# Using NSSE to Understand Student Success:
# A Multi-Year Analysis

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**Abstract – This research focuses on using NSSE (National Survey of Student Engagement) responses to predict student academic success. The analysis is based on 16,630 Indiana University - Bloomington first-year beginner students and seniors who completed the NSSE survey administered from 2006-2012. Logistic regression and linear regression on student background and pre-college information, financial aid, previous college academic performance, NSSE Benchmarks and individual NSSE items were conducted to predict academic success defined as: 1) first-year students' fall-to-fall retention and end-of-first-year cumulative GPA, 2) seniors number of terms taken to degree completion and 4-year graduation. Results show that certain student characteristics and earlier achievement are indicative of college success with higher levels of student engagement marginally contributing to the models. Analyses also highlighted elements of engagement that go counter to their expected effect on retention and performance.**

## Introduction

Student academic success and learning outcomes are of paramount importance to university educational goals. Institutional effectiveness in this context is often assessed in terms of retention rates, academic achievement, and timely graduation. According to Aud and colleagues (2013), among full-time, first-time students who enrolled in four-year baccalaureate degree-granting institutions, about 79 percent returned the following fall. In terms of graduation rates, approximately 57% of students who began their college career in fall 2005 at a four-year public institution with the intention of receiving a bachelor's degree actually received that degree in a six-year time frame. Academic success, in terms of retention and graduation, translates into better job and earning opportunities after graduation; i.e. those with a bachelor degree or higher have lower unemployment rates and higher average income (Aud et al., 2013).

College admission criteria include a variety of student pre-college characteristics that closely relate to student performance, retention and timely graduation. The Condition of Education reports have consistently shown that more selective institutions have higher rates of student retention and graduation (Aud et al., 2013, p.184 -185). Standard test scores (SAT or ACT) have been shown to be relevant predictors of college performance (DeBerard, Spielmans, & Julka, 2004). Students who entered college with higher test scores are more likely to persist in school (Alarcon & Edwards, 2013; Crede' & Niehorster, 2012), achieve higher Grade Point Averages, (Kuh, Cruce, Shoup, Kinzie, & Gonyea, 2008; Campbell and Cabrera, 2011; Crede' & Niehorster, 2012), particularly first-year students (Carini, Kuh, & Klein, 2006) and, to a certain degree, are more likely to progress to graduation (Blose, 1999; Capaldi, Lomardi, & Yellen, 2006). High school GPA is also positively related to retention and completion (Haemmerlie & Montgomery, 2012; Hicks & Lerer, 2003; DeBerard et al. 2004; Sawyer, 2013; ) as well

as academic performance in college (Alarcon & Edwards, 2013; Crede' & Niehorster, 2012; Sewyer, 2013; Campbell & Cabrera, 2011). In a study of 3,301 first-year university students, high school GPA was found to be the only independent significant predictor of university GPA for both sexes (Olani, 2009).

In addition to metrics of academic preparation, previous studies have shown that a few student characteristics may be related to student persistence and academic performance. Student gender relates to achievement in higher education in different ways, thus it is not consistent in predicting academic performance (DeBerard, & Julka, 2004). For example, various studies showed no difference in trajectories of persistence between males and females (Fike & Fike, 2008; Gilardi & Guglielmetti, 2011; Larose et al., 2008). In contrast, Alarcon and Edwards (2013, p.135) found gender to be a significant predictor of retention, with females more likely to leave the university than males. Regarding degree completion, Aud et al. (2013) reported a shift in baccalaureate degree attainment by gender, with a current female rate 7 points higher than the male rate, compared to the equal attainment rate in 1990. Gender differences have also been shown in college GPAs, with females achieving a higher final degree GPA (Sheard, 2009) which could be due to their higher levels of commitment, hardiness and attitude. There also appear to be gender differences in performance by academic discipline (De Berard et al., 2004).

Variation in performance is also displayed among minority students, reflecting a complexity that researches are still struggling to grasp. Studies have shown lower levels of completion rates for minority students compared to non-minority students (Kuh et al., 2008). Others have shown that being African American is associated with lower rates of school persistence (Haemmerlie & Montgomery, 2012), possibly because of perceived lack of institutional support (Berger & Milem, 1999). Other works have not found differences between Whites, African American and Latino/a in attrition when controlling for academic preparation (Robbins et al., 2004). Minority groups benefit from the same activities but in different ways than Whites. For example, engagement in educational purposeful activities was related to a much higher increase in first-year GPA for Hispanic students than White students; in the same fashion, this engagement was also associated with higher second-year retention for African American students compared to their White counterparts (Kuh et al., 2008).

