for first-generation status on institutional preparation for career path, with first-generation students reporting larger gains on this outcome; on average, being a first-generation student (as opposed to second-generation) was associated with a .35 unit rise in the predicted score for this outcome, holding all other variables constant. A significant two-way (first-generation status*gender) and three-way (first-generation status*gender*race/ethnicity) interaction was found on development of effective speaking; specifically, compared with their second-generation counterparts: first-generation women, overall, reported larger gains on this outcome; first-generation African-American/Black men, too, compared favorably with their second-generation counterparts; however, a difference of the opposite direction was found on first-generation multi-racial men.

Additional Results: Significant Main Effects of Control Variables

After controlling for all other variables, being a woman produced positive effects on perceived faculty interest in/concern for students, high-quality/impactful non-classroom interactions with faculty, gains from internships and faculty-mentored research, intellectual development, civic engagement, and institutional preparation for graduate school, but negative effects on gains in problem solving. Being a multi-racial student was associated with less positive perceptions of faculty interest in/concern for students (lower than Asian and Hispanic/Latino), less frequent interactions with diversity, lower satisfaction with first-year advising (lower than African-American/Black on both items), and smaller gains on institutional preparation for interpersonal relationships and family living (lower than Hispanic/Latino).

African-American/Black students also reported more interactions with diversity, larger gains on preparation for graduate school (higher than Asian on both measures), and larger gains on civic engagement (higher than White); however, they reported lower satisfaction with campus social life than White students. Being an Asian was also negatively associated with gains in intellectual development (lower than Hispanic/Latino), and career path and graduate school preparation (lower than White and Hispanic/Latino on both measures). Hispanic/Latino students also reported larger gains than White students in intellectual development, problem solving, and civic engagement. All three racial/ethnic minority groups reported more interactions with diversity than White students. A student's major predicted most of the dependent variables. Most notably, compared with one or more of the other majors: being a double major or humanities major was positively associated with most of the significant variables; being a business major was negatively associated with all engagement variables except gains from leadership experience; mixed results were found for business majors on outcomes. School size predicted high-quality/impactful non-classroom interactions with faculty, intellectual development, and institutional preparation for interpersonal relationships and family living, with larger schools comparing unfavorably. More highly ranked schools were associated with larger gains on institutional preparation for interpersonal relationships and family living.

Discussion

This study extends recent evidence concerning the effects of first-generation status on student experiences and outcomes as measured at the end of their college career, and contributes new knowledge on the moderating effects of gender and race/ethnicity.

Significance Differences on Background Characteristics

Confirming previous research (e. g., Pike & Kuh, 2005), this study found that first-generation students are disproportionately students of color. Expanding prior understanding, it further elucidated that not only the Hispanic/Latino group has a disproportionately large number of first-generation students as already manifested by previous research, so does the Asian group and the African-American/Black group. In terms of socio-economic status, confirming prior research, first-generation students are more likely to take out loans to finance their college education. It is also worth noting that compared with borrowers in the second-generation group, borrowers in the first-generation group are less likely to accumulate extremely large loans (at or above \$60K). In line with previous research, this study also found that first-generation students worked more frequently than their second-generation peers, a fact perhaps contributing to their lower likelihood of excessive borrowing.

Main Effects of First-generation Status on Engagement, Satisfaction, and Outcomes

This study provides new insights on first-generation students' engagement in select HIPs as well as leadership experiences, satisfaction with select support services, and career-related gains, variables infrequently addressed in previous research. After controlling for select student background and institutional characteristics, first-generation status has no unique effect on most of the engagement variables. Apparently, compared with their second-generation peers, first-generation students in this study have similar perceptions with regard to faculty interest in/concern for student and relationships with and availability of faculty, experience similar frequencies of high-quality/impactful non-classroom interactions with faculty, and report similar participation rate in and benefits from internships and faculty-mentored research. On interactions with diversity and participation in student or campus government, first-generation status appears to have a unique effect, actually affording first-generation students an advantage. First-

generation status also appears to have a unique, positive effect on satisfaction with career services. On study-abroad participation, however, first-generation students appear disadvantaged.

Regarding outcomes, this study suggests that first- and second-generation students seem to be equally benefiting from the college experience in terms of overall gains in intellectual development, development of problem solving and social and civic engagement, and institutional preparation for graduate school and interpersonal relationships and family living. First-generation status affects only one outcome—institutional preparation for career path, on which first-generation students actually reported larger gains.

The positive effects of first-generation status on interactions with diversity are not unusual, given that first-generation students are disproportionately students of color, and a great deal of research (including this study) has found a positive correlation between minority-group membership and diverse interactions. The fact that first-generation students are less likely to study abroad comes as no surprise. The institutional gift aid is probably insufficient to cover the additional expenses incurred by study abroad, which, along with lower parental financial support, debt concern, and loss of income from federal/institutional work study, likely contribute to their decision not to study abroad. Their higher engagement with diversity, however, might serve to compensate their potential disadvantage arising from lower likelihood of study abroad which is associated with positive impact on student growth. This might help explain the fact that first-generation students reported similar gains on intercultural knowledge and competence.

Findings related to interactions with faculty seem to contradict those by Terenzini et al. (1996). Findings on academic and diversity engagement also seem to be inconsistent with prior research (Lundberg et al., 2007; Pike & Kuh, 2005; Pike et al., 2011a; Pike et al., 2011b). Findings on outcomes (with the exception of institutional preparation for career path and

graduate school, two measures seldom addressed in prior research) are largely consistent with some of the previous findings (Pascarella et al., 2004; Terenzini et al., 1996; Toutkoushian & Smart, 2001), but seem inconsistent with others (Lundberg et al., 2007; Padgett et al., 2012; Pike & Kuh, 2005; Pike et al., 2011a). In terms of institutional preparation for graduate school, findings from this study are consistent with Toutkoushian and Smart (2001).

These inconsistencies could stem from the different institutional and student samples. Except Terenzini et al. (1996) and Padgett et al. (2012) who used two-year and four-year institutions, other studies used various types of four-year institutions and only Toutkoushian and Smart (2001), Pike et al. (2011a) and Pike et al. (2011b) studied seniors exclusively. Perhaps first-generation students' disadvantages on engagement during their first year mostly diminish as they progress to the senior year. Institutional learning environments might also account for these inconsistencies. Pike and Kuh (2005) determined that most of the differences between first- and second-generation students were due to educational aspirations and student residence (on- or off-campus), and that students living on campus tended to be more engaged and reported greater gains in their learning and personal development. Liberal arts colleges generally have a higher proportion of students living on campus. Additionally, their financial aid program is likely to reduce first-generation students' employment burden, affording them more time to focus on academics and maximize their college experience, an advantage compared with first-generation students at other types of institutions. Pascarella et al. (2004) indicated that working during college has a negative impact on several outcomes of first-generation students. Although students in this study also worked more frequently than their second-generation peers, it is likely that their financial aid has mitigated the negative impact of employment.

These inconsistencies could also be attributed to self-selection biases. First-generation students choosing to attend liberal arts colleges perhaps possess certain characteristics (e. g., enjoyment of academic challenge) distinguishing themselves from first-generation students choosing to attend other types of institution, predisposing them to fully taking advantage of the college experience. The joint effects of institutional advantages and student-level predispositions probably have contributed to the similarity found between these first-generation students' levels of engagement and outcomes and those of their second-generation peers, in contrast with the disparities often identified in studies using institutions varying in type and control.

Interaction Effects

As previous studies combined all students of color into one group, this study yields new knowledge by uncovering differences by first-generation status as moderated by gender and race/ethnicity. On a very few variables, whether first-generation status affects student experiences and outcomes depends on the gender and/or race/ethnicity of that student. Overall, this study suggests that no particular first-generation subgroup by gender or race/ethnicity appears to be systematically or substantially disadvantaged or advantaged relative to its second-generation counterpart.

Implications for Practice

This study suggests that first- and second-generation students experience college somewhat differently in several areas, but the direction of the differences is mostly positive. Taken as a whole, they appear to be equally taking advantage of the college experience. This study attests to their resiliency in overcoming financial and other barriers. Meanwhile it produces a considerable amount of empirical evidence affirming the multiple successes of private liberal arts colleges in supporting their socio-economically disadvantaged students. Their institutional

accomplishments are particularly impressive in promoting these students' interactions with diversity, in providing them high-quality career mentoring services, and in career path preparation. The finding that among a host of variables, first-generation status is the sole positive predictor of satisfaction with career services speaks volumes about the effectiveness of their career development programs/services in supporting these students. These institutions' financial investments appear to be paying off.

Despite the predominantly positive evidence, one area where liberal arts colleges could consider strengthening their efforts is supporting more socio-economically disadvantaged students to study abroad. If institutional reviews demonstrate a significant disparity on study abroad by family income, and financial hardships appear to be the primary reason, institutions can explore ideas of helping address financial barriers. Another strategy is to enhance mentoring/advising to facilitate the study abroad process which may also pose a challenge for some first-generation students. The intensity of efforts will certainly vary given the availability of institutional resources, the wide range of study abroad rates for first-generation students in the institutional sample (17% to 83%), and what can be considered as a healthy benchmark by a particular institution. Furthermore, this study underscores the need to focus on all low-income students in promoting study abroad, regardless of race/ethnicity, a need grounded in the finding that first-generation White students are less likely to study abroad than their second-generation counterparts, while no such disparity exists for the other racial/ethnic groups.

Additionally, the significant association between first-generation status and membership in the racial/ethnic minority group, as well as the significant factor interaction between first-generation status and race/ethnicity on multiple variables, clearly suggests that programs for first-generation students, when integrated or partnering with those for students of color, are

likely to yield more benefits. Meanwhile, it underscores the importance to pay special attention to the unique areas of low engagement and dissatisfaction of different racial/ethnic groups (e. g., enhancing sense of community for first-generation Hispanic/Latino students).

Limitations and Recommendations for Future Research

Firstly, this study relied on student self-reports on a survey. Despite their widespread use, some scholars raised issues about the validity of self-reports regarding engagement behaviors and gains (Bowman, 2010; Campbell & Cabrera 2011; Ewell et al. 2011; McCormick & McClenney, 2012; Porter, 2011; Porter, 2013). Future research is recommended to incorporate direct measures, such as standardized measures for critical thinking or criterion-referenced rubrics, to more accurately measure outcomes. Secondly, first-generation students in this study may not be typical of those attending other types of four-year institutions, thus limiting the generalizability of the results. Future researchers could yield valuable insights by comparisons based on institutional type. Thirdly, other important input variables, e. g., degree aspirations, were absent from the study. Additionally, the study used the amount of loan debt as a proxy for parental income/social-economic status; to what extent this proxy is adequate is an issue. Lastly, this study captured first-generation students' career-related gains at the point of graduation. Future research is recommended to investigate the effects during their early or midcareer.

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THE STUDENT’S JOURNEY: IR’S ROLE AS STORYTELLERS

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Abstract

In his 1949 work, *The Hero with a Thousand Faces*, Joseph Campbell outlined The Hero’s Journey – a storytelling motif that underlies some of the most popular myths, novels, and films in history. The institutional researchers at Bergen Community College applied Campbell’s theory when they faced the daunting task of presenting data that was visually impactful and accessible to a wide audience. Converting The Hero’s Journey into The Student’s Journey, the IR department presented data in a way that resonated with the college community. In doing so, the IR department embraced the role of campus storytellers.

Introduction

The role of Institutional Research (IR) within higher education is changing (Williams-June, 2017). In addition to long-standing functions like mandatory state and federal reporting and research assistance to faculty and staff, IR professionals wear a bevy of other hats. Some hats fit well. For instance, the expansion of voluntary reporting to outside agencies such as the Voluntary Framework of Accountability (VFA) and the National Survey of Student Engagement (NSSE) fits into the wheelhouse of most IR offices. Other hats, however, have come with far more daunting expectations. Storytelling is one such hat.

IR must present data, occasionally complicated and nuanced data, in a way that is not overwhelming to those who lack a statistical background. The idea that data must be presented in an attention-grabbing way to administrators, faculty, staff, students and community members is not new, but with the advent of Big Data, IR has seen an increase in involvement in campus-wide decision-making (Burns, 2016; Williams-June, 2017). A myriad of new consumers are requesting and viewing data reports to help justify decisions that affect institutions and the students they serve (Williams-June, 2017). To resonate with this larger audience, IR must produce reports that are accessible and visually stimulating, but perhaps most importantly relatable.

To respond to this changing landscape, Institutional Research professionals can borrow from the world of literature. The best way to convey information throughout history has always been the art of storytelling. Stories stick! That is why anecdotal evidence, while occasionally derided by more quantitative-minded researchers, is so popular amongst decision makers. Anecdotal evidence pulls on human emotions. It is more relatable and more impactful when delivering a message than numbers and charts. The issue many researchers have with anecdotal

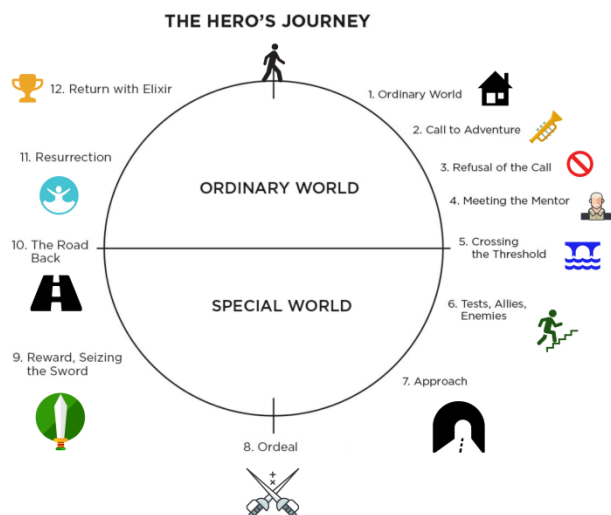
evidence is extrapolation. While the story of one student can leave a lasting impression, it is unwise to take that student and believe he/she represents a wider population.

IR offices can tell stories without reverting to anecdotes. In his 1949 book *The Hero with a Thousand Faces*, Joseph Campbell first outlined The Hero's Journey. A universal pattern of adventure and change, The Hero's Journey has served as a framework for storytelling since before the written word. It has always linked stories and myths, but Campbell was the first, or the most famous, to map its cyclical pattern. See Figure A below. Since Campbell's discovery, many have accepted The Hero's Journey as a universal motif and a source of inspiration (Sachs, 2012). George Lucas cited it as a precursor for Luke Skywalker's journey in *Star Wars* (Sachs, 2012). Herman Melville's *Moby Dick* and Charlotte Bronte's *Jane Eyre* follow similar cyclical patterns (Bronte, 1960; Melville, 2003). In his book, *Winning the Story Wars*, Jonah Sachs (2012) adapted the concept to marketing. He asserted that marketers who learn to convey their messages through stories would succeed in the future – i.e., they will win the story wars (Sachs, 2012). Using Campbell's original seventeen-step cycle, Sachs (2012) adopted a twelve-step Hero's Journey in his application of the idea to marketing strategies. This twelve-step adaptation informed Bergen Community College's application of The Hero's Journey to institutional research and is the focus of this paper.

Prologue

The story of incorporating The Hero's Journey into Bergen Community College's discourse began in Spring 2015 when Dr. Idahlynn Karre spoke at the College's Professional

Figure A.



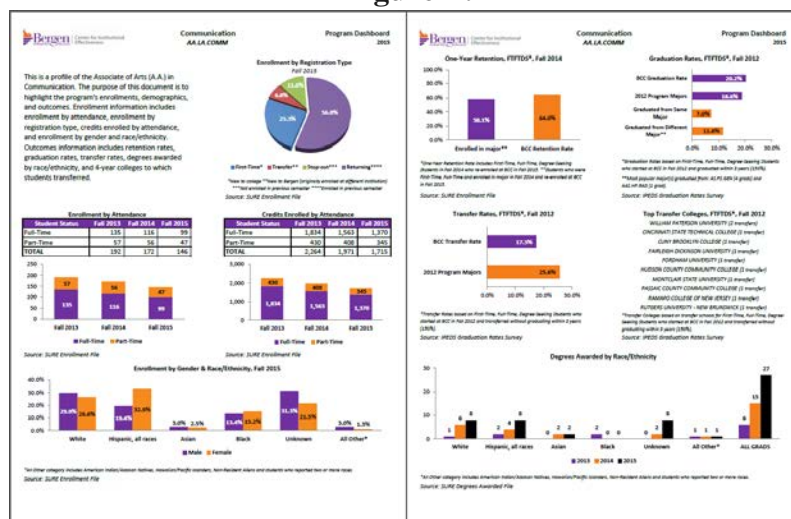
Development Day. Dr. Karre led a discussion about The Hero's Journey and its relevance to a student's journey through college. The presentation targeted the work of student services and academic departments, with no focus on institutional research. While the concept was thought-provoking and received positive reviews,

its lack of institutional research utilization prompted Bergen's IR department to file the presentation materials away and go back to churning out typical data reports.

It was not until the success of the Program Dashboards at Bergen, and beyond, in 2016 that the IR department revisited the concept of storytelling. The Program Dashboards (seen in Figure B) are a two-page data report that showed a concise overview of each program at Bergen (Bergen Community

College [Bergen], 2015). In essence, the Program Dashboards were the first unintentional foray into combining multiple data resources to tell a cohesive story about one particular

Figure B.



entity – in this case, a program. It provided information about current students enrolled in the program and went back three semesters to show trends. It reported on demographics for both current enrollees in the program and past graduates from the program. It showed first-time, full-time, degree-seeking cohorts who started in the program and whether they graduated or transferred. If they graduated, it showed whether the students completed the program they started or if they switched to another one and graduated from that. If they transferred without graduating, it showed the top colleges they attended after Bergen (Bergen, 2015). Finally, for the more career-oriented programs, it showed the top jobs that graduates could expect to get with their degree and if the job trends were improving or declining for each particular occupation (Bergen Community College [Bergen], 2014). In combining all of these measures into two concise pages, the IR department made the Program Dashboards data-heavy, but at the same time easy to read.

The IR department presented on the Program Dashboards at the 2016 Northeastern Association of Institutional Research Conference in Baltimore, MD and the New Jersey Council of Community College's Best Practices Conference in Cranford, NJ to overall positive reviews. The presenters received complements for recycling data that they produce for other initiatives and their use of multiple data sources to construct one cohesive report with a clear and distinct purpose. Internally, the widespread usage of the Program Dashboards made the need for concise, visually stimulating, and relatable data even more urgent. It was at that point that the IR department dusted off the presentation materials from Spring 2015, bought books on the topics of storytelling and *The Hero's Journey* and purchased new software, Vennage, to produce infographic reports to connect with decision makers.

This paper will show how the Institutional Research department at Bergen Community College used The Hero's Journey to adjust to its new role as storytellers at Bergen. The sections below include an explanation of the concept and its transformation into The Student's Journey from an IR perspective. A discussion of the IR department's use of the framework to create visually impactful and accessible infographic reports is also included below. Finally, the paper will demonstrate how the overall mindset change identified gaps in data collecting and reporting.

The Hero's Journey

“Sing to me of the man, Muse, the man of twists and turns driven time and again off course, once he had plundered the hallowed heights of Troy” (Fagles, trans. 1996). With these words, Greek bard Homer began *The Odyssey* – one of the greatest epics in literary history. *The Odyssey* is about Odysseus' journey back home after defeating the Trojans at the battle of Troy. The quote that starts the tale tells the reader that the story is about a man who possesses many tools, both physical and intangible. It promises that Odysseus will embark on a long and hard journey that will take him away from what he knows and on that journey he will gain insights with every new death-defying experience (Fagles, trans. 1996).

Campbell (1949), an author and teacher in comparative mythology, charted the archetypal pattern of heroes like Odysseus and he was the first to coin and successfully track The Hero's Journey. He argued that the journey was twofold. It encompassed the external adventure on which the hero embarks as well as an internal excursion into his/her own soul. The exterior experiences mirror the internal change. Only by learning lessons and growing on the expedition can the hero vanquish the unfriendly forces awaiting him/her upon the return home (Campbell, 2008). Without the ordeals he faced, Odysseus would not have defeated the suitors who had taken over his palace, attempted to seduce his wife, plotted to murder his son, and

desired to steal his throne. Campbell (2008) contended, “the adventure of the hero normally follows [this] pattern...a separation from the world, a penetration to some source of power and a life-enhancing return” (p. 27-28).

Sachs (2012) took Campbell’s concept a step further. He argued that the journey of self-discovery is not just for the hero, but also for the community as a whole. The hero needs to better the world around him/her upon returning home. After using his cleverness to outwit and kill the suitors who had taken over his home, Odysseus can reclaim his seat, secure his power, and restore peace to his kingdom (Fagles, trans. 1996). Sachs (2012) asserted “the treasure that the hero wins in the magic world is not something she keeps for herself, but rather something that she shares with her community. Ultimately, the quest is the selfless act of a hero who has made sacrifices so her world will be a better place” (Sachs, 2012, p. 163-164). With the help of some of the most famous heroes throughout history, this section includes an explanation of the twelve-step concept of The Hero’s Journey. The first step on this universal odyssey is a familiar one – The Ordinary World.

The Ordinary World

There are two trademarks of the Ordinary World. The first is a surface-level sheen that makes everything appear normal. The second trademark is an unseen bedrock of turmoil and tension that the gilded surface hides (Sachs, 2012). At the beginning of *The Lord of the Rings*, the Shire is seemingly serene. It is beautiful, peaceful, and unperturbed, but it does not take long for the audience to recognize that not everything is as it appears. Gandalf arrives at Bag End to realize Bilbo is hiding something and he eventually realizes that the hobbit is in possession of the one true ring of power (Jackson, Osborne, Walsh, Sanders, & Jackson, 2001). Campbell (2008) described the Ordinary World as one that “suffers from a symbolical deficiency” (p. 29-30).

Sachs (2012) wrote, "The Hero's Journey begins with a hero-to-be living in a world out of balance" (p. 149). This idea of imbalance lingering just below the surface is what drives the hero to embark on the journey of self-discovery. All the hero needs is a spark, which comes in the form of the second stage (Campbell, 2008; Sachs, 2012).

The Call to Adventure

The idea of the Call to Adventure is commonplace in mythology, literature, and pop culture. It is synonymous with ideas of destiny, risk, and the unknown. The Call rouses the hero-in-waiting out of an ignorant and possibly blissful slumber in the Ordinary World and wakes him/her to the possibility of more. The Call to Adventure "signifies that destiny has summoned the hero...from within the pale of his society to a zone unknown" (Campbell, 2008, p. 48) and while "muddling through life is an option...deep down the hero senses greater possibility" (Sachs, 2012, p. 150). The letter Harry Potter receives from Hogwarts on his birthday serves as his Call to Adventure as it jumpstarts his story (Rowling, 1999). It is the trigger needed for the hero to realize that not everything is perfect in the Ordinary World.

Sachs (2012) provided five ways in which the Call to Adventure can manifest itself including "the form of a dream, the emergence of traumatic circumstances, a vision, a herald character, or the hero's conscience" (p. 151). Although there are others, these five manifestations of the Call to Adventure can be seen in both literature and film. In *Game of Thrones*, Brandon Stark dreams of a three-eyed raven that he must find (Dream Call) (Martin, 1997). In *The Lion King*, the death of Mufasa sends Simba's life into a tailspin (Traumatic Circumstance Call) (Hahn, Allers, & Minkoff, 1994). Shakespeare's *Macbeth* receives a prophecy from three witches that he will become King of Scotland (Vision Call) (Shakespeare, 2013). The arrival of R2D2 and C3PO in *Star Wars* triggers Luke Skywalker's involvement in

the rebellion (Herald Character Call) (Kurtz & Lucas, 1977). Finally, in Charles Dickens's *A Christmas Carol*, Scrooge comes face to face with the consequences of his greedy ways when he receives a visit from the ghost of Jacob Marley (Hero's Conscience Call) (Dickens, 1991). Despite the Call to Adventure, some heroes remain hesitant to leave their Ordinary World. The doubt and fear coalesce in a stage called The Refusal of the Call.

The Refusal of the Call

As Jacob Marley rattles his ghostly chains in front of a terrified Scrooge in a Call to Adventure, the old man rejects the possibility that his long-dead friend is floating right in front of his face (Dickens, 1991). Marley asks Scrooge why he doubts his senses to which Scrooge replies, "because a little thing affects them. A slight disorder of the stomach makes them cheats...There's more of gravy than of grave about you!"(Dickens, 1991, p. 12). In doubting his senses and making excuses, Scrooge falls victim to the Refusal of the Call stage of the journey. For Scrooge, the Refusal of the Call is a temporary lapse back into normal life. However, as Campbell (2008) wrote, "though the hero returns for a while to his familiar occupations, they may be found unfruitful" (p. 46). Scrooge believes that the Call to Adventure is a lie and tries to explain it away and hide from it, but he cannot. Whether the hero knows it or not, he/she can never return to the way life was before the Call (Campbell, 2008; Sachs, 2012). The Refusal of the Call carries with it the ability to derail the entire journey if not for the introduction of the mentor.

Meeting the Mentor

Frodo and his band of hobbit companions are well on their journey when they come to an inn – the embodiment of a crossroads. At this inn, they are unsure of what to do next, but luckily

they meet a mysterious Ranger, Strider, who helps Frodo and his companions avoid imminent danger and continue to move forward. Strider serves as Frodo's mentor (Jackson et al., 2001).

The Meeting of the Mentor is a paramount step on any hero's path. The mentor can guide the hero and keep him/her on track while giving the hero the lessons and tools needed to succeed. Campbell (2008) called the mentor "a protective figure...who provides the adventurer with amulets against the dragon forces he is about to pass" (p. 57). Sachs (2012) contended that the "mentor's role is to get the hero moving from her uncomfortable position living in limbo onto the path she must follow in order to meet her destiny...without the mentor, the call to adventure may be nothing but a stirring, an unfulfilled potential" (p. 133). Campbell and Sachs both alluded to the importance of the mentor in staving off the Refusal of the Call.

Mentors come in all shapes and sizes. For example, Athena and Hermes aid Odysseus on his journey (Fagles, trans. 1996). Timon and Pumbaa in *The Lion King* raise a young Simba after he runs away from home following his father's death (Hahn et al., 1994). Scrooge would have continued his greedy ways without the help of the Ghosts of Christmas Past, Present and Yet to Come (Dickens, 1991). Greek gods, a meerkat and a warthog, and three ghosts all serve as mentors to their various heroes and help guide them through the next steps of their journey.

Crossing the Threshold

Scrooge breaks the laws of time and space, Frodo leaves the safe boundaries of the Shire, and Simba runs away from home on Scar's insistence (Dickens, 1991; Jackson et al., 2001; Hahn et al., 1994). In every instance, the hero crosses the threshold from the Ordinary World into the Special World – the world in which the hero will spend the majority of his/her journey. Sachs (2012) characterized the Crossing of the Threshold as "the first step into the unexplored" a step into "darkness, the unknown, and danger" (p. 64). As the primary setting of the journey, the

Special World entails not only risks, trials, and tests, but excitement, possibility, and enlightenment as well. It lacks the comfort and safety of the Ordinary World but instead offers opportunity and the potential for greatness (Sachs, 2012). Crossing the Threshold is the first taste of this new world. It is the point at which the hero realizes that he/she is not in Kansas anymore (LeRoy & Fleming, 1939).

Tests, Allies, and Enemies

Crossing the Threshold leaves the hero vulnerable to unknown dangers and risks. He/she has never been tested before and must now face early challenges in the Tests, Allies, and Enemies stage (Sachs, 2012). The minor obstacles of this juncture help prepare the hero for larger ones still to come. Accompanied by the mentor and a few noble companions, the hero begins to test his/her strengths. Minor enemies are vanquished, and the hero learns lessons from small victories and temporary defeats (Campbell, 2008; Sachs, 2012).

A standard device used in film storytelling to represent the Test, Allies and Enemies stage is the video montage. The montage condenses time, space, and information to show that the main character is preparing and facing early challenges. In *Rocky* and *The Karate Kid*, the titular characters train for their big fights with rigorous and sometimes silly exercises set to inspirational music (Chartoff, Winkler, & Avildsen, 1976; Weintraub & Avildsen, 1984). Music is also used to condense Simba's journey in *The Lion King*, as the lovable "Hakuna Matata" accompanies his maturity into a lion (Hahn et al., 1994). In *The Empire Strikes Back*, Luke Skywalker learns the ways of the force with a series of gravity-defying stunts with Yoda on his back (Kurtz & Kershner, 1980). In all four situations, the hero battles against preconceived limits and adapts in order to continue the adventure.

The Approach

The Approach stage constitutes a turning point for the hero. Up to this stage, he/she has been gathering strength and confidence away from the main villain and conflict of the story, but the time for training, fighting lesser foes, and building skills are done (Sachs, 2012). The Approach puts the ultimate challenge directly in the view of the hero. Usually, a traumatic event in the Special World forces the hero to forgo training and begin The Approach. In *The Lord of the Rings*, Frodo decides to complete the rest of his journey to Mount Doom alone after Gandalf's death (Jackson et al., 2001). Similarly, Luke Skywalker must take on a more active role after the death of Obi-wan Kenobi (Kurtz & Lucas, 1977). The Approach also signifies to the reader that the apex of the story is near. The hero is about to face the ultimate trial in a stage known as The Ordeal.

The Ordeal

The Ghost of Christmas Yet to Come points with a shrouded finger at a grave that lies only feet away from an anxious and pleading Scrooge. Scrooge knows what is on the headstone without having to look at it, but approaches it anyway and unravels at the sight of his name (Dickens, 1991). Frodo makes his way to Mount Doom barely clinging to life when Gollum attacks him to steal back his precious (Jackson et al., 2003). Odysseus returns home disguised as a beggar and devises a plan to infiltrate his palace and kill the suitors who are attempting to seduce his wife (Fagles, trans. 1996).

In every example, the hero finally comes to The Ordeal, the climax of the story. Sachs (2012) wrote that The Ordeal is the stage in which “our hero journeys to the center of the magic world [and] encounters a frightful nemesis” (p. 157). Getting to this point has been no easy feat for the hero, and yet this is the biggest challenge the hero has had to face. This test takes every weapon in the hero's arsenal to overcome. It tests physical power, mental dexterity, emotional

strength, and the hero's self-confidence. The Ordeal is the final test in the Special World to prove that the hero has in fact undergone the necessary transformation (Sachs, 2012). If the hero changed and emerges from The Ordeal victorious, he/she seizes The Reward – the ultimate prize that the hero has been chasing.

The Reward

Scrooge vows to renounce his greedy ways at the feet of the Ghost of Christmas Yet to Come, and he finds himself safely back in bed, very much alive, and with a second chance (Dickens, 1991). Frodo pushes Gollum and the ring into the fires of Mount Doom and, free from the ring's grip, and with his task complete, is rescued by an eagle and flown to safety (Jackson et al., 2003). Odysseus wins an archery contest for his wife's hand and uses his great bow to kill the remaining suitors and reclaim his home (Fagles, trans. 1996).

All three Ordeals occur when danger and death are most apparent. The three heroes overcome their ultimate obstacle by showing how they have transformed and experience symbolic rebirths. Their journeys, however, are not yet over. Seizing The Reward is not enough. The hero must leave the Special World with The Reward because he/she still has one last villain to face back in the Ordinary World (Campbell, 2008; Sachs, 2012).

The Road Back

The hero still has obstacles waiting for him/her back in the Ordinary World. The Road Back is where the story begins its descent from the apex of The Ordeal down to its ending (Sachs, 2012). It could be a celebratory stage. Scrooge is giddy at the prospect of a new life after his adventure. He rejoices in his seizing of The Reward (Dickens, 1991). However, for most heroes, the celebration is usually short-lived, if it comes at all, as they worry about losing The Reward before getting back to the Ordinary World (Campbell, 2008). The Road Back

comes with great urgency and sometimes a chase (Campbell, 2008). A good example of a perilous Road Back is the race down the beanstalk in the English fairy tale *Jack and the Beanstalk* (Kellogg, 1991). If the hero can reach the Ordinary World with The Reward still in hand, there is one last test awaiting him/her before the story ends.

The Resurrection

After reaching the Ordinary World, it is time for the hero to use The Reward and all of the lessons learned on the journey to correct the fatal flaw that initially sparked the story. This last test is confirmation that the transformation that occurred in the Special World is permanent (Sachs, 2012). Sachs (2012) contended that The Resurrection stage shows that “the hero has fully matured to embody her highest-level values” (p. 165). Scrooge confronts the victims of his selfish ways and makes amends with those he has wronged. Odysseus kills the vengeful fathers of the suitors he slew earlier in order to restore peace and order to his kingdom. Although it is not as grandiose as The Ordeal, the fight that occurs at the Resurrection stage is just as important. It confirms that the hero has indeed changed and that the change is permanent (Sachs, 2012).

Return with the Elixir

Finally, the journey ends. The hero has vanquished the final foe and can now live in peace in the Ordinary World albeit an Ordinary World that is different from the one at the beginning of the story. The foray into the Special World has transformed the hero, who was able to Return with the Elixir and transform the Ordinary World. Thanks to the hero, the surface-level sheen and the bedrock of imbalance no longer define the Ordinary World— the hero has restored the balance (Sachs, 2012). Scrooge walks into the sunset with Tiny Tim on his shoulders (Dickens, 1991). Frodo, Simba, Odysseus, and Luke Skywalker all bring peace to

once troubled and war-stricken lands (Hahn et al., 1994; Fagles, trans. 1996; Kurtz & Kershner, 1980; Jackson et al., 2003).

A similar theme cuts through the endings of these stories. The Return with the Elixir is not only about the hero finding peace after an exhaustive journey, but is about the betterment of the world around him/her as well. Sachs (2012) contended that, "having seized the treasure from the belly of the beast, the hero must leave the magic world and use that treasure to heal her own broken world" (p. 163). This is what Campbell (2008) referred to as "the boon to society" (p. 29). The journey into the Special World was an intensely personal experience for the hero, but the real purpose of the change within was the ability to change the world without – to better society as a whole (Campbell, 2008; Sachs, 2012).

The Student's Journey: Casting the Student as the Hero

What can the mythological tales of countless heroes tell us about the journey through college? Quite a bit. Attending an institution of higher learning is like the journey of Odysseus, Frodo, Simba, and the other heroes in mythology, literature, and film studied above. They all follow the same formula. The next section will explain how using institutional research data sources can transform The Hero's Journey into The Student's Journey and how IR departments are in the perfect position to track this adventure.

The Ordinary World: Identifying Imbalances

As discussed above, the Ordinary World has a bedrock of imbalance and tension. Some students use school as a way to escape negative situations at home. Others are only living in a world where they have not yet reached their fullest potential (Pappano, 2017). For older students who attend college after taking a break from education, they have been able to get by and make a living, but there may be underlying discrepancies that cause them to seek fulfillment. As Sachs

(2012) noted, “recognizing one’s own hero potential is what the journey is all about” (p. 149). For traditional-aged students, college is a logical step in the progression to a healthy and satisfying adult life. Unable to go back to the confines of high school, they look forward to college as the next stepping-stone.

The application of this first stage of The Student’s Journey requires colleges and universities to understand a student’s Ordinary World, i.e., who they were before college. This understanding lends valuable insights into *why* the student enrolled. For some institutions, acquiring the data to support this understanding is difficult. Data from application and registration forms, as well as from the financial aid application, can help to provide some insights into the Ordinary World from which students come. Unfortunately, these data offer a narrow view of what might have led a student to the college and what that college can do to serve that student. As a supplement, onboarding surveys can expand the understanding of the student’s Ordinary World, and several of the other stages along the student’s journey.

Lacking an instrument of their own, Bergen’s institutional researchers studied first semester and freshman experience surveys from the Higher Education Research Institute (HERI) and the Center for Community College Student Engagement (CCCSE). Questions on these instruments were perfectly suited to explaining students’ Ordinary Worlds. For example, questions about high school study habits, class participation, and overall attitude give a sense of the student’s educational background (CIRP Freshman Survey, 2015). The responses to these questions can help show why the students might want to leave the Ordinary World behind. Questions about the students’ marital status, dependents, siblings, and parents’ educational backgrounds give invaluable information about home life – a manifestation of the Ordinary World (SENSE, 2009). Finally, gauging perceptions of college in general, and the institution in

particular, gives insight into the student's ideas about the value of a college degree and expectations for this new stage in life. Asking the students the number of colleges they applied to, if they were accepted into their first choice, and if the institution was their top choice gives administrators a sense of how the students perceive the institution (CIRP Freshman Survey, 2015). While understanding the Ordinary World is important, it is only the first stage of the twelve-step journey. For most colleges, the Ordinary World has not even seen their introduction into the story yet. More often than not, they enter the story in stage two – the Call to Adventure.

The Call to Adventure: Destiny Beckons

The Call to Adventure experienced by soon-to-be college students might not be as dramatic as experienced by fantastical characters mentioned earlier. After all, “exaggeration is a part of the story” (Campbell, 2008). However, the Call experienced by students is real. It can be as simple as picking up a pamphlet at a Guidance Counselor's office, a college recruiter's visit to a high school, or an advertisement on the side of a bus. It could also be more substantial like the insistence of a close friend or guardian. It can also refer to a company's willingness to pay for its employee's tuition. When the recession of 2008 hit, the community college sector saw an increase in enrollment due to a particular and unfortunate Call – the loss of one's employment and stability (Hillman & Orians, 2013). Bergen Community College's enrollment increased by 14%, between 2007 and 2010, with the number of full-time students (taking 12 credits or more) increasing from 7,990 to 9,982 – a 25% increase (Bergen Community College [BCC], 2017a).

For as many reasons as there are to go to college, there are just as many Calls. This is one area that colleges often do an excellent job of collecting. The question, *How did you hear about us?* is ubiquitous on all types of applications. However, the answers to this question typically point to the type(s) of advertisements attracting the most students. There is a deeper

potential use for this question; specifically, these results can help institutions identify the various Calls that lead students to their doors.

On the 2015 CIRP Freshman Survey, students are asked to rate some reasons that might have influenced the decision to attend the college. Reasons on this question include *My parents/relatives wanted me to come here*, *A visit to the campus*, *The athletic department recruited me*, *Rankings in national magazines*, and *High School counselor advised me* (CIRP Freshman Survey, 2015). Much like the five Calls expressed by Sachs (2012) earlier, these options represent five ways that an institution can connect with potential students. Discovering the particular set of circumstances that led to enrollment allows schools to serve the individual needs of each student. Combining this information with retention, graduation, and transfer data allows IR departments to see which Calls to Adventure have the strongest influence on students. The Ordinary World and the Call to Adventure are two of the three stages of The Hero's Journey that occur before the student even attends a class at college. The third stage, the Refusal of the Call to Adventure, is by far the most difficult to track despite its critical contribution to the story.

The Refusal of the Call: A Failed Attempt at Returning to Normalcy

For a burgeoning college student, the Refusal of the Call may manifest itself in a number of ways. If a potential student received a pamphlet, a brochure, a business card, or any other outreach from a college, the paper might sit unattended for weeks or months without him/her even glancing at it. If a student registers for classes but does not make a deposit or set up a payment plan, he/she is removed from those classes and often does not return. At Bergen, efforts to ensure students' early registration are not very successful, as registration data show that despite these interventions registration spikes right before the start of the semester.

The reason these students delay enrollment is consistent with the Refusal of the Call. The reason could simply be neglect, but it could also be a byproduct of fear, nervousness, or anxiety. Financial reasons, which are barriers to student enrollment and retention, also contribute the students' Refusal of the Call. On Bergen's annual Stop-Out Survey of non-returning students, issues with financial aid and inability to pay tuition are consistently the top reasons students do not return (Bergen Community College [BCC], 2016b). Many onboarding/first-semester questions hint at the Refusal of the Call, for example, questions about the perceived value of an education, the struggle to pay for college, and balancing work responsibilities and school (CIRP Freshman Survey, 2015; SENSE, 2009). Answers to these questions tell decision makers where and how students struggle during these early stages of the journey. Identifying these troubles early and addressing them could help keep students on track.

The Refusal of the Call is the point where colleges lose many potential students. It is where many journeys stop. Campbell (2008) referred to this as "the dull case of the call unanswered; for it is always possible to turn the ear to other interests" (p. 49). At Bergen, the number of students who apply and register does not equal the number of students who enroll. While many of these students start their journey at other institutions, a good portion just refuse the call and never pick it up again. The Refusal of the Call is the first of many hurdles on the journey and carries with it the potential to derail every hero. Luckily, someone is willing to step in and offer assistance when the day seems darkest.

Meeting the Mentor: A Light in the Dark

The mentor helps the hero in times of peril; they do not have to be in the form of a wise old bearded man. In college, the mentor can be anyone: a professor, an advisor, a tutor, a former student, the placement test official, the custodian on the second floor, or even the entire Student

Government Association. The results of a qualitative study of comments from former Bergen graduates show that 15% of the respondents named someone specifically who helped them get through college (Bergen Community College [BCC], 2017d).

How the mentor takes shape is not important. What is important is that the mentor enters The Hero's Journey at the moment when failure seems inevitable and pulls the hero back from the brink. The mentor's role is that of an advisor. He/she offers "enough strength and inspiration so that [the hero will] take on the task" (Sachs, 2012, p. 153). With data, it is possible to see when the intervention of the mentor would be most helpful to the students and set about making programmatic changes that will focus on these stages. For example, respondents to the Stop-out Survey cited issues registering for courses and filling out challenging and nuanced forms like the FAFSA as reasons for not re-enrolling (BCC, 2016b). Bergen instituted a one-stop model to help students through the registration, financial aid, and the bursar processes (Bergen Community College [BCC], 2016a). A survey to students who used this service revealed that 88% of respondents had their inquiry successfully addressed by the One-Stop employee or were directed to someone else who helped them (Bergen Community College [BCC], 2017b). This service is a step forward in introducing a guiding light to help with a confusing process, but its long-term impact is still unknown. The mentor is not just around to help with the Refusal of the Call. The mentor is a constant resource of advice, information, support, and confidence throughout the journey. The examples mentioned point to the initial impact the mentor can have on bringing the hero back from the Refusal of the Call. There will be many stages where the mentor will prove his/her usefulness again, but having been rescued from limbo, for now, the student hero leaves the Ordinary World behind and successfully enters college.

Crossing the Threshold: Entering College

For college students, The Crossing of the Threshold can occur at registration, move-in day, placement testing, orientation, the first day of classes, or some other initial stages. The most important part of the crossing is not when it occurs, but that the hero fully commits to the Special World. As he/she has already seen with the Refusal of the Call, there is no going back; it is time to buy in so to speak.

The students who cross the threshold and commit completely often see the best outcomes. Bergen implemented an online orientation to reach a wider audience than the rarely attended in-person orientations. The IR department conducted a study comparing the outcomes of first-time students who completed the online orientation with those who started but never completed the orientation and those who never started the orientation. Students who completed the orientation were retained to the next semester at a much higher rate (80.4% retention rate) than those who started but never completed it (69.4%) and those who never started it (71.0%) (Bergen Community College [BCC], 2017c). Students who completed the orientation on average accumulated more credits and had higher GPAs than their counterparts had. For many of these students, the online orientation was the first assignment of their college careers, and those who completed it were better suited for the challenges ahead (BCC, 2017c).

Tests, Allies, and Enemies/ The Approach: Facing Early Challenges

The Tests, Allies, and Enemies and The Approach stages find the student heroes training, building confidence, and facing early challenges. For new students, these stages may include many tests. There are social tests, like meeting new friends and joining college organizations, and administrative tests, like purchasing books and getting to know the campus. While these are important, academic tests often define a student's initial steps into college. Too often, students

who struggle with their coursework in their first semester never come back. Peter Bahr (2010) found that 30% of first-time students to the California Community College system fell into an “experimental” cluster where students attempt only a few courses and fail most of them.

Transitioning from developmental education to gatekeeper (college-level) courses is an indicator of early progress that also defines the dual stages of Tests, Allies and Enemies and The Approach. Unlike retention rates, this transition separates students who are progressing from those who are stalling even if they keep enrolling. Not every student needs developmental education, but for those who do, completing these requirements is a major hurdle that could delay or permanently dull their advancement (McGlynn, 2013). Gatekeeper courses also serve as potential roadblocks to success because of their high failure and withdrawal rates (McGlynn, 2013).

The Voluntary Framework of Accountability (VFA) offers other indicators of initial obstacles students face at Bergen Community College (Voluntary Framework of Accountability [VFA], 2017a). One of the measures the VFA asks colleges to show is how many students in a cohort failed to earn a single credit by the end of their first semester. For the Fall 2014 Cohort, 16% of first-time or transfer students at Bergen failed to earn a credit in the first semester (VFA, 2017a). Only 27% of these students returned in Spring 2015, and none of these students received a formal degree in two years (VFA, 2017a). Tracking students longitudinally allows IR departments to continually identify roadblocks such as passing developmental education, passing gatekeeper courses, or earning credits early. The Tests, Allies, and Enemies and The Approach steps show how early successes, or overcoming early failures, beget eventual success. Small victories during these primary stages build the hero’s confidence for larger obstacles still to come.

The Ordeal/The Reward: The Ultimate Struggle for the Ultimate Prize

For the 93% of Bergen students who identify as degree/certificate-seeking, The Reward is a college diploma, and The Ordeal is the final push to earn that award (BCC, 2017a). The Ordeal might entail passing last major core courses or completing an internship, a dissertation, or a capstone project. Whatever the final task, students use everything they learned up to that point to vanquish their ultimate foe. While the final trial might seem like a hero battling an outward nemesis, it is the hero fighting forces *within* that constitute The Ordeal (Sachs, 2012). Only when the Hero confronts the weaknesses within is he/she ready to battle the external foe. The Reward is therefore not the physical paper that represents the degree; it is the culmination of everything learned and experienced while striving towards that piece of paper.

On the Graduate Follow-Up Survey, administered to graduates a year after graduating, respondents are asked to assess their skills and share how expectations of improvement at the beginning of college matched how these skills improved (or did not improve) (Bergen Community College [BCC], 2017d). The greatest difference between expectations and actual improvement is most apparent in personal skills such as *Personal Responsibility – managing yourself and your commitments* and *Tolerance and understanding of other people in our diverse society*. The graduates cited changes in personal skill areas more often than the changes in academic skill areas like *Mathematical and computational ability* and *Computer fluency – retrieve, organize, and analyze information* (BCC, 2017d). The takeaway from this analysis is that graduates more so valued the personal growth that complements earning their degree or certificate rather than the academic growth. The death and rebirth process is about the internal change before it is about external achievement. One cannot occur without the other, and both are necessary for the Hero to complete the journey.

The Road Back/Resurrection: Life after College

Earning the diploma is not the end of the story for our heroes. Life after college could entail transferring to another institution to earn another degree or going right into the workforce or potentially a combination of both. IR professionals know that their jobs continue beyond reporting graduation data. Through the National Student Clearinghouse (NSCH), institutions get transfer data for graduates and non-returners alike. Exit surveys, Graduate Follow-Up surveys, and Transfer Experience surveys ask former students about the process of moving to their next stage of life and about their transition back to the Ordinary World. Some professionally accredited programs at Bergen, like the Paramedics program, requires surveys be sent to employers of recent graduates in order to gauge how well new employees, armed with a Bergen degree, are prepared for the workforce. In response to external accountability pressures, reporting data on the Road Back and the Resurrection stages has become increasingly important.

Return with the Elixir: The Boon to Society

Bergen tasked Economic Modeling Specialists International (EMSI) with explaining Bergen's boon to society with an Economic Impact Study. The study looked at the regional impact of alumni and the degrees and certificates they earned from Bergen. The results of the study showed that for every one dollar invested by students into their education at Bergen students could expect an additional two dollars and seventy cents in lifetime earnings (Economic Modeling Specialists International [EMSI], 2017). For every one-dollar taxpayers invested into Bergen Community College, there is an extra five dollars and sixty cents in added state revenue and social savings. Furthermore, for every one dollar the service region invests there are an additional seven dollars and ninety cents in added taxes and public sector savings. In all,

Bergen's total annual impact on the region was \$609.2 million in added revenue – an equivalent of 9,971 jobs (EMSI, 2017).