Research has shown that a few indicators of financial status affect school retention. For example, family income plays a role in the development of positive peer relationships and subsequent institutional commitment and academic performance (Berger & Milem, 1999, Arum & Roksa, 2011), affecting retention and graduation. Financial aid also affects student retention and timely graduation. The provision of need- and merit-based aid significantly increases retention among students with financial need and affects a student's decision to drop out. Financial aid may reduce the probability of dropping out of college both directly by reducing the need to work, and indirectly by enhancing college performance (Singell, 2004, Fike et al., 2004).

In the midst of studies on student success, student engagement has become a focus for institutional researchers. A large body of research on student learning has concluded that students who are actively involved in academic and co-curricular activities gain more from their college experience than those who are less involved (Berger & Milem, 1999; Svanum & Bigatti, 2009). Studies have shown that above and beyond pre-college factors, student engagement provides incremental effects on student learning outcomes and school persistence. For example, in a study which used observed academic engagement in a particular course, the authors found that highly engaged students were not only more likely to attain a degree, but also earned it faster. In addition, engagement forecasted final cumulative degree GPA beyond what was accounted for by pre-college and previous college academic performance (Svanum & Bigatti, 2009).

Among theoretical models that explain education persistence, the integrated model (Tinto, 1993) has gained particular research evidence. Studies have shown that both behavioral involvement and perceptions of collegial experiences are predictive of student retention. Behaviors and perception interact with each other to influence the trajectories of student engagement and success. Later researchers advanced Tinto's model. Kuh et al. (1991) suggested that student involvement led to greater integration in the college social and academic systems and promoted institutional commitment. Astin (1996) furthered

the previous work based on Tinto's model by indicating that involvements with academics, faculty, and student peers were the most potent forms of positive involvement, while noninvolvement with campus life had a powerful negative impact on student outcomes. Berger & Milem further argued that student involvement, integration, and student outcomes were different components in a cyclical process. In their longitudinal study (Berger & Milem, 1999), early involvement in the fall semester positively predicted spring involvement and had significant indirect effects on social integration, academic integration, subsequent institutional commitment, and persistence. Early involvement at the beginning of a student's freshman year had a positive impact on strengthening the perceptions of the institution which ultimately had a positive impact on persistence. In contrast, early noninvolvement continued throughout the whole year and was related to attrition.

Built on previous theories (Astin, 1984; Kuh et al., 2001; Tinto, 1993) and on the "Seven Principles for Good Practice in Undergraduate Education" (Chickering & Gamson, 1987), the National Survey of Student Engagement (NSSE) has been a widely used measure of student engagement. NSSE was designed to measure student participation in educational practices that institutions provide for their learning and personal development in four-year colleges and universities (Kuh et al., 2001). NSSE was first administered in 2000 and has been widely used by different colleges and universities in North America (Indiana University Center for Postsecondary Research, 2004).

There are a few examples in the literature that attempted to use NSSE data to inform student outcomes. Hughes and Pace (2003) found that non-retained students reported lower levels of engagement. Popkess and McDaniel (2011) used NSSE responses to compare nursing students to other majors and found that nursing were more academically challenged, and engaged in more rigorous curricula; they engaged less in active and collaborative learning than other majors. Researchers have developed scales from NSSE items and found them to be more powerful measures than the benchmarks to inform student outcomes. For example, Zhao and Kuh (2004) used 47 items from the NSSE and constructed six scales to represent dimensions of student engagement, three measures of quality of campus, and three scales of student learning outcomes. Controlling for student and institutional characteristics, results from an OLS model showed that participating in a learning community was positively related to student engagement, student outcomes, and overall college satisfaction. Pike (2004) also developed a series of scalelets using NSSE items and established their validity in assessing student learning and associated institutional effectiveness. An alternative to benchmarks was developed for the new NSSE 2013.

The goal of this project was to conduct data analyses on associated NSSE responses and student academic records to advance our knowledge on how student perceptions of engagement in college relate to retention, academic performance, and timely graduation. Multiple studies have found that NSSE items, or combinations of items (see e.g. Pike, 2004), were more advantageous than the benchmarks to predict student outcomes (Gordon, Ludlum, & Hoey, 2008; Zhao & Kuh, 2004). Gordon et al. (Gorden et al., 2008) linked NSSE responses to freshman retention, GPA, pursuit of graduate education, and employment outcomes upon degree conferral. Their analysis of NSSE benchmarks provided minimum explanatory power in forward regression. Thus, in the current study, only analyses based on NSSE items are presented. The study was designed to identify actionable elements of student engagement that can be implemented via knowledge transfer, adjustment of existing programs and/or development of new programs. For these reasons item-based analyses are of particular importance as they allow for maintaining granularity in the representation of student experience.