The College's impact is measured in much more than dollars and cents. Graduate Follow-Up surveys and a robust alumni network can show how earning a college degree influenced a person's life long after receiving a diploma. It can also reveal the opposite. Conducting follow-up surveys and other outreach one year, five years or even ten years after students leave the institution could shed light on continual economic struggles for former students who did not experience a life-changing transformation after graduation. Regardless of what happens after college, institutions must see their students' journeys through to the end. Just as learning does not stop, neither should student tracking.

Institutional Researchers as Storytellers

One objective of The Student's Journey concept was to tell data stories in a visually stimulating, concise, and impactful way to an audience with varying levels of research experience. The IR department knew this approach to reporting data had to result in simple yet powerful reports. To reach this goal, the researchers decided to integrate the storytelling concept into existing reports and datasets. The idea was to take current reports that they deemed data-heavy and complicated and supplement them with additional sources, streamline the results, and present them in a relatable way.

The American Association of Community Colleges' (AACC), Voluntary Framework of Accountability, met the criteria for a data-heavy and elaborate report in need of a transformation. The VFA aligns with the holistic storytelling structure as it is "the principal accountability framework for community colleges with measures defined to encompass the full breadth of the community college mission" (Voluntary Framework of Accountability website, 2017b). Despite

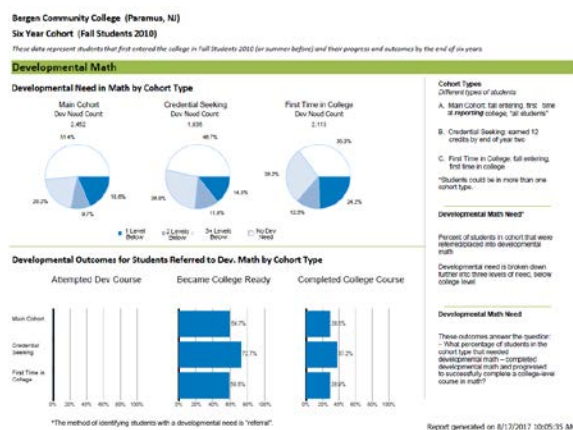
its usefulness, its reports were difficult to understand and therefore rarely used by the faculty and staff at Bergen. The researchers knew that the data reported through the VFA were worthwhile for the college, but they needed to convey these results differently.

When judged based on The Student's Journey concept, the VFA intrinsically covers many of the steps. Demographic information and Pell eligibility information give insight into the Ordinary World. Statistics on first-semester credit accumulation and developmental education course-taking behavior show how students tackle early challenges. Two-year outcomes serve as a progress benchmark and reporting six-year outcomes provides long-term information on student success. For the stages of the journey that the VFA did not cover, the IR department supplemented the story with other data sources. The IDs of the students included in the VFA cohorts allowed the researchers to capture information about stages like the Call to Adventure and Meeting the Mentor and the Return with the Elixir, by matching the students with their responses to the Graduate Follow-Up Surveys, Stop-Out Surveys, and Graduate Transfer Experience Surveys. Comments, perceptions, and employment information garnered from these surveys added a qualitative layer to the already robust VFA storyline.

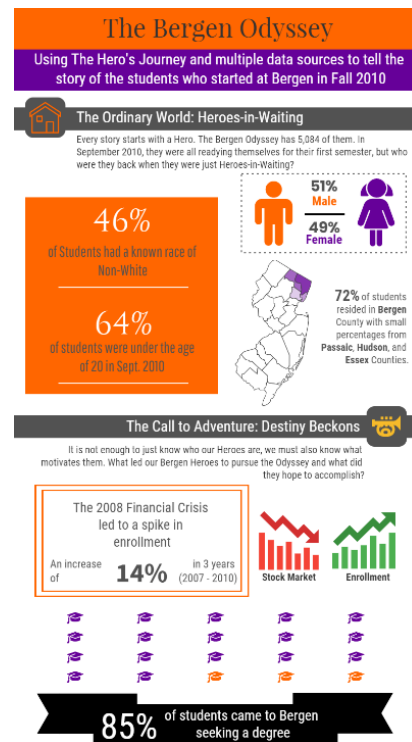
Sharing The Student's Journey

Sharing the Student's Journey became an important part of IR's new role as storytellers. Venngage, data visualization software, emerged as the platform to create visually stimulating, concise, and impactful reports. The Bergen Odyssey (seen in Figure C) was designed as an eye-catching infographic report to present the journey of the Fall 2010 VFA cohort. The report combines The Student's Journey concept with simple yet compelling statistics, enhanced by pictorial representation. When compared with the VFA-generated reports (seen in Figure D), it is clear that

the storytelling concept presents the data in a way that even a data novice can understand the students' journey and associated outcomes. By keeping the statistics easy to understand and

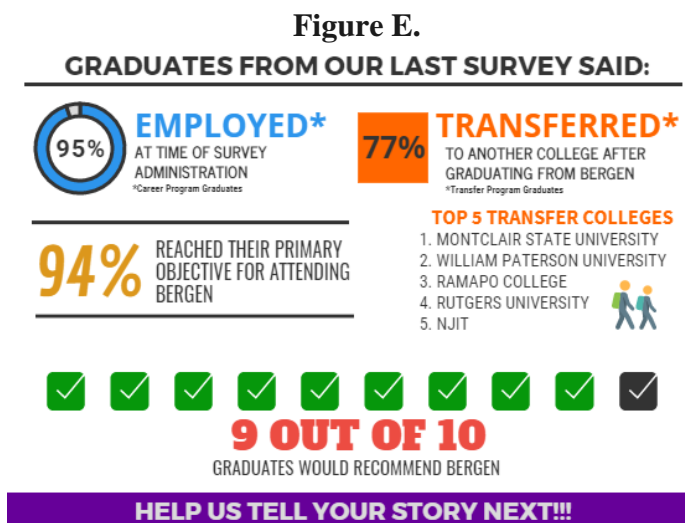


at the NEAIR conference in Jersey City, NJ to overwhelmingly positive reviews. Comments focused on the use of color and pictures to make the information engaging and connecting the quantitative data with qualitative data to add context to the numbers. The transformations that this project evoked led to other changes to existing reports as well as the creation of new reports.



Entering the Special World

The IR Department realized that the storytelling concept was not just for decision-makers. It could also serve as a way of getting students involved in telling their own stories and improving the institution. Historically, online surveys sent to students' emails at Bergen hover around a 10% response rate (BCC, 2017d). To increase this rate, the IR Department took the storytelling concept and expressed it to the student body in the form of the Your Opinions Matter poster and the Graduate Follow-Up Postcard (seen in Figure E).



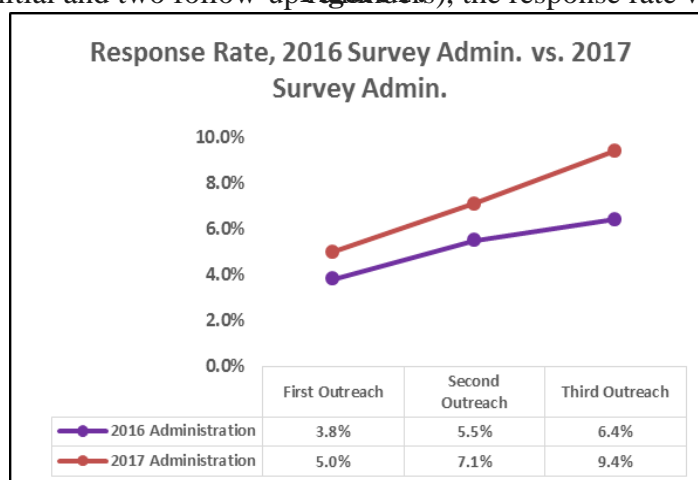
The Your Opinions Matter poster gave three concrete examples demonstrating how results from student surveys led to change at the institution. A survey that gauged interest on a potential Fashion Design program showed a tremendous interest from students who felt it was a great addition to the college – this program was launched later that year. Bergen's commencement ceremony moved to MetLife Stadium after students and parents shared their opinions through a survey and a survey gauging interest in a Weekend College resulted in the launch of the new program in 2017. These examples show how students' opinions led to a meaningful change at Bergen. By presenting them to the student body, the IR department asked students to take an active role in their storyline.

As stated numerous times in this paper, the Graduate Follow-Up Survey is an important annual survey conducted by Bergen's IR Department. When response rates slipped to a low of

12% in 2016, the IR department decided to use the storytelling concept to improve response rates. The IR department devised a plan to mail the above postcard to connect with the 2016 graduates before they were sent invitations to participate in the survey. The postcard presented statistics from the previous year's survey results. On the back was a plea to students to take the survey when they received the official invitation. The IR Department introduced a new slogan for this postcard that is now a part for all survey endeavors – "Help Us Tell Your Story." This slogan is a direct reference to the storytelling concept that has driven the researchers' thinking as well as a call to action for would-be respondents.

The response to the Graduate Follow-Up Postcard has been positive. Using this postcard as a forewarning to the actual survey invitation led to an increase in response rate. Through three email administrations last year (one initial and two follow-up reminders), the response rate was

6.4% (BCC, 2017d). With the same outreach in 2017 (one initial and two follow-up reminders), the response rate was 9.4% (2017 report is forthcoming). As seen in Figure F, this year's administration has outpaced last year's



administration in every phase. It took last year's survey five reminders to get to a 12% response rate. If the trajectory holds, this year's administration will surpass this rate easily.

The success of the Graduate Follow-Up Postcard led to the IR department being asked to create other iterations with the same statistics on the front, but a different message on the back. One iteration of the postcard, with a message to the most recent graduating class, was distributed

at commencement in May 2017 to graduates and parents alike. A third iteration was created with a general message on the back to be handed to campus visitors and placed at information desks around the institution.

Gaps and Next Steps

After taking an inventory of existing data, it was apparent that the department collected very little information for some steps along the journey. This is particularly the case for the stages at the very beginning and the very end. For the beginning stages, there is limited information about students' backgrounds, goals, and hopes for the future. Bergen does not have an instrument that captures this information. To fill this gap, the IR Department will conduct focus groups and surveys that target new-to-Bergen students.

Results of these studies will serve two purposes. In the short term, using Venngage, reports will present key findings and document the students' experiences at this stage. In the long term, however, these results will be instrumental in tracking the journey of the Fall 2017 cohort as it unfolds. This cohort is the first group to enter Bergen since the IR Department adopted this concept. Although the IR department can go back and plug-in data from existing sources to enhance the story (as it did with 2010 VFA Cohort), the Fall 2017 cohort will present the first opportunity to tell the story as it develops. Survey results and focus group comments from this semester will be combined with retention rates, remedial progress reports, gatekeeper course completions, stop-out survey results, and eventually graduation, transfer, and employment information to tell this cohort's cohesive story with every twist and turn documented.

The comprehensive report for the Fall 2017 cohort is a massive undertaking that will take many years to develop fully. In the meantime, other gaps exist in the data that need to be filled. As stated previously, the journey ends long after the diploma is awarded. Bergen also lacks

information on employment status, job earnings, and advanced degrees for its alumni. An increased effort to collect this data and keep it updated is under work. The IR Department collaborates with the Alumni Affairs office and the office of Student Life to update email addresses for alumni in the system for better outreach. The researchers are also working with Economic Modeling Specialists International (EMSI) to get accurate jobs data for the service region. They will also be making tweaks to several surveys to better capture information related specifically to The Student's Journey.

Conclusion

The institutional researchers at Bergen Community College went on a journey when they set out to use Campbell's (2008) theory to enhance their data reporting. Faced with the daunting task of making statistical reports visually stimulating and relatable, they travelled out of their research comfort zone and into the worlds of literature, film, and marketing. Using Campbell (2008) and Sachs (2012), the IR department integrated The Hero's Journey into their reporting by turning it into The Student's Journey. With the concept in mind, they took existing reports and changed them to be more user-friendly and accessible. They went a step further by creating new reports for decision makers and community members alike. Their journey is not over, however, as they continue to use the concept to identify and fill gaps in their existing data.

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THE EFFECT OF INCENTIVES ON STUDENT SURVEYS: AN IR PERSPECTIVE

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Abstract

Surveys are an important source of information institutional researchers use to learn about their students. However, web-based surveys administered in the university setting have witnessed large declines in response rates. The literature is mixed in whether and how monetary incentives can be effective with enhancing response rates. Many studies have found that smaller guaranteed incentives are more likely to yield greater response rates over large lottery incentives. The current study examines the effect of small promised incentives, large lottery incentives, as well as intrinsic motivations on survey completions at a large public state university.

Introduction

Much of the research conducted on surveys administered in the higher education setting has witnessed a decline in response rates (Koskey, Cain, Sondergeld, Alvin, & Slager, 2015; Fosnacht, Sarraf, Howe, & Peck, 2017; Sax, Gilmartin, & Bryant, 2003). Most surveys in higher education are administered via web as it is an inexpensive and fast way to capture the perceptions and attitude of students (Balajti, Darago, Adany, & Kosa, 2010; de Leeuw, 2005). But, while web surveys have been very popular at colleges and universities, this survey mode has particularly suffered in capturing desired response rates in recent years (Dillman, Phelps, Tortora, Swift, Kohrell, Berck, & Messer, 2009; Lozar Manfreda, Berzelak, Haas & Vehovar, 2008; Petchenik & Watermolen, 2011; VanGeest, Johnson, & Welch, 2007). Furthermore, the ease and availability of web surveys and enterprise-wide software products such as Qualtrics and SurveyMonkey have made the administration of surveys easier, which has led to an abundance of surveys being administered to college students. This profusion of over-surveying has contributed to survey fatigue, which can have detrimental effects on the quality of the data used by campus administrators, faculty, and policymakers to inform decisions and develop policy

(Koskey et al., 2015; Chen, 2011; Greenlaw and Brown-Welty, 2009). While there have been efforts by researchers and assessment specialists to mitigate these issues through endeavors that include validation checks to ensure representativeness and/or make post-survey adjustments (Groves, Fowler, Couper, Lepkoski, Singer, & Tourangeau, 2009; Porterfield, Weiner, & Siracusa, 2017), the desire to enhance response rates is still the preferred method to obtain valid and reliable information.

So how does one obtain higher response rates despite these obstacles? There have been a number of research studies that have investigated survey fatigue and have found several different influencing factors that can contribute to higher response rates. Surveys that are shorter (Kaplowitz, Lupi, Couper, & Thorp, 2012; Morrison, Dillman, & Christian, 2010; Sahlqvist, Song, Bull, Adams, Preston, & Ogilvie 2011) have sponsor prominence (Koskey et al., 2015; Boulianne, Klofstad, & Basson, 2011; Porter & Whitcomb, 2003), and have a message that resonates with the participants (Koskey et al., 2015; Porter & Whitcomb, 2003) have been shown to positively impact response rates.

Incentives are one of the most popular strategies directed at increasing responses rates. However, the literature is mixed in how they can be most effective. Many studies have found that smaller guaranteed incentives are more likely to yield greater response rates over large lottery incentives (Stevenson, Dykema, Cyffka, Klein, & Goldrick-Rab, 2012; Gajic, Cameron, & Hurley, 2012). Unfortunately, due to budgetary restrictions, it is often unfeasible to offer small guaranteed incentives in the university setting. The current study examines the effect of small promised incentives in eliciting survey responses at a large public state university. Given the size of the university and budget to conduct this study, these small guaranteed incentives were only

available during the first eight days of the survey administration. Large lottery incentives were also available during the entire administration of the survey.

Theoretical Frameworks

There are several prominent theories that are commonly used to help understand the impact of incentives on response rates. While the theories themselves are not exclusive to incentives, they can be used to better understand the role of incentives in facilitating survey participation.

Social Exchange Theory

Perhaps the most popular theory used in the research to study survey participation is social exchange theory (SET). The theory claims that individuals make decisions based on the balance of costs and rewards, where costs inhibit behavior and rewards promote behavior (Thibaut and Kelly, 1959). SET has been used to help explain why individuals choose to participate in a survey (Dillman, 1978; Keush, 2015; Koskey et al., 2015; Porter & Whitcomb, 2003; Sarraf & Cole, 2014). Participation is dependent on the individual's assessment of whether there is a perceived benefit (Dillman, 1978; Keusch, 2015; Porter & Whitcomb, 2003; Sarraf & Cole, 2014). While the research has consistently found that SET is applicable to individuals measuring the social rewards of survey participation, the research regarding monetary rewards via postpaid incentives has been mixed (Dillman, 1978; Porter and Whitcomb, 2003; Sarraf and Cole, 2014).

Leverage Salience Theory

Leverage-salience theory (LST) was proposed by Groves, Singer, and Corning (2000) as another method to study survey participation. Groves et al. (2000) noted “there is an embarrassing lack of replication of experimental findings (incentives sometimes work, sometimes don’t),” (p. 299). Thus, LST was developed to address some of the inconsistencies in the literature regarding survey participation. LST argues that an individual survey attribute will have a different leverage

on an individuals' propensity to participate (Groves et al., 2000). LST essentially claims that there is no one size fits all model when it comes to an individual's decision to respond to a survey. Individuals use different reasons for deciding whether or not to participate in a survey, and the fluidity of these reasons greatly varies (Groves et al., 2009; Keusch, 2015). Therefore, the decision to participate in a survey is based on 1) the individual's values and characteristics, and 2) the individual's perceived relevance of attributes related to the survey request including the survey's topic and incentive structure (Groves et al., 2000; Keusch, 2015; Sarraf & Cole, 2014).

Benefit-Cost Theory

More recently, benefit-cost theory (BCT) has proposed that survey participation is motivated by the individual's perception of the costs of the survey (Singer, 2011). BCT incorporates aspects of SET and LST where the perceived benefit and relevance are deciding factors for the individual to participate in the survey. However, BCT puts a stronger emphasis on the costs of survey participation for the individual (Keusch, 2015; Singer, 2011). BCT holds that perceived benefits must *outweigh* the perceived costs of survey completion to elicit greater response rates (Keusch, 2015; Singer, 2011).

These three theories are closely aligned and can be used to understand the effectiveness of incentives in survey participation. The aim of this paper is to better understand the role of promised incentives in eliciting survey participation among undergraduate students at a large public research university in the United States. These theories will be used to frame the research in this study.

Literature Review

Effectiveness of Incentives

More than a decade ago, Porter and Whitcomb (2003) reported that a third of institutional researchers use lottery incentives to yield higher survey response rates. That number has considerably grown. According to the National Survey of Student Engagement (NSSE) (2014) 35% of schools that participated in the 2010 NSSE survey offered some sort of an incentive and by 2014, 54% of schools were utilizing them. Furthermore, of the institutions that offered incentives in the 2013 NSSE administration, 92% offered lottery incentives, and 8% offered either a guaranteed incentive or a combination of lottery and guaranteed incentives. The incentive utilization growth has also been accompanied with any increasing number of research studies that have evaluated the impact of incentives on survey response rates. While some researchers have found that incentives facilitate higher response rates, others have found that incentives are ineffective. The research is also mixed regarding which incentives, if any, are most effective. For instance, some studies have found prepaid incentives to be more effective than lottery incentives (Dillman, 2000; Gajic, Cameron, & Hurley, 2011; LaRose & Tsai, 2014), while some studies have found monetary incentives of any kind are not particularly effective (Porter & Whitcomb, 2003; Cook, Heath, & Thompson, 2000). The conflicting research has not hindered the use of incentives in survey promotion, particularly surveys administered to students in the university setting, and the lack of substantial empirical data has done nothing to illustrate the efficacy of incentives.

Some studies have found that the use of incentives is not an effective method in eliciting survey response. Porter and Whitcomb (2003) administered an online survey to 9,000 high school seniors to investigate whether incentives were effective in increasing response rates. Participants were either assigned to the control group or one of four experimental groups which were entered into a lottery drawing for an Amazon.com gift card valued at \$50, \$100, \$150, or

\$200. The differences in response rates between the control group and groups that received an incentive of any amount were relatively small. The only statistically significant difference emerged with a response rate of 13.9% for the control group and 16.2% for the group that was entered into the lottery for \$100. Interestingly, it was discovered that lottery incentives of greater monetary value did not result in a linear increase in response rate. Therefore, the findings in this study suggest that post-paid lottery incentives do not have a significant effect on improving response rates.

Contrarily, there has also been evidence to suggest that incentives are positively associated with slightly higher survey response rates. Goritz (2006) conducted a meta-analysis on several research studies that had at least one incentivized condition and one condition with no incentive to evaluate the impact incentives have on survey response and retention rates. The retention rate of a web-based survey is the proportion of people that complete a survey once they start (Peytchev, 2009). Incentives in the meta-analysis included both lottery and guaranteed incentives. Furthermore, studies included in the meta-analysis needed to report the response rate⁶, retention rate⁷, or both. Goritz (2006) found small but positive effects in terms of absolute percentages. The average response rate was 2.8% higher when an incentive was used, and the average retention rate was 4.2% higher when an incentive was used. However, the study does not distinguish between guaranteed and lottery incentives.

Sarraf and Cole (2014) more recently found that response rates for the NSSE survey were significantly higher when a lottery incentive was used. They also found evidence to suggest that response rates varied according to the type of lottery incentive offered which included general gift cards (i.e. Amazon gift cards), technology incentives (i.e. iPads), or specific gift cards (i.e.

⁶ Included 32 studies

⁷ Included 26 studies

gift cards to a local ice cream shop). The results showed that general gift cards and technology incentives yielded significantly higher response rates for first-year students (19%) and seniors (12%) when compared to when no incentive was offered. Specific gift cards appeared to be significantly more effective than no incentive but did yield lower response rate gains for both groups (12% for first years and 7% for seniors) when compared to general gift cards and technology incentives.

Effectiveness of Incentives and Theory

According to LST, there are various factors that can impact whether or not an individual decides to take a survey. However, material incentives of any kind may be an impactful motivating factor when it comes to survey completion. Laguilles, Williams, and Saunders (2010) applied LST to examine the effects of three different types of lottery incentives using three different web-based surveys. The control group was not offered an incentive for participation and an experimental group was offered an incentive for each survey (including iPods and gift cards to on-campus dining locations). The response rates of students in the incentive group were significantly higher than the response rates of students in the control group across all four experimental designs regardless of the incentive offered. Researchers assert that “the response propensities of at least some students in all four of our incentive groups were positively leveraged by the lottery incentive” (Laguilles et al., 2010, p. 549), a finding that is consistent with the framework of LST. This finding suggests that the use of lottery incentives can be used to increase response rates and further promote survey participation.

The work of Koskey et al. (2015) further supports the findings that incentives positively influence survey response rates among undergraduate college students and applied LST and SET to their work. Students ranked the top factors in the order of most to least influential in their

decision to complete an optional second survey after completing an initial survey. Students reported that incentives were one of the top three factors influencing their decision to take the second survey. Furthermore, the authors found that both pre-paid and post-paid incentives were appealing to students, and the perceived higher value/quantity of incentives has an impact on response rates. The results regarding pre-paid incentives support SET as students feel indebted to complete the survey. They also believed that the use of prepaid and postpaid incentives could be seen in relation to LST as leverages that would influence a student's decision to complete a survey. SET and LST are therefore not mutually exclusive of one another, and both were utilized to achieve higher response rates.

The research findings that use postage mail surveys are overwhelmingly clear that pre-paid monetary incentives (those that are provided to an individual regardless of whether they respond to a survey) yield higher response rates when compared to promised post-paid incentives (those that are guaranteed, but only if the individual completes the survey) (Singer & Ye, 2013; Church, 1993). However, the same may not hold true when examining response rates in web surveys. Bosnjak and Tuten (2003) administered a survey via email to professionals in Virginia which offered a pre-paid and post-paid incentive of \$2 via PayPal. A prize drawing over no incentive did significantly improve response rates and completion rates, but there were no differences found between pre-paid and post-paid incentives. The researchers concluded that SET may not be suitable for web-based surveys since the money is not cash in hand, but rather only available electronically which may minimize an individual's feeling of indebtedness.

Subgroup Differences

The use of incentives is a subjective strategy. A particular incentive can influence one individual over another or a group of individuals over another group. This can be an effective

strategy when trying to reach a specific group, particularly with traditionally difficult to reach populations such as males (Busby & Yoshida, 2013; Dykema et al., 2012; Laguilles et al., 2010; Sax, et al., 2003; Patrick et al., 2013; Porter & Whitcomb, 2005; Marcus and Schutz 2005;) and African Americans (Dey, 1997; Patrick et al., 2013; Underwood et al., 2000). Therefore, it is essential to investigate how different student groups within the university may be incentivized to respond to a survey.

Perhaps the most cited subgroup difference is between males and females. It is widely accepted that females respond to surveys more often than males (Busby & Yoshida, 2013; Dykema et al., 2012; Laguilles et al., 2010; Sax et al., 2003; Porter & Whitcomb, 2005; Marcus & Schutz 2005). However, research suggests that males are more motivated by specific incentives. Incentives related to technology products such as Apple gift cards or iPods have demonstrated higher response rates for males that have narrowed the gender gap in response rates (Laguilles et al., 2010). Furthermore, males appear to respond at increased rates when the incentive value, guaranteed or lottery, is higher (Boulianne, 2012; Patrick et al., 2013; Stevenson et al., 2012).

Response rate differences are also traditionally found by race and ethnicity, with individuals of color responding at lower rates (Patrick et al., 2013; Dey, 1997; Underwood et al., 2000). However, when examining the impact of incentives on subgroups of participants based on race, the results are mixed. Some research has suggested that incentives yielded no significant differences by race (Patrick et al., 2013). A study conducted by Szelenyi, Bryant, and Lindholm (2005), on the other hand, found the impact of a \$2 pre-paid incentive increased response rates for African American students by 72%, Latino/a and American Indian students by 62%, White

students by 61%, and Asian students by 44%. These differences suggest that further impact analysis by race is warranted.

Incentives based on class level for university students have also been examined. Incentives have been found to be more appealing to undergraduate students when compared to graduate students (Koskey et al., 2015). However, much of the research on undergraduate students found no significant differences in response rates based on class level (Patrick et al., 2013; Sarraf & Cole, 2014).

Less research is available on the effect of incentives based on academic achievement, field of study, and admission status for undergraduate students. However, these subgroups do behave differently when responding to surveys in general. High academic achieving students are more likely to respond to surveys regardless of incentive motivation (Dey, 1997; Hutchinson, Tollefson, & Wigington, 1987; Sax et al., 2003). College GPA has been found to be a strong predictor of whether or not a student will respond to a survey, with higher response rates among students with higher GPAs (Chatman, 2007; Sax et al., 2003). Additionally, students that major in the sciences tend to respond to surveys more often than their peers (Porter & Whitcomb, 2005). These response patterns have been suggested to be related to these students' experience with academic research (Sax et al., 2003) which may influence their interest in responding to a survey.

Very little is known about whether transfer students vary in their response patterns compared to students that matriculated to the university as a freshman. Chatman (2007) examined the survey response rates of university students and found that there were no significant differences in survey response rates of students that matriculated from high school (39% response rate) and transfer students (35% response rate). Therefore, further analysis is

important to better understand response rate differences, and any effect an incentive may have on their propensity to respond to a survey.

Research on the use of incentives and their impact on survey response rates will always be needed. This is particularly the case with the swiftly changing landscape of web-based surveys. There is a clear need to continually evaluate the effectiveness of incentives in yielding response rates, particularly among college students. These analyses will help inform better ways to target individuals that are harder to reach on campus. Despite the mixed research, lottery incentives are the most popular methods researchers at universities use to attract students. There are various practical reasons why lottery incentives are popular in surveys administered to university students. Lottery incentives are less costly and are easier to distribute than incentives given to every student that participates in a survey. For example, a university that has 30,000 students may only have an incentive budget of \$1,000, meaning investing in lottery incentives may be the university's only viable option. Therefore, more empirical research is needed to determine how lottery incentives or other viable alternatives can be maximized to promote quality survey responses.

Research Questions

The current study intends to evaluate whether and which incentives are motivating factors in eliciting greater response rates in undergraduate student surveys. Students are asked to select which incentives, if any, motivated their decision to respond to a survey. Lottery incentives, guaranteed incentives, and intrinsic motivations are evaluated. The current study aims to provide guidance to individuals administering web-based surveys to a large university audience who may encounter common barriers with incentives. The goal is to assist survey researchers to utilize the

most effective methods at eliciting quality response rates within the typical constraints associated with cost and distribution.

Furthermore, incentives may motivate some students more than others. Therefore, the purpose of this study is to answer the following research questions:

1. What incentives yield the highest levels of motivation for undergraduate students to complete a survey?
2. Do incentives yield higher response rates with any particular student subgroups?
3. How effective are lottery incentives in particular, with undergraduate student surveys?

Methods

Instrument

The Student Experience in the Research University (SERU) is a nationally administered survey that allows higher education leaders to better understand the experiences of undergraduate students at research institutions. SERU is based at the Center for Studies of Higher Education at the University of California, Berkeley. Students were asked a variety of questions about their area of study, time use, campus climate, and satisfaction in relation to various elements of their undergraduate experience. All undergraduates at participating universities receive the SERU survey via email in the spring semester. Students were informed that the survey would take approximately 20-25 minutes to complete. The open-access link was also posted to social media sites, websites, posters, and newspaper ads across the university. Students were asked to sign in with their student ID. After students logged in, they were presented with an electronic informed consent form; only students that read and approved the consent form were permitted to continue. Lottery prize incentives, which included three \$500 Visa gift cards and ten \$100 Visa gift cards,

were available to students that completed the survey anytime during the administration period. All students that completed the survey within the first week (an eight-day period) were given a small prize that they needed to pick up later.

Participants

All matriculated undergraduate students over the age of 18 from a large public research university in the northeastern United States were deemed eligible and invited to participate in the survey. A total of 6,134 students completed the survey and saw the final question of the survey which asked them what motivated their response. Subgroup information was collected from the institution's database which contained demographic data.

Dependent Variables

The final question of the survey asked students to check all that apply to a multiple-choice question regarding their motivations for responding to the survey. The choices presented for this question to the students included *I wanted my opinions to be heard by faculty, staff, and administration; a small guaranteed prize such as a Rutgers magnet, drawstring bag, etc.; a lottery prize of a \$500 Visa gift card; and a lottery prize of a \$100 Visa gift card*. Variables were created from this question, and were used for analyzing the impact of a particular incentive or set of incentives in motivating a survey response. Students that reported to be incentivized by \$500 and/or a \$100 Visa gift card were considered to be motivated by high cash lotteries.

Covariates

Demographic and academic aspects were evaluated to identify whether differences existed among different groups of students. The covariates included in this study include admission status (first year admits vs transfer students), sex, field of study, class level, race/ethnicity, and grade point average (GPA). GPA was broken down into ranges of less than 2.0, 2.0-2.49, 2.5-

2.99, 3.0-3.49, 3.5 and higher, and individuals who do not have GPAs. Most students that did not have a GPA were newly admitted.

Analytical Methods

First, the sample was evaluated to determine if it is representative of the greater population of eligible students. Traditional chi-square analyses were used to compare subgroup differences between all students eligible to participate in the survey, and those that completed the survey. Chi-square tests help determine whether statistically significant differences existed among any of the subgroups. A Cramer's *V* statistic was calculated for each subgroup that was statistically significant to determine effect size. According to Cohen (1988), a Cramer's *V* statistic less than 0.10 has a negligible effect, a value between 0.10 - 0.23 has a small effect, a value between 0.24 - 0.36 has a medium effect, with any value equal to or exceeding 0.37 representing a large effect.

The next step was to evaluate the different impacts of various motivations involved in the participation and completion of the survey. A series of chi-square models were run to determine whether there were differences in motivation based on the type of incentive. Chi-square analyses were also run by student subgroup to determine whether differences existed between select types of incentives. These findings reveal whether a particular incentive is more effective for a specific set of students.

Given the prominence of lottery incentives in both the literature and practice of student surveys, further assessment of lottery incentives was warranted. A logistic regression model was estimated to predict the probability of being motivated by a lottery incentive. A dummy variable was created where individuals that selected to be motivated by a lottery incentive were coded as 1, and those that did not select to be motivated by a lottery incentive were coded as 0. The model

was designed to examine the effect of the covariates on the probability of being motivated by a lottery incentive. The covariates in the chi-square analysis were used in the logistic regression model. Predicted probabilities were calculated to estimate the probability of an outcome occurring (motivation by lottery incentive). Predicted probabilities were calculated for each variable holding all other variables at their means. Marginal effects were also computed for each covariate, and are interpreted as the change in the probability of being motivated by a lottery incentive for a discrete change.

Results

Student Sample

A description of the total population of eligible students and those that completed the survey is included in Table 1. Approximately, 18.7% (6,134/32,822) of students completed the survey. Descriptive statistics were broken out by admission status, class level, sex, race/ethnicity, GPA range, and broad field of study. No statistically significant differences were found with admission status and class level. The differences between the population and pool of respondents were significant with sex, race/ethnicity, GPA range, and broad field of study. Cramer's *V* statistics revealed that the impacts for race/ethnicity, GPA range, and broad field of study were negligible with values less than 0.10. Differences by sex were notable but the effect size was small with a value of 0.11. Therefore, the sample is representative of the population with a few known minor and small differences.

Table 1: Respondent Profile			
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	Student Population		Survey Completions		χ^2	χ^2 p-value	Cramer's V^8
	N	Percent of Total	N	Percent of Completions			
TOTAL	32,822		6,134		0.00	0.83	
Matriculation							
Native	25,024	76.2%	4,684	76.4%			
Transfer	7,728	23.8%	1,450	23.6%			
Class Level					3.37	0.34	
Freshmen	5,339	16.3%	986	16.1%			
Sophomore	6,611	20.1%	1,186	19.3%			
Junior	7,764	23.7%	1,462	23.8%			
Senior	13,108	39.9%	2,503	40.8%			
Sex					385.27	0.00	0.11
Female	16,082	49.0%	3,774	61.5%			
Male	16,740	51.0%	2,360	38.5%			
Race/Ethnicity					13.70	0.02	0.02
African American	2,415	7.4%	415	6.8%			
Asian American	8,558	26.1%	1,662	27.1%			
Hispanic	4,168	12.7%	828	13.5%			
International	2,436	7.4%	415	6.8%			
White	13,574	41.4%	2,487	40.5%			
Other (includes American Indian)	1,671	5.1%	327	5.3%			
GPA Range					198.06	0.00	0.08
Less than 2.0	1,824	5.6%	232	3.8%			
2.0-2.49	4,041	12.3%	560	9.1%			

⁸ .10 = small effect, .30 = medium effect, and .50 = large effect

2.5-2.99	7,813	23.8%	1,320	21.5%			
3.0-3.49	10,674	32.5%	2,051	33.4%			
3.5-4.00	8,259	25.2%	1,932	31.5%			
N/A	211	0.6%	39	0.6%			
Broad Field of Study							
Arts and Humanities	13,774	42.0%	2,443	39.8%	52.46	0.00	0.04
Business	5,304	16.2%	1,021	16.6%			
Engineering	2,823	8.6%	498	8.1%			
Health Sciences	1,404	4.3%	322	5.2%			
Natural Sciences	3,060	9.3%	665	10.8%			
Mathematics	1,549	4.7%	234	3.8%			
Social and Behavioral Sciences	2,889	8.8%	584	9.5%			
Other	2,019	6.2%	367	6.0%			

Impacts of Various Motivations

Descriptive breakouts of students' motivations are shown in Table 2. Motivations were split between the first week (when students were eligible for all prizes) and the entire survey administration period. Students appeared to be most motivated by all incentives and having their opinion heard followed by only the high cash lottery, only having their opinion heard, all cash incentives (high lottery and small guaranteed prize) and the small guaranteed prize in that order. These results descriptively infer that high cash lottery prizes appear to be more enticing to students than the small guaranteed prize.

Table 2: Breakouts of Students' Motivations				
	First Week		Entire Survey Administration	
	N	Percent of Total	N	Percent of Total
TOTAL	1,117		4,239	
Motivations				
All	517	46.28%	1,570	37.04%
Both Cash Rewards	155	13.88%	430	10.14%
High Cash Lottery	258	23.10%	1,643	38.76%
Opinion to be Heard	177	15.85%	563	13.28%
Small Guaranteed Prize	10	0.90%	33	0.78%

Chi-square analyses were run to determine whether there were differences in motivation based on the type of incentive. Table 3 shows the results of three different chi-square models. These included students that responded to be motivated by a single incentive – high cash lottery, small guaranteed prize, and wanting their opinion to be heard. The first chi-square analysis reveals significant differences in the first week between the three categories. Because the small guaranteed prize had such a low response, two more chi-square models were run to just compare high cash lottery to wanting their opinion to be heard, and were broken out by whether the survey was completed in the first week versus the entire administration period. Both models revealed that students were significantly more incentivized by high cash lotteries when compared to wanting their opinion to be heard.

Table 3: Chi-square Analysis of Students' Motivations				
	N	Percent	χ^2	χ^2 p-value
First Week			215.627	0.00
High Cash Lottery	258	57.98%		
Small Guaranteed Prize	10	2.25%		
Opinion to be Heard	177	39.78%		
First Week			15.0828	0.00
High Cash Lottery	258	59.31%		
Opinion to be Heard	177	40.69%		
Overall			528.7398	0.00
High Cash Lottery	1,643	74.48%		
Opinion to be Heard	563	25.52%		

Chi-square analyses in Table 4 were also conducted by subgroup to assess whether significant differences were apparent between various types of students. Differences in sex, admission status, race/ethnicity, class level, GPA range, and broad field of study were evaluated to assess whether students that indicated they were motivated by a high cash lottery or wanting their opinion to be heard were different. Chi-square analysis revealed that differences existed by admission status, class level, and race/ethnicity for the high cash lottery incentive. Further, chi-square analysis revealed that differences existed by admission status, sex, race/ethnicity, and broad field of study for students wanting their opinion to be heard. Statistically significant differences for both types of incentives were only seen by admission status and race/ethnicity.

No significant differences were found with GPA for either incentive. These results are particularly revealing for the dichotomous variables such as admission status and sex, but the results for the other variables still demonstrate that differences exist. However, the interpretation of these differences is limited. Alternative methodology must be used to uncover more robust details for these subgroup differences.

Table 4: Chi-square Analysis by Student Subgroup								
	High Cash Lottery				Opinion to be Heard			
	N	Expected Percent	Observed Percent	χ^2	N	Expected Percent	Observed Percent	χ^2
Admission Status				3.84*				26.77*
Native	1,289	76.40%	78.45%		378	76.40%	67.14%	
Transfer	354	23.60%	21.55%		185	23.60%	32.86%	
Class Level				8.69*				3.48
Freshmen	256	16.10%	15.58%		84	16.10%	14.92%	
Sophomore	326	19.30%	19.84%		95	19.30%	16.87%	
Junior	346	23.80%	21.06%		145	23.80%	25.75%	
Senior	715	40.80%	43.52%		239	40.80%	42.45%	
Sex				3.23				0.02*
Female	975	61.50%	59.34%		348	61.50%	61.81%	
Male	668	38.50%	40.66%		215	38.50%	38.19%	
Race/Ethnicity				24.81*				47.30*

African American	86	6.80%	5.23%		58	6.80%	10.30%	
Asian American	527	27.10%	32.08%		90	27.10%	15.99%	
Hispanic	215	13.50%	13.09%		77	13.50%	13.68%	
International	112	6.80%	6.82%		51	6.80%	9.06%	
White	616	40.50%	37.49%		264	40.50%	46.89%	
Other (includes American Indian)	87	5.30%	5.30%		23	5.30%	4.09%	
GPA Range				8.32				7.19
Less than 2.0	60	3.80%	3.65%		31	3.80%	5.51%	
2.0-2.49	146	9.10%	8.89%		52	9.10%	9.10%	
2.5-2.99	309	21.50%	18.81%		132	21.50%	23.45%	
3.0-3.49	571	33.40%	34.75%		173	33.40%	30.73%	
3.5-4.00	546	31.50%	33.23%		173	31.50%	30.73%	
N/A	11	0.60%	0.67%		2	0.60%	0.36%	
Broad Field of Study				13.64				14.88*
Arts and Humanities	625	39.80%	38.04%		215	39.80%	38.19%	
Business	311	16.60%	18.93%		96	16.60%	17.05%	
Engineering	131	8.10%	7.97%		50	8.10%	8.88%	
Health Sciences	101	5.20%	6.15%		19	5.20%	3.37%	
Natural Sciences	183	10.80%	11.14%		62	10.80%	11.01%	

Mathematics	67	3.80%	4.08%		12	3.80%	2.13%	
Social and Behavioral Sciences	141	9.50%	8.58%		71	9.50%	12.61%	
Other	84	6.00%	5.11%		38	6.00%	6.75%	

Table 5: Logistic Regression		
	Estimate (Standard Error)	Odds Ratio
<i>Admission Status</i>		
Transfer	0.3172 (.09)**	1.373
Sophomore	-0.1622 (.13)	0.850
Junior	-0.1631 (.14)	0.849
Senior	-0.1463 (.13)	0.864
<i>Sex</i>		
Male	0.0877 (.08)	1.092
<i>Race/Ethnicity</i>		
African American	0.3283 (.22)	1.389
Asian American	-0.3596 (.19)	0.698
Hispanic	0.1141 (.20)	1.121
International	0.5858 (.21)**	1.796
White	0.1964 (.18)	1.217
<i>GPA Range</i>		
Less than 2.0	1.2469 (.64)	3.479
2.0-2.49	0.8688 (.63)	2.384
2.5-2.99	0.9920 (.62)	2.697
3.0-3.49	0.7638 (.62)	2.146
3.5-4.00	0.798 (.62)	2.221
<i>Broad Field of Study</i>		
Arts and Humanities	-0.1886 (.16)	0.828
Business	-0.1742 (.18)	0.840
Engineering	-0.1564 (.20)	0.855
Health Sciences	-0.3784 (.25)	0.685
Natural Sciences	-0.1635 (.19)	0.849
Mathematics	-0.4359 (.27)	0.647

Social and Behavioural Sciences	0.0841 (.18)	1.088
Intercept	-2.6814 (.66)	
R²	0.02	

Table 6: Predicted Probabilities and Marginal Effects

	Probability of Lottery Motivation	Marginal Effect (Standard Error)
<i>Admission Status</i>		
Transfer	0.831	-0.060 (.01)**
<i>Class Level</i>		
Sophomore	0.880	0.011 (.01)
Junior	0.871	0.000 (.01)
Senior	0.869	-0.003 (.01)
<i>Sex</i>		
Male	0.864	-0.014 (.01)
<i>Race/Ethnicity</i>		
African American	0.836	0.218 (.02)
Asian American	0.918	0.050 (.00)
Hispanic	0.862	-0.010 (.14)
International	0.807	-0.080 (.03)**
White	0.856	-0.026 (.01)
<i>GPA Range</i>		
Less than 2.0	0.814	-0.067 (.03)*
2.0-2.49	0.868	-0.003 (.02)
2.5-2.99	0.853	-0.023 (.01)
3.0-3.49	0.882	0.016 (.01)
3.5-4.00	0.876	0.008 (.01)
<i>Broad Field of Study</i>		
Arts and Humanities	0.870	-0.011 (.00)**
Business	0.874	0.004 (.01)
Engineering	0.878	0.008 (.15)
Health Sciences	0.910	0.035 (.01)**
Natural Sciences	0.874	0.004 (.01)
Mathematics	0.906	0.032 (.01)*
Social and Behavioural Sciences	0.836	-0.042 (.02)*

A logistic regression model was run to predict whether students were motivated by the high cash lottery drawing. Results were reported in the form of raw coefficients, odds ratios, as well as marginal effects and predicted probabilities. The results between the logistic regression and the chi-square analyses had similar trends and revealed that certain student subgroups were more or less motivated by the high cash lottery incentive. According to the results of the raw coefficients in Table 5, transfer students and international students were significantly different from their peers. According to the calculated odds ratios in Table 5, the odds of reporting a high cash lottery as being a motivator increased by 37.3% for transfer students, and 79.6% for international students. Additionally, predicted probabilities in Table 6 demonstrate that approximately 83.1% of transfer students and 80.7% of international students were motivated by a high cash lottery. All other independent variables are set at their means when calculating these probabilities. Further, the marginal effects show that without the use of a high cash lottery, response rates would decrease by 6% for transfer students and 8% for international students.

Discussion

The use of incentives for promoting surveys is increasingly relevant as response rates continue to decline. Studying the strategies of whether certain incentives are more influential than others for a particular audience is crucial. It is important to note that this case highlighted university students but results may vary for other populations and may potentially vary from institution to institution. The results in this study are of particular relevance to university personnel such as institutional researchers, deans, and faculty that want to learn more about their students through the use of a survey. The findings in this paper are the opposite of what has traditionally been found when studying the impact of high cash lottery incentives, and provide evidence that university personnel should continuously reevaluate which incentives work best for their students.

The key finding was that high cash lotteries were strongly favored by undergraduate students over other incentives, both intrinsically and financially driven. Strikingly, the guaranteed small prizes had very little influence on response rates. However, these results are similar to Bosnjack and Tuten (2003) whom suggested that prepaid promised incentives are not suitable for web-based surveys since the money is not cash in hand, but rather merely a promise which minimizes the feeling of indebtedness.

The results of this study also demonstrate the influence incentives have on particular subgroups. The statistically significant effects on transfer students and international students revealed that high cash lotteries may have powerful effects. This finding should be useful for researchers that have difficulty recruiting individuals from these particular subgroups.

The findings in this study also connect to the theoretical frameworks that evaluate how incentives impact survey response rates. All three theoretical frameworks discussed in this paper appear to be relevant to our findings, but we find that SET and BCT are the most applicable. LST focuses on individual differences which makes it difficult to generalize to a larger set of responses. LST may reveal why one individual may respond to a survey but given the level of information gathered, we did not feel LST was appropriate for this paper. All students that completed the survey indicated they were motivated by an intrinsic incentive, a financial incentive, or both. Therefore, it is reasonable to assume students felt an incentive for taking the survey was more beneficial than the costs of taking the survey which is the basis of SET. BCT which is similar to SET puts a higher emphasis on the costs of taking a survey. Given that the survey was advertised as taking approximately 20-25 minutes to complete, it is assumed the primary cost was the time it took to complete a survey. According to BCT the incentives offered with this survey appear to be benefits that outweigh the time it would take to complete the

survey. Therefore, the finding that high cash lottery incentives were the most significant motivator for this population reveals that high cash lottery incentives are effective in eliciting response rates for a survey that takes approximately 20-25 minutes to complete.

There were several limitations in this study. First, all information is self-reported and only available from students that completed the survey. Further, the use of a control group was unfeasible since the survey and incentives were promoted across campus. Therefore, we are unable to determine why individuals did not complete the survey and what alternative incentives would have motivated them to do so such as shorter survey length and survey content. Second, the guaranteed incentive structure was limited to one week and only given to students that completed the survey due to budget constraints. This may have impacted the effect the guaranteed incentive would have had if all students were given a small item prior to starting the survey which may have enhanced their feeling of indebtedness. Finally, while the findings in this paper are meant to be generalizable to a similar population, it is important to note the effect individual characteristics may have on response rates. An individual institution's culture or student body makeup may exacerbate these differences as well. LST can be used to address these undetected differences which may be difficult to analyze and interpret in a quantitative study such as this one. Further research that addresses these limitations is recommended.

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SUPERSIZED: BUILDING IR EFFECTIVENESS AT SMALL COLLEGES

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Abstract

Existing research on structure and function of effective IR practice (Terenzini, 1993; Volkwien, 2008) provides little attention to the small college context. Successful institutional researchers meet the growing information needs of decision-makers by overcoming, distinct challenges, such as limited staff and technology support. This session presents key factors from a recent national study of 212 IR offices that predict the overall effectiveness and efficiency of institutional research at small colleges. Results highlight how strong data entrepreneurs build relationships with senior administrators, engage in effective cross-campus collaboration, and use technology to create impactful IR in small college settings.

From the earliest days of the profession, institutional researchers have examined the configuration and function of their own offices just as readily as they have conducted research about the colleges and universities they serve. Despite the assertion of early IR professionals, that filling out questionnaires and generating descriptive reports do not meet the definition of research (Russell, 1960, p. 19), studies repeatedly show such tasks are routinely defined as *institutional* research at many types of institutions (Chirikov, 2013; Delaney, 1997; Muffo, 1999).