Our study was conducted based on the theoretical framework that student success is a cycle of engagement behaviors and perceptions and student outcomes, presented in the work of Bergar and Milem (1999): early student involvement enhances student perceptions of an institution which in turn facilitates later involvement, and all three components influence student persistence. Four student success measures are used: end-of-first-year retention, end-of-first-year GPA, senior students' time to degree completion and senior's on-time graduation. We hypothesized that these different stages of student success could be predicted by college entry characteristics and student engagement in their first year and senior year.

Guiding questions were the following: 1. Beyond what was accounted for by student characteristics and previous achievements, how do student engagement behaviors and perceptions

influence student outcomes in first-year fall-to-fall retention,  first-year student cumulative GPA, senior on-time graduation and time of degree completion. 2. What and how well do individual NSSE items predict student outcomes?

## Data and Methods

### Data

Data consisted of 16,630 undergraduate first-year and senior students enrolled in a Midwest, public university who completed the NSSE survey in a spring semester from 2006-2012.  Since transfer students differ from non-transfer students in academic background, demographic characteristics, and length of time to graduation, for the purpose of this project, transfer students were excluded from the analyses, which produced a final sample of 8,708 first-year students and 7,922 seniors.  First-year and senior students were evenly distributed, with 48.32% of first-year students in the population. The ethnicity generally reflected the overall campus data, with 5.74% international students, 81.82% White students, 3.40% African Americans, 4.15% Asians, and 2.88% Hispanics. Approximately 61% of survey responders were female and18.56% of the students were eligible to apply for a Pell Grant.

An analysis comparing the NSSE responders to the 2011 survey and the student population on the same year on campus found that responders tended to have higher cumulative and semester GPAs and SAT/ACT scores, and were more likely to be females and White (Bloomington Assessment and Research Internal Report). Patterns of responder bias are consistent with other studies (e.g. NSSE 2010 Overview).

Table 1 shows descriptive statistics of target and non-NSSE variables used in the analyses.

Table 1. Descriptives of Variables Used in Analyses

| | First-Year Students | | Seniors | |
|---|---|---|---|---|
| | Frequency | Percentage | Frequency | Percentage |
| Gender | | | | |
| Male | 3373 | 38.73% | 3067 | 38.71% |
| Female | 5535 | 61.27% | 4855 | 61.29% |
| Ethnicity | | | | |
| White | 6872 | 79.35% | 6894 | 87.25% |
| Ethnic Minority | 1250 | 14.43% | 845 | 10.69% |
| International Student | 538 | 6.21% | 162 | 2.05% |
| ACT/SAT | | | | |
| Mean | 1217.04 | | 1187.01 | |
| SD | 146.78 | | 155.77 | |
| Unmet Financial Need | | | | |
| $0 | 5160 | 59.26% | 3704 | 46.76% |
| Other | 3548 | 40.74% | 4218 | 53.24% |
| Pell Grant Elligibility | | | | |
| Yes | 1726 | 19.82% | 1290 | 16.28% |
| No | 6982 | 80.18% | 6632 | 83.72% |
| Passing All Previous Classes | | | | |
| Yes | 8070 | 92.67% | 6700 | 84.57% |
| No | 638 | 7.33% | 1222 | 15.43% |
| First-Year Retention | | | | |
| Yes | 8190 | 94.05% | | |
| No | 518 | 5.95% | | |
| End-of-First-Year Cumulative GPA | | | | |
| Mean | 3.22 | | | |
| SD | 0.58 | | | |
| 0-1.99 | 632 | 7.25% | | |
| 2.00-4.00 | 8077 | 92.75% | | |
| End-of-Fourth-Year Cumulative GPA | | | | |
| Mean | | | 3.34 | |
| SD | | | 0.41 | |
| Number of Gaps Excluding Summer | | | | |
| Yes | | | 2291 | 28.92% |
| No | | | 5631 | 71.08% |
| Mean | | | 0.27 | |
| SD | | | 0.51 | |
| Terms to Degree | | | | |
| Mean | | | 9.25 | |
| Mode | | | 8 | |
| SD | | | 2.99 | |
| Four-Year Graduation | | | | |
| Yes | | | 4907 | 61.96% |
| No | | | 3015 | 38.06% |

## Measures

*Student Engagement*

The National Survey of Student Engagement (NSSE) was used to measure student engagement. The survey used a well-developed, validated set of 85 items directed at a variety of student behaviors and experiences related to engagement. Students were asked to rate how often they engage in a variety of academic and extracurricular activities. Students rated the majority of the items on a 4-point Likert scale ( 1= Never, 2 = Sometimes, 3 = Often, 4 = Very often or 1 = Very little, 2 = Some, 3 = Quite a bit, 4 = Very much), with the exception of items measuring number of hours spent on activities.