Institutional Research is an administrative function dedicated to the production of information that allows college and university leaders to make more informed decisions on a wide range of issues. Faced with a broad array of competing information needs that require varying time commitments, effective offices must find the time to continuously engage in professional development to enhance analytical, technical, and policy knowledge. We contend the most *effective* IR offices are likely to be those that leverage technology to facilitate routine reporting and streamline complex tasks. The *efficient* use of technology creates the necessary opportunities for professional development, committee work, and other higher-level institutional engagement.

First, this chapter explores the concepts of “efficiency” and “effectiveness” in institutional research, building working definitions based on previously published studies and making note of gaps in the literature, some of which are the result of technological innovations that have occurred in the field over the last several years. Secondly, we introduce the Survey of Practices in Institutional Research and Assessment Leadership (SPIRAL), a quantitative instrument based on the theoretical models of Volkwein, Terenzini, and their associates. The instrument is summarized and the survey population is defined. Finally, survey results are

carefully analyzed and discussed. The survey results, in conjunction with interviews of a subset of respondents, reinforce and further clarify the concept of entrepreneurial institutional research initially proposed.

In short: when IR offices maximize efficiency and effectiveness, they are entrepreneurial. Put another way, an entrepreneurial office is one exercising initiative and resourcefulness to take advantage of opportunities, often resulting in greater capacity for efficient and effective information production and distribution. A series of statistical analyses emphasize these findings, as contact with senior leadership, cross-divisional collaboration and the analytical/technological expertise of chief IR officers were found to be significantly correlated to highly effective IR offices.

Efficiency and Effectiveness in Institutional Research

In this section, we synthesize and organize comparative and theoretical studies of institutional research to define the concepts of effectiveness and efficiency as they relate to IR. Effectiveness in institutional research can be thought of generally as the ability to promote data utilization in decision making: Honda, Asano, and Shimada (2015) propose a continuum of effectiveness, with largely descriptive tasks fulfilling accountability requirements on one end and projects contributing to the improvement of the institution and increased visibility of the IR function on the other.

Swing (2009) equates effectiveness with capacity, advocating for an intentional process of building campus awareness of institutional research, developing a focus, and advocating for change to actually take place. This process may be somewhat easier at small, private colleges,

where the relationship between the administrative and academic operations is tighter and making decisions by consensus is more common (Parmley, 2009, p. 76). Parmley's research suggests IR officers at smaller institutions may have to worry less about issues of coordination and communication – getting a seat at the table in order to advocate for institutional research – than their colleagues at larger institutions. Consequently, IR leaders at small colleges are challenged to boost their own analytical capacity through technology as opposed to coordinating and managing the priorities of number of IR staff, given that most small colleges typically only have one or two IR professionals.

The concept of effectiveness as a continuum or process owes much to Terenzini's research on organizational intelligence (1993, 2013), presented as a foundation of: technical/analytical intelligence including “mastery of the IR analytical toolbox”, issues intelligence encompassing “knowledge of the major operational domains and issues for colleges and universities”, and contextual intelligence that “must move beyond the campus boundaries [to] understanding the local context[,] augmented by at least some awareness and understanding of state, regional, national, and international contexts” (2013, p. 146). As originally summarized:

These three forms of organizational intelligence are mutually dependent and supportive: Only in the presence of the other two is the value of any specific form of organizational intelligence fully realized. Moreover, all three forms [...] are found in truly effective institutional research offices, and occasionally they are found in the same individual. (1993, p. 9)

Although “institutional type and sector may have a significant impact on the actual configuration of the function” (Leimer & Terkla, 2009, p. 57), studies indicate successful and satisfied IR professionals have a keen sense of social intelligence: the ability to understand and navigate

complex social situations that is a subset of issues intelligence (p. 45). Other important qualities include flexibility, a natural curiosity, and a certain amount of patience (p. 52) in addition to a strong foundation of technical skills.

Other studies based on statistical analyses of survey data have attempted to confirm the relationship between skills, knowledge, and effectiveness among institutional researchers. Knight, Moore, and Coperthwaite (1997) found participants who were employed in the field for a greater number of years and those with terminal degrees considered themselves to be more effective in their roles (p. 429). The survey instrument asked participants to rate their own effectiveness on a five-point scale; this question served as the dependent variable for their analysis (p. 426). In addition to potential disparities between self-reported effectiveness and objective evaluations, the authors cited advances in technology that Terenzini could not have accounted for in his original typology as limitations of the study (p. 437).

Returning to Honda, Asano, and Shimada (2015), their research proposes a continuum of IR task efficiency which can be defined as the ability to produce data within a given timeframe and with available resources. Less efficient offices primarily fulfill requests on an ad hoc basis, which can be unpredictable in scope, required resources, and benefit to the IR function and to the institution as a whole. More efficient offices complete tasks in a routine manner: reports and analyses are recurring and scheduled in advance, so that templates and other processes may be built to facilitate their completion. These scales of effectiveness and efficiency form four quadrants into which tasks and projects can be classified.

Few studies extensively address the role of technology in facilitating institutional research: although the continued proliferation of technology available to IR staff “should help small offices operate efficiently without large numbers of people”, availability alone cannot

become mastery of technical/analytical intelligence if “people with limited statistical knowledge [...] produce mounds of numbers and Greek letters without the slightest idea of what it all means” (Muffo, 1999, p. 56). Huynh, Gibbons, and Vera (2009) present a thorough overview of strategies for selecting technology “to support [...] institutions in meeting some of today’s toughest challenges: strategic planning, information analysis, stakeholder support, and data presentation” (p. 60). Covering hardware and software options from Microsoft Excel to classroom-response tools such as iClickers, the authors summarize their findings by stressing that IR professionals “need to work from a foundation of meaningful collaborations among work groups and well-thought-out approaches aligned with the institution’s strategic focus” in order to “broker informed decisions about which technological innovations will best achieve the goals of the institutional research office of the future” (p. 70).

Experienced IR leaders often measure effectiveness by how many people know them on their campuses (Knight, 2010). Knight (2014) presents a number of tools for measuring the effectiveness of an IR office and concludes that effectiveness is as much about human relationships as it is efficient structures and processes. Chambers and Greek’s (2007) study of institutional research perceptions among college presidents finds campus CEOs believe many IR offices are very efficient in terms of their technical and analytical skills. However, chief IR officers sometimes fail to effectively frame information in a way that addresses the complexities of running an academic institution in an environment of assessment, accountability and affordability (p. 3).

Exploring this divide between effectiveness and efficiency, Chambers and Greek interview campus presidents to determine what IR leaders should do to enhance their effectiveness. Their six guidelines include:

- Maintaining objectivity: “The institutional researcher should be as objective, detached, thorough, and systematic as any other researcher”
- Being ahead of the curve, not behind it: “Understanding what is taking place both on- and off-campus related to emerging issues is needed”
- Staying aware of trends at the national, state, local, and institutional levels: Be aware of a variety of data sources and maintain a log of institutional data requests to predict future ones
- Breaking out of the routine: Be proactive within the framework of the institution’s history and culture
- Understanding institutional context by collaborating with senior administrators: IR is in a unique position to function as a “data broker”, helping to frame questions and meld perspectives
- Participating in self-assessment practices: Ensure the IR function is competent and well-equipped to meet the institution’s data needs (p. 5-7).

Although none of the CEOs interviewed are from small baccalaureate colleges, many of these suggestions are pertinent to such institutions, as the vast majority are private and highly tuition dependent.

IR leaders are often asked to support many policy functions that require an understanding of the institutional context and the external trends. Indeed, it may be easier for effective IR leaders at smaller institutions to increase the visibility of IR. Senior management can be more accessible in the flatter organizational environment of a small college or university. The faculty as a collective often take a greater interest in shared institutional governance at smaller baccalaureate institutions, given their focus on teaching as opposed to an expectation of research

activity. In fact, shared governance is a strategy to reconcile external challenges (such as demographic shifts, accountability, and affordability) with strongly held educational missions (Prewitt-Freilino, 2008).

National Studies and Next Steps

Institutional research offices at small colleges may struggle to assemble the human and technological resources to support the tasks and projects handed to them by senior administrators, yet national studies of IR offices over the last ten years have indicated that some offices are not only succeeding, they are thriving. Volkwein's (2008) overview of the structure and function of IR offices broadly defines four types of configurations based on office size, degree of centralization, and development of the IR function. These classifications – craft structures, small adhocracies, professional bureaucracies, and elaborate profusions – are based on nearly 20 years of firsthand observations, and are presented as a sort of evolutionary process. Volkwein sees craft structures “as fitting a surprisingly large number of one- and two-person offices that are highly burdened by mandated routine reporting and a modest amount of number crunching for the institution” (p. 12). Because his typology is not based primarily on institutional characteristics such as enrollment or sector, Volkwein sees examples of craft structure offices at community colleges and branch campuses of state research universities, as well as at selective liberal arts colleges (p. 13).

Most craft structures will evolve to become small adhocracies, primarily through increasing the size of the IR staff. Adhocracies typically feature “a flat hierarchy, simple structure, and minimal specialization [...] adhocracies are highly responsive to their administrative hosts and account for at least 30 percent of the IR offices in the Northeast” (p. 12). Example institutions include several private baccalaureate colleges with fewer than 1,000

students (as of 2008). Although Volkwein suggests that some adhocracies represent a more “entrepreneurial” function than their craft structure counterparts (p. 12), distinguishing features or capabilities are not discussed aside from a general doubling or tripling of staff, from one to two or three. Indeed, staff size seems to be the driving force of three of Volkwein’s categories, with professional bureaucracies representing “a more formal IR arrangement of at least four professionals and usually more” (p. 13).

The implication of Volkwein’s research is twofold: staff size has the biggest impact on the structure and function of an institutional research office, and as a result, small offices do not have the capacity to handle certain types of projects, burdened as they are with routine reporting and other tasks. Considering that 54% of IR offices in the United States employ two or fewer FTE (Volkwein, Liu & Woodell, 2012), over half of IR offices in the United States face an uphill battle to innovate and expand. Other national studies do little to challenge this narrative. Of the respondents who identified themselves as senior IR officers in the Association for Institutional Research’s *Defining Institutional Research* study of IR tasks, only 5% indicate that they have 1 to 3 FTE staff, while another 5% function as one-person offices (2016, p. 4). The initial presentation of the data organizes tasks based on IR office size and what percentage of senior IR leaders perform the task to a high degree (p. 4). The formatting and organization of the results, as well as the focus on discrete tasks, leaves *Defining Institutional Research* as a study of what IR offices do with little consideration of how tasks are completed and whether or not they can be considered objectively successful.

This brief review of the literature suggests that effectiveness in institutional research is a topic that has been explored in several studies, but which may in fact be a combination of two elements. If effectiveness is primarily the combination of personality, professional experience,

and institutional organization that allows some IR staff to work across divisions and attain a high-level view of their institution and the challenges it faces; the strategic use of technology to compensate for a lack of staff or to expand the reach of the IR function may be more usefully thought of as IR efficiency. Studies of small IR offices and the strategies they utilize to leverage influence and expand their footprints are lacking in the literature, and the reported findings of regional and national studies often do not consider the impact of office size when analyzing responses.

Study of Practices in Institutional Research and Assessment Leadership (SPIRAL)

A number of key questions remain regarding the practice of institutional research in small college settings following Terenzini's foundational analysis of the IR function and Volkwein's subsequent works on institutional research typology. Because the small college often does not have the desire or the ability to increase IR capacity through additional human resources, the current study aims to discover alternative strategies and to uncover how data entrepreneurship (a combination of efficiency and effectiveness in IR functions) is achieved at small institutions, where responsibility for institutional research may be limited to a single person. The following research questions guide our effort to understand data entrepreneurship within the context of IR at smaller colleges and universities:

1. What are the characteristics (institutional, personal, and professional) of small IR offices and their staff that have effectively increased their capacity?
2. What factors predict the overall effectiveness and efficiency of institutional research at small colleges?
3. How do the characteristics of the effective small college IR office relate to previous research and the concept of data entrepreneurship?

Survey of IR leaders at Small Colleges

In support of our research questions, we created a survey we call the Study of Practices in Institutional Research and Assessment Leadership (SPIRAL). The survey instrument contains 26 items with a strong focus on efficiency, effectiveness, and reach of the IR office into senior level and cross-divisional discussions and projects. Items related to IR engagement focus on the frequency of IR's interaction with senior leadership, the role of IR on key institutional committees (i.e., data provider, committee member, committee leader), and IR's contribution to addressing key challenges or priorities that face smaller colleges (e.g., student recruitment and retention). Because efficiency allows small IR offices to broaden their effectiveness without recurring investment in human resources, efficiency-related survey items focus on automation, data organization, and utilization of data analytics and productivity tools (e.g., macros, visualization software, APIs, and data mining workflow software). A number of demographic questions were also included to establish a profile of the background and experience of professionals leading IR functions at small colleges.

In summer 2016, we sent the SPIRAL survey via email to chief institutional research officers at 485 U.S. Baccalaureate-Arts and Sciences and Baccalaureate-Diverse Fields institutions with undergraduate enrollments of fewer than 5,000 students. Institutions were selected via the Integrated Postsecondary Education System (IPEDS) data center, and student workers searched for contact information using membership directories of the Association for Institutional Research (AIR) and North East Association for Institutional Research (NEAIR), as well as searches of institutional web pages. A modified survey invitation was sent to the CEO of 109 colleges for which an IR contact could not be located, asking them to complete the survey or

forward it to the appropriate contact at their institution. Follow-up email reminders were sent within two weeks of the initial invitation.

In total, 212 institutions responded for a 44% response rate. Our survey questions aimed to uncover the characteristics of the IR function at small colleges and relate maturity of the office and office engagement items to an overall measure of IR entrepreneurship. Based on initial analysis of responses, we identified three IR leaders who reported a strong impact across multiple institutional functions and conducted one-on-one interviews in order to add additional context to the survey results.

Characteristics of the Small College IR Office

The demographics of the IR leader respondents are majority female (54%), predominantly white (89%), with a median age of 40-49. Only one in four IR leaders who responded are under the age of 40. Most have worked at their institutions for longer than 5 years (62%). Nearly half (47%) hold a doctorate, and most report to a senior leader, such as a vice-president (64%) or president (15%). Respondents reported an average office of 1.7 FTE, including themselves.

Multiple linear regression analysis was used to identify key factors that predict IR effectiveness at smaller colleges. We derived a measure of IR effectiveness by asking IR leaders “How often does the information or insights you produce impact decision making in the following areas?” Respondents rated frequency of decision-making impact across ten areas on a four-point scale from never (1) to very often (4). The means and standard deviations for the ten areas of IR effectiveness are presented in Table 1. We averaged across responses on the ten impact areas to construct an overall IR effectiveness rating for each participating institution. The measure of IR effectiveness served as the criterion measure for the regression analysis.

Table 1. Descriptive statistics and percentage breakdown of IR effectiveness responses by area

Variable	M	SD	Never (1)	Seldom (2)	Often (3)	Very often (4)
Academic Programs	2.96	0.69	2%	21%	57%	20%
Advancement/Alumni	1.97	0.61	19%	65%	15%	1%
Finance & Budget	2.48	0.76	9%	40%	43%	7%
Marketing & Branding	2.11	0.73	19%	53%	25%	3%
Organizational Structures	1.96	0.73	25%	57%	15%	3%
Strategic Planning	3.09	0.76	3%	17%	49%	31%
Student Financial Aid	2.22	0.81	16%	54%	22%	8%
Student Life	2.48	0.73	7%	44%	41%	7%
Student Recruitment	2.50	0.77	7%	47%	35%	11%
Student Retention	3.16	0.78	3%	16%	44%	37%

Note. The following survey question was asked to measure IR effectiveness in the above areas: How often does the information or insights you produce impact decision making in the following areas?

The bivariate correlations with IR effectiveness are presented in Table 2 as an initial analysis of predictors in our study. The bivariate correlations reveal that a number of factors not statistically related to IR effectiveness that were excluded from subsequent analysis, including gender of the IR leader, the institution's Carnegie classification, and undergraduate enrollment. A number of factors defined as measures of IR maturity (Volkwein, Liu & Woodell, 2012) have modest but significant bivariate correlations with IR effectiveness, such as reporting line, years of IR experience for the IR leader, and staff size. IR leader degree level does not have a significant relationship with IR effectiveness, and it should be noted that there appears to be no difference between IR leaders at smaller colleges and other types of institutions with regard to educational attainment (Delany, 1997; Knight, Moore, & Coperthwaite, 1997). The use of

student workers has a modest relationship with IR effectiveness at small colleges; surprisingly, only one-third of respondents utilize student workers even though these IR offices are mostly limited to one or two professional staff.

Table 2. Bivariate correlations of key variables with IR effectiveness

Variables	<i>r</i>
IR Office Maturity Indicators	
IR Leader's Years Degree Level	-.03
IR Leader's Years of IR Experience	.14
IR Staff FTE	.16*
Reporting Level of IR Leader	.18*
Organizational Characteristics	
Liberal Arts & Science Institution	-.05
IR Leader is Male	.05
Undergraduate Enrollment	.05
IR Use of Student Work Study	.15*
IR Engagement Indicators	
Analytical/Technological Expertise	.53**
Contact with Senior Leadership	.57**
Cross-Divisional Collaboration on Campus Priorities	.59**
External Engagement in the IR Profession	.29**
Leadership Positions on Institutional Committees	.14
Readership of IR Publications and Trends	.27**

** $p < .01$, * $p < .05$

In addition to demographics, we examined IR office engagement in six key areas: analytical/technological expertise, contact with senior leadership, cross-divisional collaboration on campus priorities, leadership on key campus committees, external engagement in the IR

profession, and familiarity with IR publications and trends. The six areas of IR engagement were based a synthesis of Terenzini's research on organizational intelligence (1993, 2013), Knight's work on effective leadership in IR (2013) and the author's own experiences building IR capacity at small colleges. Measures of IR engagement have much stronger correlations than measures of IR maturity and demographics. Only two were excluded: leadership on key campus committees and readership of IR publications do not correlate significantly with IR effectiveness in this study.

In Table 3, we present a multiple regression of factors that best predict IR effectiveness in the small college setting. The predictors in the regression model explained 56.8% of the variance in IR effectiveness ($R^2 = .57$, Adjusted $R^2 = .55$, $F(9,166) = 20.19$, $p < .001$). It was found that contact with senior leadership significantly predicted overall IR effectiveness ($\beta = .37$, $p < .001$), as did cross-divisional collaboration ($\beta = .31$, $p < .001$) and analytical/technological expertise ($\beta = .27$, $p < .001$). Although the three IR office engagement indicators had bivariate correlations between .50 and .60, tests to measure multicollinearity were well within established parameters (VIFs below 2.0; Pituch & Stevens, 2016). In the final model, the level of external professional engagement did not predict IR effectiveness. Moreover, none of the IR office maturity measures including office size, reporting line, or experience of the IR leader contribute significantly to predicting the effectiveness of an IR office at a small college.

Table 3. Summary of regression coefficients for IR effectiveness

Variables	<i>B</i>	<i>SE</i> <i>B</i>	β
Analytical/Technological Expertise	.167	.032	.288** *
Contact with Senior Leadership	.171	.026	.378** *
Cross-Divisional Collaboration on Campus	.194	.035	.323**

*** $p < .001$

Notes. $R^2 = .57$ ($ps < .001$)

Discussion and Implications

The engagement measures that most significantly predict effectiveness relate to Terenzini's three levels of organizational intelligence for effective institutional research practice (1993, 2013). Leveraging analytical and technical intelligence allows a small IR office to take advantage of technology to automate data extraction, data preparation, data analysis, and visualization for recurring projects including IPEDS, fact books, and dashboards that measure institutional performance and support accountability. By automating recurring tasks, the small IR office increases capacity and can respond to more ad hoc requests with greater efficiency. IR officers who apply technical and analytical expertise to build efficiency have more time to interact with senior leadership and collaborate with other units on strategic institutional priorities, enhancing effectiveness.

The effective IR office is not just a business intelligence reporting unit that has a transactional relationship with college leadership. In order to connect with senior leaders, contextual intelligence and organizational intelligence are required to produce information that is relevant and timely for the challenges and opportunities facing the institution in the local, region, and national context. Survey results and interviews indicate the most effective IR offices interact with senior leaders on a weekly basis via email or in person. The small college environment presents IR leaders with an opportunity to interact with senior leaders more frequently than at larger institutions, with their greater numbers of staff, organizational complexities, and competing priorities.

Although the opportunity to interact with senior leadership is a distinct advantage of working at a smaller institution, few IR leaders in our study interact more than once a month (by email or in-person) with most of their campus leadership. When broken down by senior administrators, only the chief academic officer and the chief enrollment officer interact with a majority of survey respondents more than once per month (74% and 54%, respectively). Future research should compare the perspective of IR leaders with the viewpoint of their campus leaders for a more comprehensive understanding of institutional research effectiveness.

A number of the most effective and visible small college IR offices employ only a single IR professional. Although adding staff can increase IR capacity, it is not an option for most small college IR leaders. The first step for building an effective IR function at a small college is increasing the capacity of the office to respond to external and internal data requests. The entrepreneurial IR leader employs a wide range of technical tools to automate tasks using workflows, syntax, macros, scheduling, and other software tools. Data should also consistently and efficiently be stored to increase responsiveness to data requests. If automation is not possible for certain tasks, such as completing college guidebook surveys, entrepreneurial IR leaders utilize student workers to conduct data entry or to gather student feedback.

IR offices at small institutions may resist employing student workers because of limitations on their work schedules, or students' lack of experience with data and concepts commonly used within the institutional research profession (such as cohorts, retention rates, etc.). Based on survey responses and follow-up interviews, the most entrepreneurial IR leaders view students as an opportunity to expand the capacity of the IR function. One IR director, in addition to employing a number of work-study students in his office, recently proposed a course at his institution that would build IR capacity through projects and allow students to gain valuable

research and data analysis skills. He also facilitates a one hour per week course for students wanting to learn data collection, research, analysis, and visualization skills: Students decide on the campus issue they want to investigate, execute the research project, and present results to student leaders and senior campus administrators. Demand consistently exceeds the 28 slots available, despite the course requiring a 3.6 GPA to enroll and being a single credit elective that is graded Pass/Fail. It should also be mentioned that this director is the only full-time IR staff member at his institution. Ultimately, the utilization of student workers may be any effective strategy to increase IR capacity after the IR leader has leveraged their technical and analytical expertise to improve office efficiency.

IR offices can be efficient producers of information, but readiness does not always mean the office is effective in terms of impact on organizational decision-making. The entrepreneurial IR leader develops a reputation on campus as a problem solver. They have the flexibility, due to efficiencies in their own office, to work on responding to cross-divisional information needs and especially requests related to strategic institutional priorities. This requires the entrepreneurial IR leader to be engaged with senior leadership in order to understand the most critical institutional issues. It is rare to find within a single individual both the technical/analytical expertise coupled with the organizational and contextual intelligence to be an IR entrepreneur. However, interviews with IR leaders who possess these skills indicate they find the small-college IR office both challenging and rewarding: these leaders have a unique ability to influence institutional decision-making and help navigate the existential challenges unique to smaller colleges.

Future Directions and Conclusions

Future research ought to consider the perceptions of senior leaders and other stakeholders regarding the efficiency and effectiveness of IR at small colleges, in order to explore potential

gaps between what senior leaders and IR officers at small colleges value and are concerned about at their institutions. Similarly, it may be of value to test whether IR leaders who report the most contact with senior administrators are rated by those leaders as more effective than IR officers with less frequent interactions. The current study defines interaction as in-person or via email, though it may be worth comparing whether the mode of interaction impacts perceptions of IR effectiveness. The importance of contact with senior leadership should be compared to trends at other types of institutions: Does the small-college model of IR effectiveness apply to larger colleges and universities? How do entrepreneurial IR leaders at small colleges adapt to larger institutions? It would also be meaningful to study the impact of turnover in the small college context.

Data entrepreneurs are necessary to maximize the effectiveness and efficiency of the IR function at small colleges. Analysis of our survey and interview data emphasize that becoming a data entrepreneur requires a mindset of continuous learning and experimentation. One must look for solutions to improve office efficiency and be willing to devote the time to applying new solutions that provide the most benefit to the functioning of the office. The data entrepreneur also seeks to understand and anticipate the issues that are important to decision-makers. Timely and relevant unsolicited information should be targeted to individual senior leaders in order to increase interaction with and build trust of the IR function.

The entrepreneurial small college IR leader is seen as having valuable information and insights into the challenges and opportunities facing the institution. Continuous improvement in areas related to the production and use of information should guide all aspects of effective IR leadership in any college setting, but it is especially valuable at smaller institutions. When an IR leader has the dual challenges of increasing IR capacity and being an effective broker of

information without the resources of larger colleges or universities, true data entrepreneurs will harness technological and managerial resources to make a meaningful and lasting contribution to their institutions.

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Evaluating a 2nd Year Living and Learning Environment

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Abstract:

Colleges are under growing pressure to increase retention and graduation rates. Living-learning environments have been developed with this end goal in mind. Such programs typically focus on enhancing the freshmen experience and improving first-year retention rates. This study focuses on living-learning programs developed at Virginia Commonwealth University to improve retention and graduation rates among upperclassmen. These programs recruit undergraduate students for a multi-year, residential-academic hybrid environment with a common curricular sequence and a shared programmatic theme. The first of these programs to launch, the Academic Scholars Program in Real Environments (ASPiRE), opened its doors in the fall 2012 semester and is focused on the theme of civic/community engagement. We gather data on the first four ASPiRE cohorts as well as a random sample of students with similar pre-participation enrollment characteristics and track their enrollment through Fall 2016. These administrative data include a broad array of potential control variables including basic demographic information, academic background/preparedness, and post-matriculation (pre-program) enrollment behavior. Our quantitative analysis proceeds with estimation of multivariate logistic models of enrollment and graduation, estimation of a discrete time hazard function that makes use of multiple term-specific outcomes, and finally, as our treatment and control samples have some very different characteristics, we use matching models to compare outcomes for individuals from the control sample with similar individuals from the experimental sample. Our results, while still subject to selection bias, provide some evidence that participants in ASPiRE are more likely to persist than non-participants, though graduation rates do not appear significantly higher.

* The opinions expressed in this paper are those of the authors and do not necessarily reflect those of the Federal Reserve Bank of Richmond or the Federal Reserve System.

Introduction:

Colleges are under growing pressure to increase retention and graduation rates. Living-learning environments have been developed by institutions in part to improve these figures. Such programs typically entail a common living environment and a shared curriculum, designed to cultivate a greater sense of community and belonging. Many focus on freshmen with a goal of promoting student attachment and first-year retention. This paper focuses on living-learning environments developed at Virginia Commonwealth University (VCU) with the intent of increasing retention among upperclassmen. These programs recruit already enrolled undergraduate students to commit to a two-year residential-academic hybrid environment, with a common curricular sequence and a programmatic theme. We conduct a quantitative evaluation of one such program, using administrative data on participants and random samples of non-participants who exhibit a similar pattern of prior enrollment, to examine the relation between participation in this program and subsequent enrollment and graduation.¹

The National Center for Education Statistics reports that 78.9% of the fall 2009 cohort of full-time, first time students at four-year institutions returned to the same institution for a second year, but only 39.8% of these students graduated within four years and only 59.4% within six years. These measures have risen only modestly since they were first collected following passage of the Student Right to Know Act in 1990.² By comparison, VCU had a first year retention rate of 86% in 2013 and a six-year graduation rate of 57% for the 2007 entering cohort. With better than average first year retention and a somewhat lower six-year graduation rate, institutional attention focused on how the latter might be improved.

¹ Qualitative information would be a valuable addition to this analysis, but are not available to us.

² First year retention rose about four percentage points between 2006 and 2014. Four-year graduation rates have increased about 3.5 percentage points between 2000 and 2009 and six-year graduation rates about two percentage points.

Graduation rates are important for students, institutions, and the nation. Students who enroll but do not complete a degree incur costs and possibly accrue debts without reaping the full benefit associated with degree receipt. Institutions experiencing high attrition lose out on any investment they have made to recruit and enroll those who drop out, forego the donations a successful graduate might provide in the future, and risk receiving less state and national operating support as funding is now increasingly tied to student success. Nationally, while the United States still boasts one of the most highly educated populations in the world, the fraction of 24-35 year olds with a tertiary education has plateaued and the US ranks only fifteenth amongst 34 OECD countries on this benchmark (OECD, 2011). One of VCU's responses has been to develop living-learning programs for upperclassmen.

Four such programs are now in operation. The most well-established of these programs is VCU's Academic Scholars Program in Real Environments (ASPiRE), a living-learning program designed to "enrich and deepen students' understanding of their capacity to create positive change in communities and address critical societal needs through long-term sustainable partnerships".³ The ASPiRE program began recruiting students in the fall of 2011. A new class of approximately one hundred ASPiRE participants has entered the program annually since fall 2012. ASPiRE students are required to complete a minimum of 100 hours of community service and a common four semester curricular sequence of nine credits during the two-year program.

The second living-learning program to open its doors (Spring 2013) was the GLOBE program, designed to prepare students "to live and work in a 21st-century global environment."⁴ Students enter this three-year program in the spring of their freshmen year and must complete at

³ <http://aspire.vcu.edu/about-vcu-aspire/> Accessed 12 July 2017.

⁴ <http://www.housing.vcu.edu/living-learning-communities/living-learning-programs/> Accessed 22 September 2017.

least 40 hours of community service and a sequence of 12 credits. In addition, GLOBE students must attend ten program-sponsored events. Two additional programs began operation in Fall 2015: LEAD “dedicated to the development of current and future leaders” and focused on developing “graduates who can successfully manage professional and civic organizations at a local, national, and global level within their respective fields” as well as INNOVATE offering a “multidisciplinary approach to create a culture that inspires true creative thinking.” Participants in LEAD complete at least 20 hours of University service and 20 hours of service in the community and must attend at least five VCU LEAD events each academic year. LEAD students also must enroll in not less than nine but not more than 15 credit hours specifically designed for participants in this program. INNOVATE requires 60 hours of co-curricular programming. Each of these programs requires students to live on campus, in the same residence hall, for two years.

Though we anticipate analyzing each of these programs, the analysis that follows focuses on the ASPIRE program for which we have data on four entering cohorts, three of which have completed the program and at least two of which should have earned sufficient credits to graduate.

Literature

There exists a substantial literature examining college retention and progress toward a degree, both theoretical and empirical. What follows is but a partial review. One economic theory often used to explain individual decisions to enroll and persist in college is human capital theory. According to this theory, individuals enter college and persist so long as the expected benefits of doing so exceed the expected costs. In an important theoretical contribution in the education literature, Tinto (1975) emphasizes the importance of post-enrollment experiences,

positing that they are more likely to influence retention and progress toward a degree than characteristics observed upon matriculation. This hypothesis is consistent with human capital theory since those enrolling must have felt the benefits outweighed the costs at the time of matriculation and only post-enrollment experiences provide new information students can use to update their expectations and subsequently choose a different path. That the six-year graduation rate (excluding transfers) in the US was but 59% for first time, full-time students enrolling at four-year institutions in the fall of 2009 suggests that many students do update their expectations. In subsequent work, Tinto (1988) notes that students entering college make this transition in stages and that not only are the factors influencing attrition likely to differ from those influencing enrollment, but that the factors influencing attrition may differ longitudinally post-enrollment.

Empirically, personal/household characteristics and academic background have certainly been linked to the decision to enroll in college (see Stratton 2014 for a review). Theory suggests that the impact of such time-invariant variables on persistence may be limited. Consistent with theory, conditional on enrollment, Adelman (2006) finds that gender, race, and ethnicity are not significant predictors of graduation. Graduation rates do vary with household income, but, of course, income can vary over time. Entrance exam scores and high school GPA have also been linked to persistence and graduation (Adelman 2006, Stratton and Wetzel 2013). The role of these pre-enrollment signals of academic ability once post-enrollment signals (i.e. college GPA) are available is less clear. Ishitani (2003), for example, finds that high school GPA becomes statistically insignificant after freshman year, when college GPA is included. Terenzini and Pascarella (1978) report finding that parental education, SAT scores, and high school rank are not significant predictors of persistence given controls for social and academic integration –

controls that include college GPA – but that there were racial and gender differences in the predictive ability of the integration measures.

As discussed above, living-learning programs have been developed in an effort to improve retention. Tinto's work (1975) provides a theoretical justification for these programs. He emphasizes the importance of academic and social integration and suggests that institutions that are more successful in building a strong sense of inclusive educational and social community on campus will have better retention. This work is important because it demonstrates that universities can actively influence their college retention rates even after the applicant screening process. A substantial empirical literature has sought to test these predictions looking at common curricula, co-curricular activities, and residential life, all key components of the VCU living-learning environment we examine.

Astin (1993) examines the role of various curricula using a longitudinal study of more than 500,000 college students. He finds that the only courses that are significantly associated with college outcomes are those that are considered “true-core”, where students take exactly the same courses. Astin argues that a common curriculum creates a core learning experience shared among students, which leads to conversations both in and out of the classroom. These conversations help contribute to the academic and social integration factors that Tinto emphasizes in his works.

Many other studies have also examined the association between classroom experiences and student attrition. Zhao & Kuh (2004) use the National Survey of Student Engagement to focus on participation in learning communities, which they define as programs where groups of students take two or more classes together and may or may not have a common residence. They find that participation in these programs is strongly correlated with academic performance, as

well as overall satisfaction with the college experience. Lenning (1999) cites evidence from many single institution studies of learning communities, that well-designed programs can increase GPA, retention, and student satisfaction. Lichtenstein (2005) looks at learning communities defined as two writing intensive courses aimed at incoming freshmen and reports a positive association between such communities and retention, but argues that the effect may depend upon the characteristics of the program. These studies provide a justification for the common curriculum of living-learning programs.

Residence life has also been studied as a factor in college success. Deangelo et al. (2011) find that students who plan to live in a private residence and not on campus during their freshmen year have 35.3% lower odds of completing their degree within 4 years. Their logistic model of student success also controls for race, ethnicity, parental education, high school performance, student self-ratings⁵, and institutional characteristics⁶. Inkelas et al. (2006) also report a positive association between living on campus and persistence.

Studies of residence-based living-learning programs themselves have also been conducted. These programs come in many shapes and sizes but like those recently developed at VCU typically include a shared interest or major or curriculum. Inkelas et al. (2003, 2006) report that most studies of living-learning environments have found a positive association with persistence, while lamenting the fact most are single institution studies. Using a survey administered to students, the authors (2003) compare three types of programs (living-learning, academic honors, curriculum based) with a control group. The results show that living-learning programs generally have a positive impact on first year student perceptions. Spanierman et al.

⁵ Many self-ratings were used, but only “emotional health” and “drive to achieve” were statistically significant

⁶ Specifically, measures of institution type (public vs. private etc.), size, and cost were included.

(2013) provide evidence of the positive impact living-learning programs have upon students' sense of community and belonging. In a single institution study, Pascarella and Terenzini (1980b) find persistence is greater for those in a living-learning environment, but that much of this effect is attributable to the influence the living-learning environment has upon faculty and peer relationships.

Soldner et al. (2012) use data from a multi-institution survey of living-learning programs to assess the relation between such programs and persistence in STEM majors, finding that after controlling for such variables as frequency of contact with peers and faculty, living-learning programs have no direct effect, but that their effect indirectly via faculty and peer interactions is significant. Purdie and Rosser (2011) find that living on a themed floor did not improve freshmen grades or retention but participation in a freshman interest group did. Stassen (2003) finds increased retention rates and stronger academic performance for participants in three different types of living-learning programs: honors, academic themed halls, and talent advancement. Both of the above studies control for demographic characteristics and academic background, but not measures of academic or social integration. Stassen (2003) in an analysis of such integration found some evidence of better integration in a living-learning program involving a common writing class – the only living-learning program she found to be consistently associated with higher grades and persistence. Brower and Inkelas (2010) even report greater persistence amongst non-participating students sharing dorm space with living-learning program participants. Also notable given the focus of the ASPIRE program examined here on service, is the finding by Lockeman and Pelco (2013) that students who participated in service learning courses earned more credits, had a higher GPA, and a higher graduation rate than students who did not.

The vast majority of the research on living-learning programs focuses on freshmen and the transition to sophomore year. The concern and focus of the programs analyzed here is on subsequent transitions. Brower and Inkelas (2010) note the existence of programs focused on upperclassmen, but, in general, information on such programs is limited. Programs targeted at first-year students must address concerns in the first stages of student integration to the college experience – the ‘separation’ and ‘transition to college’ stages (Tinto 1988). The so-called third stage ‘incorporation to college’, however, likely remains important in subsequent years and depends strongly on feelings of connectivity such as could be offered by a living-learning program, particularly those that provide substantial peer and faculty interaction. Thus, while there are few studies of upperclass living-learning programs, theoretically such programs can influence persistence.

The studies reviewed above predominately rely on ANOVA and multivariate/logistic regression techniques to compare outcomes across participating and non-participating populations to arrive at their empirical conclusions. Discrete time hazard models constitute another methodology that has been implemented to examine enrollment patterns (DesJardins et al. 1999, 2002 and Ishitani 2003). Each of these methodologies assumes that any selection bias into the program is accounted for by the observable covariates incorporated in the model. A somewhat less restrictive approach, matching, can also be employed to estimate the relation between program participation and enrollment outcomes. We investigate all three approaches in the analysis that follows.

Data and Raw Differentials

Our analysis is based upon administrative data generally available from university records. Our experimental sample constitutes 404 persons entering the ASPIRE program between the fall of 2012 and the fall of 2015 – the first four cohorts of participants.⁷ Control samples of approximately 440 were drawn for comparison with each ASPIRE cohort. These samples constitute a random sample⁸ of the population of VCU students who reported gender, race/ethnicity, and age; who were not ASPIRE participants; who were between the ages of 18 and 21; who were enrolled full-time in the term ASPIRE was recruiting and enrolled in each of the subsequent two semesters; and who had no more than 36 non-AP/IB credits as of the start of the term when the ASPIRE cohort to which they are compared was recruited.⁹ This yields a control sample of 1,636 individuals.

For all these individuals we have information on gender, age, race/ethnicity, Virginia state residency, high school GPA, ACT or SAT test scores, AP/IB credits, transfer credits, credits earned at VCU prior to admission (typically earned through dual enrollment programs with local high schools), and (for the over 80% who filed the FAFSA form) some basic parental education data. Term-by-term data on enrollment, credits earned, grades, financial aid, tuition, honors program participation, dorm residency, and course withdrawal for a period of up to four

⁷ Excluded from the ASPIRE sample are individuals who failed to report race/ethnicity (1), who were under the age of 18 or over age 22 as of May 1st in the year they entered ASPIRE (9), who had more than 36 non-AP/IB credits in the term they were recruited (2), who enrolled at VCU more than two years before entering ASPIRE (2), and who graduated before completing the ASPIRE program (2). Thus, our sample includes more than 96% of ASPIRE participants.

⁸ Specifically, the control sample constitutes an 8.2% draw from the population.

⁹ Later excluded were students for whom credit hours and/or graduation were inconsistently reported (4), who enrolled at VCU more than two years before ASPIRE was recruiting (32), who were international students (43), and who graduated before they would have completed the ASPIRE program (29). Thus, approximately 94% of the individuals drawn for the control sample who met the initial criteria were included in the analysis sample.

years (eight semesters) following entry/potential entry to ASPIRE is available as is information on graduation. Sample means for the experimental and the control groups are reported in columns 1 and 2 of Table 1 respectively.

Table 1
Sample Statistics
As of term did/could have entered ASPIRE

<u>Variable</u>	(Experimental) ASPIRE <u>Sample</u>	(Control) VCU <u>Sample</u>
Female	0.787	0.587
Race/Ethnicity		
White, non-Hispanic	0.250	0.502
African American	0.473	0.188
Hispanic	0.092	0.080
Asian	0.119	0.169
Mixed Race	0.067	0.061
Cohort		
First	0.349	0.260
Second	0.171	0.248
Third	0.282	0.245
Fourth	0.198	0.247
SAT Score	1028.738	1089.597
ACT Dummy	0.045	0.048
No Test Dummy	0.025	0.009
Credits Earned Prior to Entry	38.492	46.298
Prior VCU GPA (a)	3.074	3.001
Dummy if prior VCU GPA = 0 (b)	0.035	0.000
Member of the Honors College	0.057	0.069
Withdrew from a Class (c)	0.126	0.147
Financial Aid (1000's 2015\$)	7.349	5.624
Tuition (1000's 2015\$)	6.342	6.345
Number of Observations	404	1,636

(a) Set equal to sample mean if prior VCU GPA = 0.

(b) Identifies those 14 students who enter VCU and ASPIRE simultaneously.

(c) Set equal to zero if were enrolled in 15+ credits in term withdrew from a class.

Raw term-by-term outcomes are reported in Table 2 for each semester following entry/potential entry to the ASPiRE program. The fraction not enrolled (and not graduated) is reported in the top half of the table; the fraction who have graduated is reported in the bottom half. Recall that the sample is restricted to individuals who did not graduate until participation in the ASPiRE program would have been complete and thus graduation is not possible prior to the third term following entry/potential entry to the program. Table 2 demonstrates that those in the experimental sample are less likely to be disengaged from school in every term as compared to those in the control sample. The fraction who have graduated is, however, generally substantially lower for program participants as compared with the control sample, only rising above the graduation rate of the control sample seven terms after entering the program. Seven terms later would be six years following matriculation, if those entering ASPiRE were all first term sophomores.

Table 2
Term-by-Term Outcomes

# of Terms Post-Entry /Potential Entry	Experimental <u>Sample</u>	Control <u>Sample</u>	Sample <u>Size</u>
<u>% Not Enrolled</u>			
1 Term later	4.21%	6.11%	2,040
2 Terms later	6.44%	10.64%	2,040
3 Terms later	9.88%	11.77%	1,556
4 Terms later	10.49%	13.07%	1,556
5 Terms later	13.33%	16.49%	1,041
6 Terms later	16.19%	18.17%	1,041
7 Terms later	16.31%	20.71%	566
8 Terms later	17.02%	21.18%	566
<u>% Graduated</u>			
3 Terms later	3.70%	22.00%	1,556
4 Terms later	9.57%	31.57%	1,556
5 Terms later	52.38%	61.61%	1,041

6 Terms later	64.76%	67.51%	1,041
7 Terms later	76.60%	72.47%	566
8 Terms later	78.01%	74.12%	566

These raw differences provide some evidence that outcomes are different between these samples, but do not take into account observable differences between the experimental and control populations. There are some substantial differences in the characteristics of these groups. The experimental sample has a much larger fraction of women (79% versus 59%) and African Americans (47% versus 19%). Those in the experimental sample also have lower test scores, have greater financial need, and consequently receive more aid. Most important from the perspective of evaluating the probability of graduating, those in the control sample have on average earned eight more credit hours than those in the experimental sample prior to the term they did/would have entered the ASPIRE program. While the average individual in the experimental sample has earned no more than 36 credits, the average individual in the control sample has earned 48 credits. This differential is driven by the relaxed selection criteria we employed for the control sample, a criteria intended to minimize the number of ASPIRE participants we would have to drop, but one that yields a credit heavy control group.

There are many ways one can model outcomes and control for covariates. As discussed above, we proceed to employ three different approaches, beginning with a standard logit model to examine the probability with which individuals are enrolled.

Single Outcome Logit

Table 3 presents results from a standard weighted logit analysis calculated with robust standard errors. Our primary focus is on enrollment in the fall following entry/potential entry to the ASPIRE program (one year later), and our preferred specification for this analysis is reported

in the first column. These results indicate that 89.4% were enrolled one year later. This number is quite high, but recall that virtually everyone in the sample was enrolled for three consecutive semesters. Results indicate that those participating in ASPIRE were significantly more likely to be enrolled (p-value 0.070). To identify the magnitude of this differential, we calculated the simulated marginal effect for the sample. This entails calculating the difference between the average predicted probability of enrollment assuming everyone participates in ASPIRE and the average predicted probability of enrollment assuming no one participates in ASPIRE. This simulated marginal effect of participating in ASPIRE is 3.25 percentage points (p-value 0.043), which given that only 10% of the sample is not enrolled is substantial.

Other significant factors include credits earned and VCU GPA prior to entry/potential entry to ASPIRE, both of which are positively related to enrollment one year later. Having accumulated more credits demonstrates a commitment to college. Those with higher college GPAs demonstrate their ability to complete college. Controlling for college GPA, prior academic performance, measured here by SAT score, is no longer significant (p-value 0.29). Higher tuition and financial need are negatively related to enrollment one year later. The higher the real price of college and the lower the income, the less likely is persistence. These results are economically reasonable.

Table 3
Logit Analysis of College Outcomes

<u>Variables</u>	<u>Enrolled</u> <u>1 Year Later</u>		<u>Enrolled</u> <u>1 Term Later</u>		<u>Enrolled</u> <u>3 Terms Later</u>		<u>Graduated</u>
Sample Probability	0.8945		0.9393		0.8827		0.7193
ASPiRE Sample	0.4823	*	0.4438		0.1000		0.2434
	(0.2659)		(0.3302)		(0.2758)		(0.2253)
	[0.0325]	**	[0.0155]		[0.0076]		[0.0350]
Female	0.0286		-0.4661	*	0.1546		0.5397
	(0.1854)		(0.2422)		(0.2099)		(0.1871)
African American	0.3988		-0.0564		0.3020		-0.0897
	(0.2471)		(0.3048)		(0.2623)		(0.2452)
Hispanic	0.6828	*	-0.1220		0.4812		0.0793
	(0.3808)		(0.4449)		(0.3772)		(0.3196)
Asian	0.4462		0.2881		0.0711		-0.1450
	(0.2764)		(0.3263)		(0.2997)		(0.2713)
Mixed Race	0.0373		-0.7892	**	0.1254		0.0526
	(0.3601)		(0.3951)		(0.4725)		(0.3789)
SAT Score	-0.0012		-0.0031	***	-0.0018	*	-0.0016
	(0.0008)		(0.0011)		(0.0009)		(0.0008)
Credits Earned Prior to Entry	0.0293	***	0.0187	**	0.0369	***	0.0442
	(0.0060)		(0.0073)		(0.0076)		(0.0066)
Prior VCU GPA	1.4447	***	1.7879	***	1.7768	***	1.2820
	(0.1821)		(0.2393)		(0.2199)		(0.1811)
Member of the Honors College	-0.4868		-0.7613		-0.4087	*	-0.7338
	(0.5648)		(0.6621)		(0.2395)		(0.2280)
Withdrew from a Class	-0.2387		-0.0094		-0.6607		-0.5162
	(0.2131)		(0.2807)		(0.7092)		(0.5579)
Tuition (1000's 2015\$)	-0.0687	*	-0.0151		-0.0811	**	0.0442
	(0.0365)		(0.0527)		(0.0404)		(0.0429)
In Need of Aid	-0.4579	**	-0.3981		-0.7866	***	-0.3082
	(0.2060)		(0.2693)		(0.2522)		(0.2446)
Pseudo R-Squared	0.1940		0.2168		0.2575		0.2263
Number of Observations	2040		2040		1556		1041

Standard errors are reported in parentheses. Simulated marginal effects are reported in brackets. Asterisks indicate statistical significance: *** 1%, ** 5%, * 10%.

Also included in the specification are cohort dummies, a dummy identifying those students whose prior VCU GPA was zero, a dummy variable identifying students who took the ACT, a dummy variable identifying students who reported no entrance exam, and a constant term.