*Student Background and Pre-College Experiences*

Student high-school GPA, ACT/SAT score, demographic background information (i.e., gender, race, ethnicity) were obtained from the registrar's office. Demographic background variables were dummy coded in the regression models.

*Financial Aid*

Student financial aid information refers to the information available for the student at the beginning of each fall semester of enrollment. The information used included expected family contribution, unmet financial need, and Pell Grant eligibility. This latter variable was identified as having a strong predictive value of student performance in other studies (Barber, 2013). Descriptive analysis

showed that unmet financial need was frequently reported as 0, creating an extremely positively skewed distribution. Thus, students were classified as either 'having financial need' or 'not having need'.

*Student Academic Information*

Student academic performance in college was also obtained. Information included semester GPA and cumulative GPA for each year, first-year student fall-to-fall retention, the ratio of passed and taken classes (Barber, 2013), number of terms from first enrollment to degree completion without summer, number of gaps between semesters, and 4-year graduation. The distribution of the ratio of passed and taken classes warranted that this variable be dummy coded indicating that students either passed all classes or failed at least one class.

## Analysis

The NSSE data files for each year were appended to create a single file for analyses. Some students participated in multiple years of survey with one class level (first-year or senior). Thus, in the analysis, only the most recent NSSE answer for each level was kept in the data and 677 repeating responses were removed from the analysis. Then the appended NSSE data was joined with student background and pre-college information, financial aid, and academic performance data relevant to the year of the survey.

For first-year students, two student outcomes were examined: fall-to-fall retention and end-of-first-year cumulative GPA using logistic and linear regression. Initially NSSE benchmarks were used as predictors resulting in limited significant results in this analysis and confirming findings in other studies (Gordon et al., 2008; Pike, 2004; Zhao & Kuh, 2004). Due to potential issues with generalizability of scalelets (Pike, 2004) and lack of successful results with other data reductions techniques, i.e. selecting items based on their resonance to theory and exploratory and confirmatory factor analysis, the authors decided to focus this paper on results that are based on the use of individual NSSE items.

As a much higher percentage (more than 40%) of students with lower GPAs depart from school than those with higher GPAs, a separate analysis was conducted on a split data set with students in two subgroups: those with a spring semester GPA lower than 2.0, and those with a GPA equal to or higher than 2.0 (this cut off reflects the threshold used to assign students to the probation category). Similarly, two student outcomes, four-year graduation and terms to degree completion, were examined for seniors by using logistic regression and multiple linear regression, respectively.

## Results

### First-Year Student Retention

Table 2 shows the result of the regression models using NSSE individual items to predict first-year retention using student demographics, end-of-first-year cumulative GPA, financial aid, and experience of failing a class. In the overall model that included all students, those who were male, who had higher end-of-first-year cumulative GPA, and who had unmet financial need were more likely to be retained. Being male was associated with a slightly higher likelihood of retention, with the odds ratio below 1.5 indicating no effect size for this variable. The history of failing a class did not have an impact on retention. The following seven NSSE items were positively contributing to the retention model: working with faculty on non-coursework activities, foreign language coursework, better relationship with other students, participating in co-curricular activities, spending more time commuting, using computers in academic work, and greater overall satisfaction with this university. In contrast, students who spent more hours on physical fitness activities, tried harder to understand other's views that are different from one's own, had better relationship with administrative staff and those who spent more hours providing care to dependents were less likely to be retained after the first year.

When classifying students into two subgroups based on first semester GPA, end-of-first-year cumulative GPA showed the largest contribution to retention for both groups. Even when considering the limited variation in the GPA range of the lower performing group, 1 point of increase in GPA would

make the student 22 times more likely to be retained. However, other variables showed different results. For students with GPA below 2.0, gender did not make any difference in fall-to-fall retention and only four NSSE engagement items positively predicted students' retention: tutoring other students, preparing for class, and time commuting to class, while discussing class-related ideas with others outside of class predicted dropping out. Among these four items, only tutoring other students had an effect size (odds ratio greater than 1.5) on retention. Conversely, for students with 2.0 GPA and higher, the trend of persistence was similar to the overall student body; students who were male and who had a higher first-year GPA were more likely to be retained. Students who had unmet financial need, did foreign language coursework, participated in more co-curricular activities, took more time to commute to school, used more computing and information technology, and reported higher satisfaction with the university were more likely to be retained. Participating in more physical fitness activities and taking care of dependents were negatively associated with student retention. For the higher performing students, only the NSSE item of overall satisfaction with the institution had a medium effect size.