Numerous alternative specifications (not reported here) were estimated to check the robustness of these results. Including age, parental education, and high school GPA as well as markers for transfer status, Virginia residency, and residence in a dorm prior to the entry date failed to provide a better fit (p-value 0.84), but yielded similar results regarding ASPIRE participation. ASPIRE participation was not found to have a significantly different effect across cohorts (p-value 0.26). Controlling for AP/IB credits and transfer credits separately from credits earned at VCU suggests that transfer credits are less predictive of enrollment, but one cannot reject the hypothesis that all count equally (p-value 0.78). Controlling for financial aid rather than need improves the fit slightly. Greater financial aid is positively associated with subsequent enrollment, particularly for students in need – though need continues to have a significant negative association. One cannot reject the hypothesis that grant aid, loan aid, and workstudy aid all have the same effect (p-value 0.50). Finally, the ASPIRE sample includes 14 students who enter ASPIRE and VCU simultaneously (and consequently have no VCU GPA prior to entering VCU) – whereas all those in the control sample had to have entered VCU a year earlier. Results are robust to excluding these individuals. The sign and marginal effect associated with the ASPIRE dummy remain similar across all specifications. Statistical significance in the five to ten percent range (using a 2-sided test) is typical.

Using a similar specification, we modeled the probability of being enrolled one and three terms later as well as the probability of having graduated. These results are reported in columns 2 through 4 of Table 3. Participation in ASPIRE is consistently associated with positive outcomes and found to have a substantial marginal effect, but that association is not significant at

the 10% level. Both participation in the Honors College and higher SAT scores are, in these cases, associated with worse outcomes that are often statistically significant. These findings could suggest that high performing students do not feel academically integrated at VCU and so are subsequently more likely to leave, perhaps transferring to a different institution.

Discrete Time Hazard Models

That ASPIRE participation has a consistent positive effect on progress toward a degree across all these outcome measures suggests that merging information across terms might yield more powerful evidence of the association between this living-learning program and college outcomes. One means of combining these outcomes is to estimate a hazard model. Hazard specifications model the movement from one discrete state to another. In the enrollment context, there are three possible states: non-enrollment, enrollment, and graduation. Graduation is an absorbing state, a state from which one does not reemerge. As enrollment is measured in discrete rather than continuous time periods (for example, 1 semester versus 3.6 weeks), a discrete time hazard model can be estimated in which enrollment status in semester $t+1$ is modeled conditional upon enrollment status in semester t . Practically, discrete time hazard models can be estimated using a multinomial logit specification. Thus, one can model the probability that an individual who was enrolled (or not) in term t is not enrolled, enrolled, or graduated in term $t+1$.

A complication introduced by these models is that outcomes are not stationary over time. As the theoretical literature suggests, students may acquire new information after they matriculate that causes them to update their priors regarding the costs and benefits associated with persistence towards a degree. In addition, students must typically obtain a certain number

of credits in order to graduate. To accommodate these complications, discrete time hazard models often include not just individual-specific, time-invariant characteristics such as demographic, household, and academic background information known at the time of matriculation, but also time-varying information such as college grades, number of credits earned, number of courses withdrawn from, number of terms not enrolled, and even external labor market conditions that could influence the opportunity cost of continued enrollment.

The focus on program evaluation here substantially limits the flexibility of the discrete time hazard approach for two reasons. First, as our selection criteria is such that most individuals have enrolled for at least three consecutive semesters prior to entering the sample and the probability of not enrolling typically falls substantially after freshmen year (Pascarella and Terenzini 1980a), non-enrollment is sufficiently uncommon to make estimation conditional upon non-enrollment unfeasible. Hence, we focus solely on modeling enrollment status following a term of enrollment. Second, as the purpose of this analysis is to examine how participation in ASPiRE influences individuals' college experience and the prior literature suggests participation in a living-learning program can affect persistent and grades, it is not reasonable to control for enrollment patterns or even grades post-entry or potential entry to the program.¹⁰ This concern leaves us with few options. We chose to include five time-varying covariates: a dummy to identify fall terms, a measure of the number of semesters that passed between matriculation to VCU and entry/potential entry to ASPiRE, a quadratic in the number of semesters that have passed since entry/potential entry to ASPiRE, and a dummy variable identifying the term four years following initial matriculation. The term dummy is included because individuals are more likely to leave an institution between the spring and fall semesters and generally more likely to

¹⁰ We find no evidence based on regression analysis that grades post-entry or potential entry to ASPiRE are significantly different in the experimental sample, but choose to err on the side of caution.

graduate in the spring semester (Stratton 2017). The measures of time are intended to reflect the need to complete a certain number of credits in order to graduate. The dummy variable identifying the four-year mark is incorporated to capture a spike in graduations that occurs around that time. As these variables are not measures of terms enrolled, but simply mark the passage of time, they will only imperfectly capture credits earned, but are exogenous to participation in the ASPiRE program. Note further that because those in the fourth cohort are only observed for one year following entry/potential entry to ASPiRE and hence cannot have graduated, we exclude this cohort from the hazard analysis.¹¹

Results from this analysis are reported in Table 4. The first column presents estimates for the non-enrollment outcome. The second column presents estimates for the terminal outcome, graduation. Persistence is the base case. Tests indicated that as was the case for the logistic model, race, cohort, and test scores were not significantly associated with outcomes, so these variables were dropped. The effect of prior credits differed significantly by source and so AP/IB credits, non-VCU credits, and prior VCU credits were entered separately.

The top rows show the actual sample probabilities and the sample outcomes predicted by this discrete hazard specification. These probabilities are very close (within four percent) in the case of non-enrollment and enrollment (identified as one less the probability of not being enrolled and the probability of graduating). The model does, however, substantially overpredict the probability of graduating – at 14% versus 12% (an almost 20 percent differential).

The parameter estimates reported in the subsequent rows indicate the association between each variable and non-enrollment (or graduation) relative to remaining enrolled. The coefficients to ASPiRE indicate that participating in ASPiRE is associated with a reduced

¹¹ The measure of real tuition also varies over time as it does in the logit models. The indicator of need was fixed at its value in the semester before entry/potential entry to ASPiRE.

probability of transitioning to non-enrollment and a reduced probability of graduating. As the sum of all probabilities must equal one, this means that ASPIRE participants have a higher probability of being enrolled as compared to non-participants. These effects are not, however statistically significant (p-value 0.42). Thus, this discrete hazard model fails to identify a clear link between participation in the ASPIRE program and progress towards a degree.

Table 4
Discrete Time Hazard Model of Transitions from Enrollment

<u>Variables</u>	<u>Non-Enrollment</u>	<u>Graduation</u>	
Actual Sample Probability	0.0558	0.1198	
Predicted Sample Probability	0.0561	0.1425	
ASPIRE Sample	-0.0929 (0.1644) [-0.0035]	-0.1660 (0.1379) [-0.0109]	
Time-Varying Covariates:			
Fall Semester	0.1829 (0.1682)	-0.7225 (0.1724)	***
Number of Semesters Pre-Entry	0.3692 (0.1583)	-0.1126 (0.1584)	**
Number of Semesters Post-Entry	-0.3738 (0.2002)	3.9106 (0.3129)	*
Number of Semesters Post-Entry Squared	0.0584 (0.0199)	-0.2530 (0.0289)	***
Year 4	0.2470 (0.2721)	1.5123 (0.1663)	***
Tuition (1000's 2015\$)	0.0637 (0.0295)	0.0522 (0.0225)	**
Non-Time-Varying Covariates:			
Female	-0.0874 (0.1294)	0.4102 (0.1143)	***
AP/IB Credits	0.0048	0.0272	***

	(0.0098)		(0.0069)	
Other Initial Credits	0.0032		0.0846	***
	(0.0099)		(0.0092)	
Initial Credits from VCU	-0.0253	**	0.0901	***
	(0.0117)		(0.0111)	
Prior VCU GPA	-1.5289	***	0.2117	
	(0.1555)		(0.1431)	
Dummy if prior VCU GPA = 0	1.1231	*	-0.8140	
	(0.6679)		(0.8396)	
Member of the Honors College	0.2462		-0.6536	***
	(0.5023)		(0.2266)	
Withdrew from a Class	0.3180	**	-0.1841	
	(0.1549)		(0.1653)	
In Need of Aid	0.3493	**	-0.1711	
	(0.1723)		(0.1332)	
Constant	1.0344		-19.0489	***
	(0.6399)		(1.0292)	
Pseudo R-Squared		0.3569		
Number of Observations		6,552		

Standard errors are reported in parentheses.

Simulated marginal effects are reported in brackets.

Asterisks indicate statistical significance: *** 1%, ** 5%, * 10%.

The effects of the other covariates are about as expected. Looking at the time-varying covariates, we find that students are less likely to transition to graduation in the fall term and more likely to do so if they matriculated eight semesters (four years) ago. While the modal student entered VCU two semesters before potential entry to ASPIRE, those who first enrolled even earlier are more likely to transition to non-enrollment, else the more time has passed the greater the probability of graduating and the lower the probability of not enrolling, subject to diminishing returns in both cases. Higher real tuition increases both the probability of not enrolling and the probability of graduating.

The time-invariant characteristics most closely associated with a transition from enrolled to not enrolled are having withdrawn from a class, having financial need, having a low college GPA, and having fewer initial credits from VCU. Initial credits earned toward the degree are strongly correlated with graduation, though AP/IB credits are less predictive than other college credits. Having been in the Honors College is negatively associated with graduation, a pattern similar to that observed in the single outcome logit analysis. Finally, women seem more successful, all else equal, in transitioning to graduation than do men.

Matching Models

To interpret the logistic regression results or hazard results reported above as causal, one must make a number of assumptions. One sufficient (but not necessary) assumption is that the regression model is correctly specified and the treatment has a linear impact on outcomes (Angrist 2010). This assumption implies that the model includes all the variables (X) related to selection into the experimental population, that there is no omitted variable bias whether from observable or unobservable characteristics. It also implies that outcomes are a linear function of the covariates X .¹²

Matching is an alternative approach that relaxes the need to assume linearity. This approach entails matching individuals from each sample (experimental and control) with individuals from the other sample who have the same (or similar) characteristics. Matching is more easily conducted using dummy variables. Many of the covariates employed here are simple indicator variables, but not all. Credits earned and GPA are both continuous measures

¹² Technically, outcomes are mean independent of participation conditional upon the X and the conditional mean function is linear. In the case of logistic regression, the assumption is rather that the conditional cumulative density function is a linear function of the X .

and highly significantly associated with progress toward a degree. Consequently, we use both propensity score and nearest neighbor matching. Nearest neighbor matching likely works best with dummy variables, propensity score matching with continuous variables. In some nearest neighbor matching cases, we require exact matching by gender, two of three racial groups, and the dummy variable identifying need (some of the characteristics that differ most between the experimental and control samples).

Employing these techniques, we estimate both the Average Treatment Effect (ATE) and the Average Treatment Effect on the Treated (ATET). The ATE is in theory the expected effect of participation in ASPiRE on a randomly drawn person from the population (where the population is restricted based on the criteria used to pull the control sample), whereas the ATET is the mean effect for those who do participate in ASPiRE. The former is calculated by looking at the average difference in the outcome of interest between the matched samples using all the observations. The latter is calculated by looking at the average difference in the outcome of interest between only the experimental group and its matched sample.

Table 5 presents the results. The results labeled as ‘full sample’ incorporate controls for all the covariates included in the logistic models, except the dummy variable identifying those who enter VCU and ASPiRE simultaneously (for whom prior VCU GPA is zero). These 14 individuals are by definition in the experimental sample, meaning this characteristic is collinear with the sample. Estimates excluding these individuals are reported in the ‘limited sample’ results. Column 1 displays results regarding enrollment one year following entry or potential entry to ASPiRE. Columns 2 and 3 display the results regarding enrollment one and three terms

later. Column 4 displays the results regarding graduation, for the first and second cohorts.¹³

These results represent marginal effects.

Table 5
Matching Analysis of College Outcomes

	Enrolled		Enrolled		Enrolled		Graduated (a)	
	<u>1 Year Later</u>		<u>1 Term Later</u>		<u>3 Terms Later</u>			
Sample Probability	0.8945		0.9393		0.8827		0.7193	
<u>Average Treatment Effect</u>								
<u>Full Sample</u>								
Propensity Score	0.0691	***	0.0083		0.0263		0.0576	*
	(0.0153)		(0.0180)		(0.0194)		(0.0330)	
Nearest Neighbor	0.0446	***	0.0152		0.0244		0.0403	
	(0.0160)		(0.0128)		(0.0249)		(0.0405)	
<u>Limited Sample</u>								
Propensity Score	0.0499	***	0.0089		0.0363		0.0870	**
	(0.0148)		(0.0216)		(0.0234)		(0.0370)	(b)
Nearest Neighbor	0.0494	***	0.0291	***	0.0317		0.0709	*
	(0.0152)		(0.0092)		(0.0232)		(0.0366)	
Nearest Neighbor	0.0528	**	0.0202		0.0084			
with Exact Matching	(0.0215)		(0.0200)		(0.0330)			
<u>Average Treatment Effect on the Treated</u>								
<u>Full Sample</u>								
Propensity Score	0.0545	**	0.0099		0.0123		0.0143	
	(0.0243)		(0.0166)		(0.0313)		(0.0440)	(b)
Nearest Neighbor	0.0074		-0.0074		-0.0185		0.0190	
	(0.0199)		(0.0141)		(0.0239)		(0.0429)	
<u>Limited Sample</u>								
Propensity Score	0.0205		0.0205		-0.0288		0.0493	
	(0.0217)		(0.0181)		(0.0218)		(0.0467)	

¹³ Exact matching for the graduation outcome would have to take cohort into account to control for the time frame, but was not feasible given the reduced sample size.

Nearest Neighbor	0.0128 (0.0201)	0.0000 (0.0136)	-0.0096 (0.0241)	0.0302 (0.0445)
Nearest Neighbor with Exact Matching	0.0256 (0.0214)	0.0103 (0.0148)	-0.0064 (0.0251)	

Standard errors are reported in parentheses.

Asterisks indicate statistical significance: *** 1%, ** 5%, * 10%.

Matching is conducted based on all the covariates included in the logistic analysis, except the dummy identifying those who simultaneously enter VCU and ASPIRE.

The limited sample excludes those who simultaneously enter VCU and ASPIRE.

Exact matching on dummies for gender, for in need of aid, for African American, and Asian race.

(a) Analysis is restricted to those in the first and second cohorts.

(b) Those who took no entrance exam are excluded as this variable perfectly predicts non-graduation.

The ATE results are a bit larger in magnitude and more statistically significant than the logistic results. There is robust evidence of a significant positive association between participation in ASPIRE and enrollment one year following entry/potential entry to the program. The magnitude of the effect is large (between 4.5 and 6.9 percentage points depending upon the matching technique and sample) and generally significant at the 1% level. The ATE results regarding graduation are also substantial (between 4.0 and 8.7 percentage points) and generally statistically significant. As was the case in the logit analysis, the point estimates regarding enrollment one and three terms following entry/potential entry while positive, are rarely statistically significant.

The ATET results are less positive. These are smaller in magnitude (even occasionally negative) and only in one case statistically significant. These results suggest that participation in ASPIRE had a smaller impact on those who did in fact participate than it would have had on those in the control sample had they participated.

Discussion and Conclusion

The goal of this analysis has been to evaluate the impact of participation in ASPIRE, a living-learning program developed for upperclassmen at VCU, on progress toward a degree. Using a control sample of students with similar pre-participation enrollment characteristics, we assess the association between participation and persistence using single outcome logit models, more complex hazard specifications, and matched pairs. Technically, none of these approaches assures us of capturing the causal effect of participation in ASPIRE on progress toward a degree, as those who choose to participate may differ in unobservable ways that are not adequately controlled for even with the rich set of observable characteristics available in these data.¹⁴

What we do observe is some evidence that those participating in ASPIRE are more likely to persist than those not participating. Logit analysis indicates a positive association with enrollment in each of the subsequent three terms as well as a positive association with graduation. This relation is, however, only statistically significant for the semester one year following entry/potential entry to the living-learning program. At that point, the simulated marginal effect suggests participants are 3.25 percentage points more likely to be enrolled than non-participants – a substantial differential given that only just over ten percent are not enrolled.

Attempts to obtain more robust positive associations by using a discrete time hazard model to examine transitions from enrollment to non-enrollment, enrollment, and graduation across multiple time periods were not successful. Point estimates suggest participants are less likely to transition to non-enrollment, but also potentially substantially less likely to graduate. These associations were not statistically significant and are based on a set of covariates that excludes many time-varying covariates that students might use to update their expectations and

¹⁴ Ideally applicants would be randomly assigned to treatment and control groups, but sample sizes do not make this feasible.

change their enrollment pattern. These variables were excluded because credits earned and GPA subsequent to program participation might themselves have been influenced by program participation. Thus, a discrete time hazard model may not be suitable for examining programmatic effects when so many important predictors of persistence are potentially endogenous.

Subsequent matching analysis finds a significant and substantial positive Average Treatment Effect on enrollment, particularly for the semester one year following entry/potential entry to the program and for graduation, but the Average Treatment Effect on the Treated while positive is generally not significant. These results suggest that the impact of participation on persistence for those who choose to participate may be driven in part by unobservables associated with persistence. Overall, the results are suggestive of a positive association, but not definitively so. Further follow-up to ensure participating students are on track to graduate in a timely fashion is already being pursued by the ASPiRE program administrators. The goal is, after all, not just completion of the program, but graduation from the university.

As additional data become available, we plan to expand this analysis to include the other upperclass living-learning programs at VCU. We hope also to use data from the National Student Clearinghouse to track those who drop out of VCU to determine if they have perhaps transferred to another institution. Such might explain the negative association observed in both the logit and discrete time hazard specifications between SAT scores and Honors program participation and graduation. Finally, it would be valuable to supplement this analysis with qualitative data assessing the degree to which those participating in these living-learning programs feel they have established closer ties to VCU and relate those feelings to their college outcomes.

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**PROGRAM-LEVEL PEER SELECTION IN BENCHMARKING COSTS OF
INSTRUCTION**

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Abstract

Institutions often select their peers based on the Carnegie Classifications and regions. For programs that are not aligned with their institutional classification, program-level peer comparison is key to accurately understanding performance. This study provides two statistical solutions to quickly identify program-level, within-discipline peers across institutions. In the present case study, we classified 174 English programs into four peer groups by using their program-level instructional characteristics reported in one or multiple academic years. The program-level peer selection method is an effective alternative especially for those potentially misaligned programs where benchmarking with the most appropriate peer group is the objective.

Introduction

Many institutions have their list(s) of peer institutions that are based upon consideration related to institutional roles, missions and scope (Brinkman & Teeter, 1987, Teeter and Brinkman, 2003). Institutional peers are often mentioned in strategic planning, academic program review, performance evaluation and benchmarking (Stanley & Honda, 2015). However, in practice an individual academic program or department often finds they are not comparable with the counterparts from peer institutions in terms of class sizes or the highest degree granted. In those cases, benchmarking programs with their institutional peers could distort their performance evaluation and misinform decision making regarding allocating faculty and financial resources for instructional activities. This paper will revisit the current peer selection methods and illustrate our approach to generate groups of peer programs in English major using program/department-level measures of instructional productivities.

Background and Literature Review

Given the wide use of benchmarking in higher education, peer selection methods have been extensively explored and well documented (Brinkman & Teeter, 1987; Teeter & Brinkman, 2003; Xu, 2008; Trainer, 2008; McLaughlin, Howard & McLaughlin, 2011; Carrigan, 2012, Boronic & Choksi, 2012; Stanley & Kilgore, 2014; D’Allegro & Zhou, 2013; D’Allegro, 2017; Chatman, 2017, etc). In the 1980s, Brinkman and Teeter (1987) summarized four types of predetermined peer institutions, by geography, history, jurisdictional factors and Carnegie Classifications¹, and now these widely recognized methods are still frequently used in practice.

Higher education decision makers sometimes prefer data-driven peers developed by an analytical approach especially when they would like highly granular benchmarking results. In addition to those predetermined classifications, more refined peer selection methods focus on applying quantitative methods to an expanded selection of key criteria. Since most institutions participate in a variety of national surveys every year, an institution can extract a dataset of those key metrics from a pre-selected sample of other participating institutions. A primary data source for this is the Integrated Postsecondary Education Data System (IPEDS) maintained by the United States Department of Education’s National Center for Educational Statistics (NCES). Additional data sources include national surveys focusing on specific areas like the American Association of University Professors (AAUP) and the National Association of College and University Business Officers (NACUBO) (Trainer, 2008) and formal data-sharing consortia consisting of inter-institutional data exchange and sharing.

Cluster analysis, factor analysis, discriminant analysis are those quantitative methods commonly involved in peer selection (Teeter and Brinkman, 2003, Xu, 2008; Trainer, 2008; McLaughlin, Howard & McLaughlin, 2011; D’Allegro & Zhou, 2013; Stanley & Honda, 2015;

D’Allegro, 2017). The advantages of utilizing these methods are obvious: you can select the variables or criteria of your interest and handle all the variables in one procedure to generate an objective peer group. The complexity among multiple variables within a dataset can also be taken care of, such as by hierarchical clustering and longitudinal variables. More often than not, before presenting the finalized peers to leadership, a panel of subject matter experts need to examine and revise the data-derived peer list by taking pragmatic factors into consideration.

Institutional peers are not equivalent to program peers. Despite so many choices of data sources and methods, most of the current peer groups are generated based on institutional-level characteristics, such as total enrollment, admission rates, general student-faculty ratio, etc (Stanley & Honda, 2015; Chatman, 2017). However, even the most similar institutional peers could have significantly different configuration of disciplines that comprise each institution. Some disciplines offered by one institution may not be offered by its institutional peers. Across institutions the programs from the same discipline are very likely to vary by department sizes, the highest degree offered, faculty numbers and other factors associated with instructional activities. Individual programs’ development may mismatch their affiliated institution. For example, a doctoral university may have programs that only grant bachelor degrees.

When it comes to benchmarking for academic program review and strategic planning, simply comparing institutional peers could be problematic given the issues described above. A common observation is the cost of delivering one unit of instruction (e.g. one credit hour or one class section) varies largely across departments. Chemical Engineering often has higher instructional expenditures than History, and Psychology often produces many more credit hours and class sections per faculty member than Music does. These observations have been supported by research evidence. A study conducted for NCES (Middaugh, Graham, & Shahid, 2003)

utilized the method of hierarchical linear modeling (HLM) to explore and describe the dispersion of instructional costs across institutions, and to identify those factors associated with the dispersion. The HLM results demonstrated that approximately 80% of the variance in cost is at the discipline level within an institution. In other words, programs in the same discipline from different institutions have more similar costs of instruction than different programs in the same institution. The assessment of faculty instructional productivity and costs needs to be performed at the program level.

Program-level benchmarking is gaining increasing attention whereas a major constraint is the limited source of program-level data from other institutions. A very recent article by Chatman (2017) emphasized the importance of program-level peer selection by stating, "...Psychology might select Psychology peers and Biology might select a different set of Biology peers..." To achieve the goal of benchmarking program peers, he constructed doppelganger universities with comparative statistics at campus, college, and department levels. One data source he used and highlighted in his paper is the National Study of Instructional Costs and Productivity, also known as the Delaware Cost Study (DCS). Administered by the Higher Education Consortia at the University of Delaware, the DCS surveys four-year institutions studying the unique question "who teaches what to whom and at what cost" every year. It is "the only national study of its kind in higher education that provides four-year institutions with a clear picture of faculty teaching loads, direct instructional costs, and other academic activities relative to cost" (Gagliardi & Wilkinson, 2017). Over the past 18 years (1998 -2015) the DCS data has covered 47.6% of the public and 14.9% of the private institutions of all US institutions recorded by IPEDS, as well as 57.3% degrees granted by all institutions and almost all representative

disciplines, defined by the Classification of Instructional Programs (CIP) at both 2-digit and 4-digit levels (Baxter, unpublished). Some benchmarking metrics provided by the DCS include:

- Undergraduate and graduate student credit hours taught per FTE faculty
- Total organized class sections taught per FTE faculty
- FTE students taught per FTE faculty
- Instruction-level metrics based on division and undergraduate/graduate level
- Direct instructional expenses per student credit hour (SCH) taught
- Direct instructional expense per FTE student taught
- Separately budgeted research and service expenditures per FTE tenured and tenure-track

faculty (Higher Education Consortia. 2016).

The above metrics are available in the national norms and institutional reports, reported at 2-digit, 4-digit and 6-digit CIP levels. When using the DCS results for assessing instructional productivity and costs, participating institutions often focus on two key performance indicators (KPI) : the direct instructional cost (\$) per SCH and the direct instructional cost (\$) per FTE student, for each of their programs.

Research Question and Design

Within a discipline, which institutions offer the academic programs that have comparable instructional productivities so that they are program-level peers for benchmarking the cost of instruction?

The present study adopts a data-driven approach to identify within-discipline program peers across institutions using multiple years of data from the DCS. Two statistical methods are involved: the Latent Class Analysis (LCA) and the Naïve Bayesian Classifier (NBC), both of which are well utilized to generate clusters in different research settings (Magidson & Vermunt, 2002; Ray, 2017; Zhang, 2004). To illustrate this two-step procedure, this paper used a dataset consisting of only English programs that reported to the DCS, with a focus on identifying peer groups out of all English programs participating in the 2015 DCS.

Methods

Data source

This study uses a single data source from the Delaware Cost Study database. Guided by established definitions, every year the participating institutions report their faculty information associated with their teaching loads in the past academic year and direct instructional expenditures for the according financial year to the DCS. Each institution is identified by its Federal Interagency Committee on Education (FICE) code, along with the study year they participated. Each institution reports a certain number of academic programs, identified by the 6-digit CIP codes provided by NCES. Therefore each case in the dataset is at the program level (6-digit CIP) and also can be aggregated at the general discipline (4-digit or 2-digit CIP) or the institutional level (FICE).

Institutions may report different sets of CIPs in different years. Within one year, an institution may report more than one program with the same CIP. In the current study, these programs with duplicated CIPs and Year information are merged so each CIP only appears once for each FICE each year. For illustrative purposes, this paper focuses on identifying peer

programs for a 4-digit CIP code 23.01. Typically named as English and/or Writing Studies, programs coded as this CIP are offered by most four-year institutions.

An inspection of the DCS data in multiple years reveals that a department/program's instructional productivity and costs may vary across semesters and academic years. Selecting peers based on a longitudinal dataset allows us to smooth the within-program variation over years. The current study uses a total of 344 English programs' data from 2012 to 2015, in which 71 programs consistently provide data each year and 174 ones (the 71 ones included) participated in 2015.

Peer Selection Measurements

Among a variety of metrics in the DCS database, we are particularly interested in the organized class sections, undergraduate instruction and the teaching loads by tenured/tenure-track faculty, all at the program level. Therefore six variables were derived from the original dataset and we consider them as important factors that contribute to an understanding of instructional costs at the program level. The variables considered in modeling peer group selection have been observed to have the following characteristics. First, programs awarding more degrees typically have higher instructional costs. Second, a graduate credit hour costs more than an undergraduate credit hour and producing a graduate degree costs more than an undergraduate degree. Third, tenured/tenure-track (T/TT) faculty members involve higher fixed costs when compared to faculty at other ranks. Fourth, research and public service expenditures indicate the research capacity of this program and should be positively related to its instructional activities and expenditures.

From the DCS longitudinal dataset, we selected and computed the following six variables for each study year from 2012 to 2015:

1. The highest degree granted (Bachelors, Masters, Doctorate or Professional Degree) (variable name: hideg_12, hideg_13, hideg_14, hideg_15)
2. The proportion of bachelor's degrees of the total degrees awarded (variable name: pb_12, pb_13, pb_14, pb_15).
3. The proportion of undergraduate class sections compared to the total class sections (variable name: uop_12, uop_13, uop_14, uop_15).
4. The proportion of class sections taught by T/TT faculty of the total class sections taught (variable name: top_12, top_13, top_14, top_15).
5. Research and public service expenditures in externally sponsored grant activity, converted into standard scores to reduce too large variation (variable name: stdrp_12, stdrp_13, stdrp_14, stdrp_15).
6. The total number of all degrees awarded by the program (variable name: degtot_12, degtot_13, degtot_14, degtot_15).

Analyses

This program-level peer selection took two steps. First, a series of latent class models identified a certain number of “longitudinal peer” groups out of 71 programs that have their instructional information available each academic year from 2012 to 2015. Second, a Naïve Bayesian algorithm classified the remaining 103 programs that do not have longitudinal data into the settled peer groups based on the probability of each program belonging to each group.

Step 1: Determine Longitudinal English Peers based on the 2012 - 2015 dataset

Among the 174 English programs that reported to the 2015 Study Year of the Delaware Cost Study, 71 programs also reported their data each year from 2012 to 2014. Annual participating programs contribute to a complete longitudinal dataset without missing data, serving as a good training set for guiding the remaining data points to their most likely cluster. Therefore the first step is to classify longitudinal peers using the 2012 to 2015 datasets of these 71 programs coded as CIP 23.01. A series of Latent Class Analyses (LCA) were performed using the statistical software Mplus 7 on this dataset. As a subset of Structural Equation Modeling (SEM), LCA constructs a model that assumes there is a hidden (latent) categorical variable defining a certain number of subgroups. Unlike the cluster analysis and discriminant analysis, it does not necessarily require any relationship among the dependent variables and no independent variable is involved. Model selection relies on a combined assessment using computed values of Bayesian information criterion (BIC), Akaike information criterion (AIC), simplicity and augmented by subject matter experts' opinions.

Step 2: Classify the remaining English programs in 2015 to the settled peer groups

The Naive Bayesian Classifier is a set of supervised learning algorithms based on applying Bayes' theorem with the "naive" assumption of independence between every pair of features. They require a small amount of training data to estimate the necessary parameters. In this case the longitudinal peer groups generated by Step 1 serves as the training data, from which the NBC, performed by the Python programming language, learned the probabilities of features in each peer group and the probability of each case belonging to each group. Then it predicted

the probabilities of each newly added case from the remaining 103 English programs belonging to each of the peer groups and determined the most likely peer group for them. Please note that these 2015 programs may also report data to earlier years but not in consecutive years from 2012 to 2015. For example, a program may participate in 2013 and 2015, the NBC can incorporate both years of data. At this point, all 174 English programs have been classified into their program-level peer groups.

Results

Program-level Peer Selection Results

In Step 1, the four-group LCA model was selected based on 1) low AIC and BIC values and 2) adequate group sizes in most of the groups generated. The AIC and BIC information of multiple models is listed in Table 1. In Figure 1, the “spaghetti” plot generated by the M-plus program displays individual programs’ total number of degrees over 4 years (dotted line), as well as the means of the four peer groups (colored lines). As seen in Figure 1 Group 4 has only one program itself, and Table 2 shows that the program had significantly higher research and public service expenditures than any other programs every year. See Table 2 for the group means of each variable used in the LCA for each year of the four years.

Table 1 Latent class model results of the longitudinal dataset (2012-2015)

	AIC	BIC
Model		
3-group	12022.229	12298.276
4-group*	11657.555	12008.27
5-group	11719.138	12144.522
6-group	11551.488	12051.54

Note: The model selected for next steps

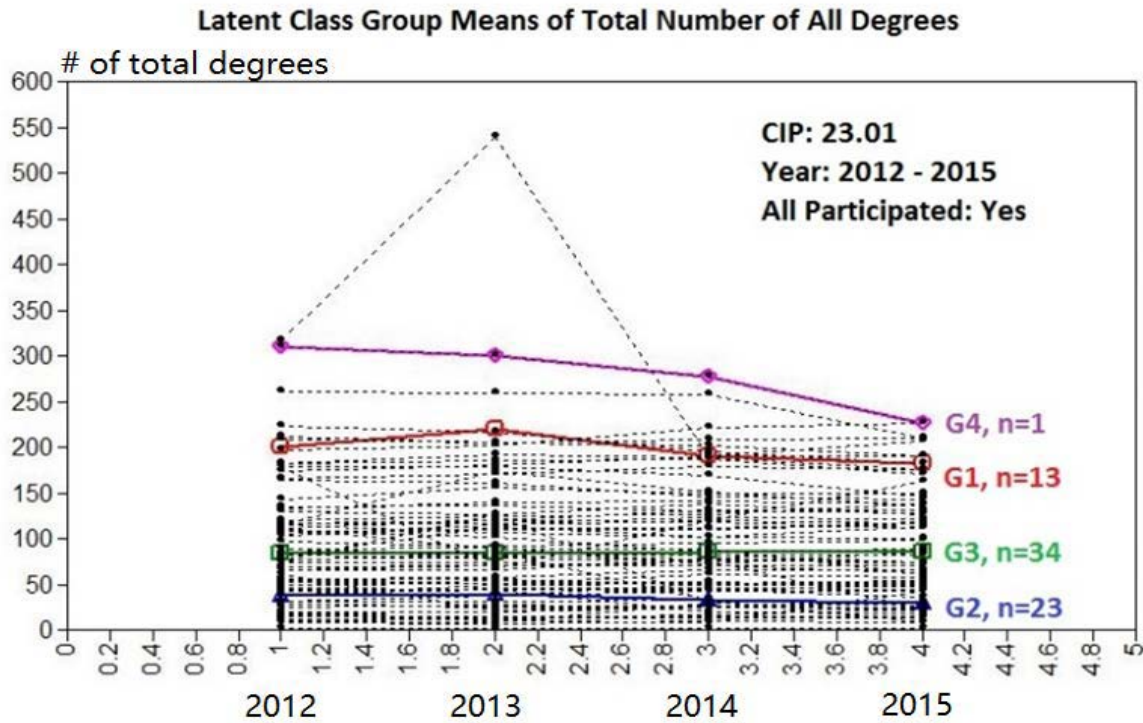


Figure 1 Total Degrees by Group in the Four-group LCA Model

(HD version available upon request)

Table 2 Group Means of Variables for Selecting Longitudinal English Program Peers (2012 – 2015)

	Group 1	Group 2	Group 3	Group 4
Study Year 2012 (N=71)				
Averaged Total Degrees	200	38	84	310
Standard Scores of Research and Public Service Costs	-.180	-.222	-.208	.643
Averaged % Organized Class Sections Taught by Tenured/Tenure-track Faculty (%)	34	55	35	18
Averaged % Bachelor Degrees in Total (%)	83	95	76	90

Averaged % Undergraduate class Sections in Total (%)	83	95	92	92
N of Bachelor as the Highest Degree	0	16	0	0
N of Master as the Highest Degree	5	7	22	0
N of Doctorate as the Highest Degree	8	0	12	1
N of Programs	13	23	34	1
Study Year 2013 (N=71)				
Averaged Total Degrees	219	38	84	300
Standard Scores of Research and Public Service Costs	-.180	-.222	-.210	.822
Averaged % Organized Class Sections Taught by Tenured/Tenure-track Faculty (%)	33	55	34	41
Averaged % Bachelor Degrees in Total (%)	83	95	76	89
Averaged % Undergraduate class Sections in Total (%)	84	95	92	78
N of Bachelor as the Highest Degree	0	16	0	0
N of Master as the Highest Degree	5	7	23	0
N of Doctorate as the Highest Degree	8	0	11	1
N of Programs	13	23	34	1
Study Year 2014 (N=71)				
Averaged Total Degrees	191	32	86	277
Standard Scores of Research and Public Service Costs	-.158	-.221	-.210	1.075
Averaged % Organized Class Sections Taught by Tenured/Tenure-track Faculty (%)	34	58	35	18
Averaged % Bachelor Degrees in Total (%)	83	95	77	88

Averaged % Undergraduate class Sections in Total (%)	84	96	93	91
N of Bachelor as the Highest Degree	0	16	0	0
N of Master as the Highest Degree	5	7	24	0
N of Doctorate as the Highest Degree	8	0	10	1
N of Programs	13	23	34	1
Study Year 2015 (N=71)				
Averaged Total Degrees	183	29	86	227
Standard Scores of Research and Public Service Costs	-.156	-.221	-.211	1.255
Averaged % Organized Class Sections Taught by Tenured/Tenure-track Faculty (%)	36	57	35	20
Averaged % Bachelor Degrees in Total (%)	83	95	77	85
Averaged % Undergraduate class Sections in Total (%)	86	96	92	91
N of Bachelor as the Highest Degree	0	16	1	0
N of Master as the Highest Degree	5	7	9	0
N of Doctorate as the Highest Degree	8	0	24	1
N of Programs	13	23	34	1

Based on the LCA results, the Naïve Bayesian Classifier assigned the 103 remaining English programs that participated in 2015 but not in all the previous three years to one of the above four groups. Figure 2 plotted additional lines that represent those newly added programs at Step 2. Table 3 reported the final peer groups' means of selecting variables in 2015.

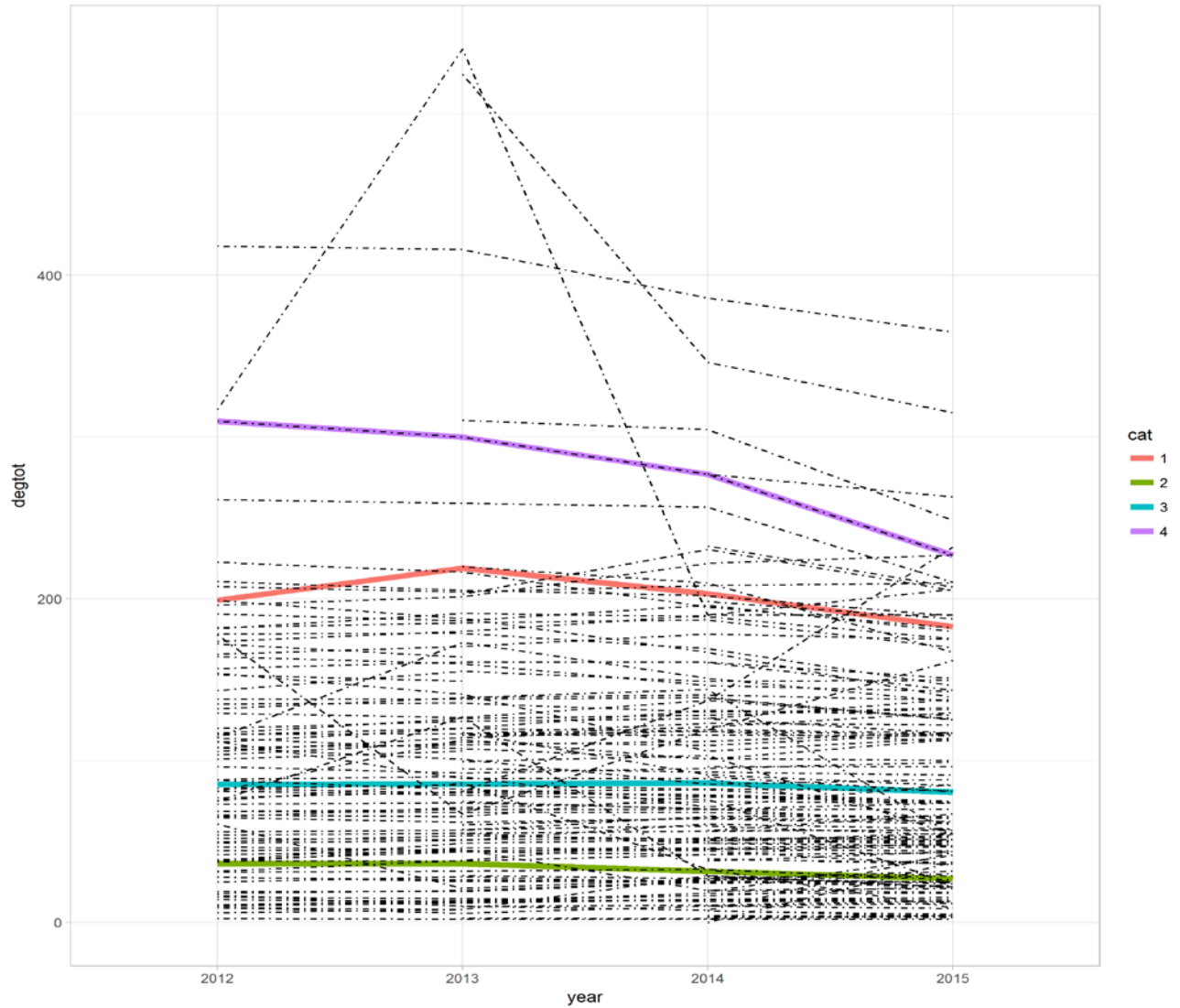


Figure 2 Total Degrees by Group in the NBC-based Results
(HD version available upon request)

Table 3 Group Means of Variables for Selecting 2015 English Program Peers

	Group 1	Group 2	Group 3	Group 4
Study Year 2015 (N=174)				
Averaged Total Degrees	183	27	81	227
Standard Scores of Costs in Research and Public Service (\$)	-.135	-.221	-.213	1.254

Averaged % Organized Class Sections Taught by Tenured/Tenure-track Faculty (%)	32	54	37	20
Averaged % Bachelor Degrees in Total (%)	80	94	73	85
Averaged % Undergraduate class Sections in Total (%)	78	95	92	91
N of Bachelor as the Highest Degree	0	47	1	0
N of Master as the Highest Degree	10	20	48	0
N of Doctorate as the Highest Degree	22	0	24	1
N of Programs	32	67	74*	1

Note: In Group 3 one program has no degree granted.

Validation: Program Peers versus Carnegie Peers

How different are these data-driven, program-level peers from the traditional institutional peers? What evidence was obtained to support the hypothesis that program-level peers are better than Carnegie-based peers to meet our needs? We first looked into the institutional Carnegie Classifications of the English programs in each peer group generated by our approach and summarized the results in Table 4. In addition, we simply compared the group means of those commonly used KPIs of evaluating instructional productivity and costs from our peer groups and Carnegie-based peer groups (English programs from institutions in the same Carnegie group). Results of the comparison are summarized in Table 5.

Table 4 Institutions' Carnegie Classification in Peer Groups of 2015 English Programs

	Group 1	Group 2	Group 3	Group 4
Study Year 2015 (N=174)				
n	32	67	74	1
R1* and R2 (Research Institutions**)	26	3	38	1
R3 (Doctoral Institutions)	3	6	9	0
M1, M2 and M3 (Comprehensive Institutions)	3	46	26	0
B1 and B2 (Baccalaureate Institutions)	0	12	1	0

Note1:* Carnegie Classification 2015 edition

Note2:** Delaware Cost Study National Norms Classification

Table 5 Selected KPIs of Instructional Productivity and Costs: 2015 Program-level Peers versus 2015 Carnegie-based Peers (CIP =23.01, N=174)

Program-level Peers	Group 1	Group 2	Group 3	Group 4
n	31*	66*	70*	1
Dir. Cost/SCH1	242	203	199	322
Dir. Cost/FTE Std.2	6913	5963	5814	9200
Psnl as % of Dir. Cost3	96	98	97	96
Res. Exp./FTE TT Fac4	1453	96	454	114400
Serv. Exp./FTE TT Fac5	1395	19	172	0
Res. + Serv./ FTE TT Fac6	2872	159	873	114400
Carnegie-based Peers	Research	Doctoral	Comprehensive	Baccalaureate
n	62	17	76	12
Dir. Cost/SCH	217	191	212	187
Dir. Cost/FTE Std.	6246	5607	6272	5624
Psnl as % of Dir. Cost	97	98	98	98

Res. Exp./FTE TT Fac	1980	244	133	0
Serv. Exp./FTE TT Fac	939	322	7	0
Res. + Serv./ FTE TT Fac	2990	1332	183	206

Note:

1. Direct Instructional Expenditures per Student Credit Hour
2. Direct Instructional Expenditures per FTE student
3. The percentage of Personnel Expenditures (Salary and Benefits)
4. Research expenditures per Tenured/Tenure-track Faculty
5. Public service expenditures per Tenured/Tenure-track Faculty
6. Research & public expenditures per Tenured/Tenure-track Faculty

* Six institutions did not provide costs data so they were excluded from their groups. They were involved in the peer selection based on their instructional productivity data

Discussion

The current study used two statistical methods to quickly identify program-level peer groups based on their program-level instructional information. Program-level peer selection is particularly important when benchmarking practices aim at informing the department/program-level decision making and strategic planning. Within an institution, instructional activities vary largely across departments in different disciplines. Comparing the teaching loads and costs between Music and Chemistry is inappropriate. One standard, institution-level classification system cannot be applied to all programs. A corollary is that institutional peers are very unlikely to be comparable at each department/program level. Comparing Music programs from two peer institutions might not be appropriate either, if one offers undergraduate courses only and the other one offers both graduate and undergraduate courses.

The four peer groups identified by the LCA and Bayesian cluster models demonstrate distinct patterns in terms of their instructional productivity and costs at the program level. As shown in Table 3, Group 1 of the 2015 peer programs produced significantly more degrees than Group 2 and 3, with lower percentages of undergraduate degrees and class sections. Moreover, Group 1 consists of 10 Masters' programs and 22 Doctoral programs, indicating the peers are larger programs with a concentration on advanced degrees. Group 2 produced the least numbers of degrees however had the highest percentage of undergraduate class sections taught by T/TT faculty, indicating peers in this group might be smaller and more undergraduates-focused programs. This assumption can be further confirmed by that Group 2 has 47 Bachelors' programs and 20 Masters programs. Group 3 has the most peer programs that offer a very high percentage of undergraduate teaching activities as well as a small portion of advanced degrees. Due to a significantly high expenditures in research and public services, Group 4 has only 1 institution which had similar activities to Group 1 peers. Group 1 also has higher research expenditures than Group 2 and 3. Comparing across Groups reveals that English programs from an adequate sample of institutions cannot be classified by a single dimension in terms of their instructional activities.

The comparison between the program-level peers generated in this study and Carnegie-based peers revealed two interesting facts. First, Carnegie Classification is an effective indicator of program-level instructional expenditures and productivities. Institutions in the same Carnegie class are also often grouped together in our approach. For example (see Table 4), Group 1 consists of most R1 and R2 institutions that offer large English programs offering advanced degrees. Group 2 consists of Baccalaureate and smaller Master institutions. Group 3 consists of mixed Carnegie Classes from Research and Master ranks, whereas Group 3 peers have smaller

programs than the averages of their Carnegie peers, with less research costs and more focusing on undergraduate teaching. Moreover, Table 5 demonstrate that the R1-and-R2-dominated peer groups, namely Group 1 and Group 4 in which that only English program is from a R1 institution, has the highest average cost per student credit hour and the highest cost per FTE student and the most research and public service expenditures. Group 2 has the lowest research and service expenditures and the highest portion of Baccalaureate and small Master institutions. Considering English is one of the most commonly seen program in most four-year institutions, we can suggest that a majority of English programs do not deviate from with their institutions' Carnegie Classifications. Benchmarking those English programs with their Carnegie peers is relatively legitimate.

Second, the “minority” programs exist in each of the program-level peer groups generated in this study except Group 4. Although most group members are R1 or R2 institutions in Group 2, there are still three R3 institutions and 3 Master-level ones. Those English program are classified into this group, indicating they are more similar to those from Research institutions than those from the same Carnegie class, in terms of program-level instructional productivity and research costs. This is the case when an individual academic program mismatches its institution's Carnegie Classification. For example, benchmarking a Group 1 program from a Baccalaureate institution with its Carnegie peers probably leads to a biased conclusion that this program has too high cost of instruction.

Summary of Group Features:

- Group 1: Larger programs offering advanced degrees and a large total number of all kinds of degrees, considerably lower % UG class sections taught, considerably lower %

class sections taught by TT faculty. Many have research funding. The most expensive to teach each SCH and each FTE student.

- Group 2: the smallest-sized programs, primarily offering bachelor degrees and teaching UG classes, the highest % class sections taught by TT faculty. Not research-oriented.
- Group 3: A majority of Master-level programs. Higher % class sections taught by TT faculty than Group 1 but lower than Group 2. Most offer advanced degrees but less research-oriented than those in Group 1.
- Group 4: A program with significantly higher research funding than any other programs as well as a very large number of total degree produced.

Methodologically, while the LCA and the NBC methods are originated from different theoretical backgrounds, neither of them has strict assumptions among variables. In other words, they are relatively flexible and can handle either categorical or continuous variables as peer selecting criteria. The next step in our research is to modify the current LCA model by including more variables from broader data sources.

Conclusion

In conclusion, program-level peer selection is necessary for benchmarking cost of instruction as within-discipline and within-institution programs have varying characteristics associated with instructional activities. The statistical solutions introduced in this paper can help identifying program peers quickly. Individual programs that “mismatch” their institution’s Carnegie Classification are particularly encouraged to consider program-level peer selection. Future work is expected to incorporate public data sources and a wider selection of peer criteria.

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