**First-Year Student Academic Performance**

The explanatory power of individual NSSE items was further tested as predictors of end-of-first-year cumulative GPA (Table 3). Passing previous classes had the biggest impact on academic performance in this model. Other items showing strong a positive contribution were higher ACT/SAT score and more time spent preparing for class. Items that showed a weaker yet positive relationship with academic performance: asking questions or contributing to discussions in class, making class presentations, tutoring other students, working harder than expectations, participating in volunteer work, participating in spiritual activities, regarding college as acquiring a general education, and as gaining knowledge and skills for future employment, and a higher evaluation of overall college experience. Conversely, coming to class without completing requirements had the greatest negative effect on GPA, followed by items such as: reading for personal enjoyment or academic enrichment, number of problem sets that take more than an hour, perceived challenge of exams, working for pay off campus, relaxing and socializing, longer time commuting to class, perceiving spending longer time studying, and coping with non-academic responsibilities. The analysis also showed relationships that are less intuitive; for example, having serious conversations with diverse students, including diverse perspectives in course assignments, having a good relationship with students and administrative personnel, speaking clearly and effectively, and using computing and information technology were related to lower GPA.

Table 2. Binary Logistic Regression on 06-12 NSSE Individual Items Estimating First-Year Retention

| Code | Label | Item Name | Forward Regression B | SE | Wald χ2 | OR | 95% C.I. | | GPA 0-1.99 Forward Regression B | SE | Wald χ2 | OR | 95% C.I. | | GPA 2.0-4.0 Forward Regression B | SE | Wald χ2 | OR | 95% C.I. | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | (Constant) | | -5.26*** | 0.55 | 90.64 | | | | -5.28*** | 1.0807 | 23.8403 | | | | -4.09*** | 0.6598 | 38.4644 | | | |
| | Gender | | | | | | | | | | | | | | | | | | | |
| | Male | | 0.15* | 0.0679 | 4.8339 | 1.348 | 1.033 | 1.759 | 0.0926 | 0.1518 | 0.3723 | 1.203 | 0.664 | 2.182 | 0.18* | 0.0782 | 5.0463 | 1.421 | 1.046 | 1.93 |
| | Ethnicity | | | | | | | | | | | | | | | | | | | |
| | White | | -0.088 | 0.1227 | 0.5138 | 0.762 | 0.42 | 1.382 | -0.3171 | 0.3059 | 1.0749 | 0.674 | 0.14 | 3.251 | -0.00687 | 0.1325 | 0.0027 | 0.829 | 0.441 | 1.561 |
| | Ethnic Minority | | -0.096 | 0.1474 | 0.4277 | 0.755 | 0.391 | 1.457 | 0.2402 | 0.3504 | 0.47 | 1.177 | 0.22 | 6.297 | -0.1732 | 0.1642 | 1.1128 | 0.702 | 0.344 | 1.433 |
| | End-of-First-Year Cumulative GPA | | 1.44***b | 0.0948 | 229.9499 | 4.208 | 3.495 | 5.067 | 2.9***c | 0.3909 | 58.1996 | 19.729 | 9.17 | 42.445 | 0.82***a | 0.141 | 33.405 | 2.259 | 1.714 | 2.979 |
| | Unmet Financial Need | | 0.15* | 0.0641 | 5.3802 | 1.347 | 1.047 | 1.732 | | | | | | | 0.15* | 0.0728 | 4.184 | 1.347 | 1.013 | 1.792 |
| **NSSE Items** | | | | | | | | | | | | | | | | | | | | |
| Code | Label | Name | | | | | | | | | | | | | | | | | | |
| 1j. | Tutored or taught other students (paid or voluntary) | TUTOR | | | | | | | 0.41*a | 0.2052 | 3.9873 | 1.506 | 1.008 | 2.252 | | | | | | |
| 1s. | Worked with faculty members on activities other than coursework (committees, orientation, student life activities, etc.) | FACOTHER | 0.22* | 0.0965 | 5.0762 | 1.243 | 1.029 | 1.502 | | | | | | | | | | | | |
| 1t. | Discussed ideas from your readings or classes with others outside of class (students, family members, co-workers, etc.) | OOCIDEAS | | | | | | | -0.52**a | 0.1854 | 7.8729 | 0.594 | 0.413 | 0.855 | | | | | | |
| 6b. | Exercised or participated in physical fitness activities | EXRCSE05 | -0.19** | 0.0695 | 7.0861 | 0.831 | 0.725 | 0.952 | | | | | | | -0.19* | 0.0785 | 6.1254 | 0.823 | 0.706 | 0.96 |
| 6e. | Tried to better understand someone else's views by imagining how an issue looks from his or her perspective | OTHRVIEW | -0.21** | 0.0764 | 7.5102 | 0.811 | 0.698 | 0.942 | | | | | | | | | | | | |
| 7e. | Foreign language coursework | FORLNG04 | 0.21*** | 0.0601 | 12.2299 | 1.234 | 1.097 | 1.388 | | | | | | | 0.23*** | 0.0669 | 11.7545 | 1.258 | 1.103 | 1.434 |
| 8a. | Relationships with other students | ENVSTU | 0.13** | 0.0496 | 7.0177 | 1.141 | 1.035 | 1.257 | | | | | | | | | | | | |
| 8c. | Relationships with administrative personnel and offices | ENVADM | -0.13*** | 0.0447 | 8.4372 | 0.878 | 0.805 | 0.959 | | | | | | | | | | | | |
| 9a. | Preparing for class (studying, reading, writing, doing homework or lab work, analyzing data, rehearsing, and other academic activities) | ACADPR01 | | | | | | | 0.25* | 0.1072 | 5.5311 | 1.287 | 1.043 | 1.588 | | | | | | |
| 9d. | Participating in co-curricular activities (organizations, campus publications, student government, fraternity or sorority, intercollegiate or intramural sports, etc.) | COCURR01 | 0.14* | 0.051 | 8.0374 | 1.156 | 1.046 | 1.277 | | | | | | | 0.21*** | 0.0618 | 11.5286 | 1.234 | 1.093 | 1.392 |
| 9f. | Providing care for dependents living with you (parents, children, spouse, etc.) | CAREDE01 | -0.20* | 0.0831 | 5.5836 | 0.822 | 0.698 | 0.967 | | | | | | | -0.26** | 0.095 | 7.5801 | 0.77 | 0.639 | 0.927 |
| 9g. | Commuting to class (driving, walking, etc.) | COMMUTE | 0.29*** | 0.0843 | 11.6783 | 1.334 | 1.131 | 1.574 | 0.32* | 0.156 | 4.1341 | 1.373 | 1.011 | 1.865 | 0.28*** | 0.1025 | 7.268 | 1.318 | 1.078 | 1.611 |
| 11g. | Using computing and information technology | GNCMPTS | 0.19** | 0.0721 | 6.977 | 1.21 | 1.05 | 1.393 | | | | | | | 0.21** | 0.0788 | 6.8842 | 1.23 | 1.054 | 1.435 |
| 14 | If you could start over again, would you go to the same institution you are now attending? | SAMECOLL | 0.83***b | 0.0805 | 106.5107 | 2.294 | 1.96 | 2.686 | | | | | | | 1.02***ab | 0.08 | 161.7168 | 2.765 | 2.364 | 3.234 |
| **Overall model evaluation** | | | | | | | | | | | | | | | | | | | | |
| | Likelihood Ratio Test | | 495.46*** | | | | | | 105.87*** | | | | | | 282.82*** | | | | | |
| | Score Test | | 577.77*** | | | | | | 98.23*** | | | | | | 332.99*** | | | | | |
| | Wald Test | | 408.70*** | | | | | | 65.64*** | | | | | | 266.20*** | | | | | |
| | -2 Log Likelihood | | 1916.38 | | | | | | 292.78 | | | | | | 1561.05 | | | | | |
| **Goodness-of-fit test** | | | | | | | | | | | | | | | | | | | | |
| | Hosmer & Lemeshow | | 5.19 | | | | | | 9.56 | | | | | | 5.3 | | | | | |

* p < .05   ** p < .01   *** p < .001   a = small effect size, b = medium effect size, c = large effect size.

Gender and ethnicity were dummy coded in the regression models. For gender, males are compared with females. For ethnicity, White are compared to ethnic minorities and international students.

Table 3. Linear Regression on 06-12 NSSE Items Predicting End-of-First-Year Cumulative GPA

| Variables | | | | Forward Regression | | |
|---|---|---|---|---|---|---|
| | | | | B | SE | Standardized B |
| (Constant) | | | | 0.84*** | 0.10 | |
| Gender | | | | | | |
| | Female | | | 0.13*** | 0.01 | 0.11 |
| Ethnicity | | | | | | |
| | Ethnic Minority | | | -0.067*** | 0.02 | -0.04 |
| | International Student | | | 0.15*** | 0.04 | 0.05 |
| SAT/ACT score | | | | 0.0014*** | 0.00 | 0.34 |
| *Passing All Previous Classes* | | | | *0.84*** | *0.03* | *0.35* |
| NSSE ITEMs | | | | | | |
| Code | Lable | | Name | | | |
| *1a.* | *Asked questions in class or contributed to class discussions* | | *CLQUEST* | *0.051*** | *0.01* | *0.07* |
| 1b. | Made a class presentation | | CLPRESEN | 0.030** | 0.01 | 0.04 |
| 1e. | Included diverse perspectives (different races, religions, genders, political beliefs, etc.) in class discussions or writing assignments | | DIVCLASS | -0.021* | 0.01 | -0.03 |
| *1f.* | *Come to class without completing readings or assignments* | | *CLUNPREP* | *-0.079*** | *0.01* | *-0.11* |
| 1j. | Tutored or taught other students (paid or voluntary) | | TUTOR | 0.038*** | 0.01 | 0.06 |
| 1r. | Worked harder than you thought you could to meet an instructor's standards or expectations | | WORKHARD | 0.045*** | 0.01 | 0.07 |
| 1u. | Had serious conversations with students of a different race or ethnicity than your own | | DIVRSTUD | -0.045*** | 0.01 | -0.08 |
| 3b. | Number of books read on your own (not assigned) for personal enjoyment or academic enrichment | | READOWN | -0.043*** | 0.01 | -0.07 |
| 4a. | Number of problem sets that take you more than an hour to complete | | PROBSETA | -0.027*** | 0.01 | -0.05 |
| 5 | The extent to which your examinations during the current school year have challenged you to do your best work | | EXAMS | -0.036*** | 0.01 | -0.06 |
| 6c. | Participated in activities to enhance your spirituality (worship, meditation, prayer, etc.) | | WORSHP05 | 0.025*** | 0.01 | 0.05 |
| 7b. | Community service or volunteer work | | VOLNTR04 | 0.024** | 0.01 | 0.04 |
| 8a. | Relationships with other students | | ENVSTU | -0.022*** | 0.01 | -0.05 |
| 8c. | Relationships with administrative personnel and offices | | ENVADM | -0.012* | 0.01 | -0.03 |
| *9a.* | *Preparing for class (studying, reading, writing, doing homework or lab work, analyzing data, rehearsing, and other academic activities)* | | *ACADPR01* | *0.045*** | *0.00* | *0.12* |
| 9c. | Working for pay off campus | | WORKOF01 | -0.031*** | 0.01 | -0.05 |
| 9e. | Relaxing and socializing (watching TV, partying, etc.) | | SOCIAL05 | -0.022*** | 0.00 | -0.06 |
| 9g. | Commuting to class (driving, walking, etc.) | | COMMUTE | -0.019* | 0.01 | -0.03 |
| 10a. | Spending significant amounts of time studying and on academic work | | ENVSCHOL | -0.034** | 0.01 | -0.04 |
| 10d. | Helping you cope with your non-academic responsibilities (work, family, etc.) | | ENVNACAD | -0.034*** | 0.01 | -0.06 |
| 11a. | Acquiring a broad general education | | GNGENLED | 0.032** | 0.01 | 0.04 |
| 11b. | Acquiring job or work-related knowledge and skills | | GNWORK | 0.031** | 0.01 | 0.05 |
| 11d. | Speaking clearly and effectively | | GNSPEAK | -0.031** | 0.01 | -0.05 |
| 11g. | Using computing and information technology | | GNCMPTS | -0.024** | 0.01 | -0.04 |
| 13 | How would you evaluate your entire educational experience at this institution? | | ENTIREXP | 0.051*** | 0.01 | 0.06 |
| | Model R Square | | | 0.46 | | |
| | Adjusted R Square | | | 0.46 | | |

\* p < .05    \*\* p < .01    \*\*\* p < .001

Gender and ethnicity were dummy coded in the regression models. For gender, females are compared with males. For ethnicity, White are compared to ethnic minorities and international students.

## Senior Students Time to Graduation

The number of summer and spring terms taken from first enrollment to degree completion was used as the dependent measure in a linear regression model (Table 4). Among the non NSSE items, the greatest predictor of time to graduation was number of non-summer gaps taken and passing all previous classes. Among the student engagement measures, caring for dependents had the greatest impact on lengthening the time to graduation. Other items that were related to prolonged time to graduation include: discussing course content with others, perceiving higher challenges for school, conducting independent study or self-designed major, and working for pay on- and off-campus. On the other hand, writing more short and long length papers and having better relationships with other students, participating in co-curricular activities, and developing a personal code of ethics were related to shortened time to

graduation. Contrary to the values of the higher education community (e.g., high impact practices), having good relationships with faculty members is related to longer time from enrollment to graduation, whereas coming to class without completing readings or assignments, doing practicum or field experiences, foreign language coursework, are all related to shortened time to degree completion. Competing goals of shortened time to degree completion and valued educational experiences should be explored more fully.

Table 4. Linear Regression Analysis on 06-12 NSSE Items Predicting Time to Graduation

| | | | Forward Regression | | |
|---|---|---|---|---|---|
| | | | B | SE | Standardized B |
| (Constant) | | | 10.80*** | 0.47 | 22.95 |
| *Gender* | | | | | |
| | *Female* | | *-0.19** * | *0.07* | *-2.64* |
| Ethnicity | | | | | |
| | Ethnic Minority | | -0.14416 | 0.11 | -1.27 |
| | International Student | | 0.11306 | 0.25 | 0.45 |
| Senior Cumulative GPA | | | -0.00998 | 0.10 | -0.1 |
| *Number of Gaps Excluding Summer* | | | *1.89*** * | *0.07* | *26.83* |
| Pell Grant Eligibility | | | 0.25** | 0.10 | 2.64 |
| *Passing All Previous Classes* | | | *-1.38*** * | *0.12* | *-11.66* |
| | | | | | |
| NSSE Items | | | | | |
| Code | Label | Name | | | |
| 1f. | Come to class without completing readings or assignments | CLUNPREP | -0.10* | 0.04 | -2.35 |
| 1m. | Used e-mail to communicate with an instructor | EMAIL | -0.15** | 0.05 | -2.9 |
| 1t. | Discussed ideas from your readings or classes with others outside of class (students, family members, co-workers, etc.) | OOCIDEAS | 0.13** | 0.04 | 3.09 |
| 3c. | Number of written papers or reports of 20 pages or more | WRITEMOR | -0.16** | 0.05 | -3.19 |
| 3e. | Number of written papers or reports of fewer than 5 pages | WRITESML | -0.077* | 0.03 | -2.45 |
| 5. | The extent to which your examinations during the current school year have challenged you to do your best work. | EXAMS | 0.062* | 0.03 | 1.99 |
| 7a. | Practicum, internship, field experience, co-op experience, or clinical assignment | INTERN04 | -0.085* | 0.04 | -2.19 |
| 7g. | Independent study or self-designed major | INDSTD04 | 0.12* | 0.05 | 2.29 |
| 8a. | Relationships with other students | ENVSTU | -0.14*** | 0.03 | -4.17 |
| 8b. | Relationships with faculty members | ENVFAC | 0.081* | 0.03 | 2.47 |
| 9b. | Working for pay on campus | WORKON01 | 0.092*** | 0.02 | 4.11 |
| 9c. | Working for pay off campus | WORKOF01 | 0.11*** | 0.02 | 5.81 |
| 9d. | Participating in co-curricular activities (organizations, campus publications, student government, fraternity or sorority, intercollegiate or intramural sports, etc.) | COCURR01 | -0.072*** | 0.02 | -3.48 |
| *9f.* | *Providing care for dependents living with you (parents, children, spouse, etc.)* | *CAREDE01* | *0.32*** * | *0.04* | *7.93* |
| 11n. | Developing a personal code of values and ethics | GNETHICS | -0.10** | 0.04 | -2.74 |
| | Model R Square | | | 0.23 | |
| | Ajusted R Square | | | 0.23 | |

* p < .05    ** p < .01    *** p < .001

Dependent variable is number of terms from registration to graduation exluding summer. Gender and ethnicity were dummy coded in the regression models. For gender, females are compared with males. For ethnicity, White are compared to ethnic minorities and international students.

## Senior Students Four-Year Graduation

Senior students were coded into two groups: those who graduated within 4 years and those who took longer than four years. Logistic regression was performed using on-time graduation as the criterion and NSSE items and other student data as the predictors (Table 5). Number of academic non-summer gaps had the greatest impact on on-time graduation. The results showed that males were more likely to graduate on time than female students. There was no difference among white, ethnic minorities and international students in their 4-year graduation. Higher GPA and Pell Grant eligibility both predicted higher likelihood of finishing a degree on time. Out of the 42 NSSE items, 15 items were significant predictors of on-time graduation and the results were similar to those in the linear regression model for time to graduation discussed in the previous section: caring for dependents and preparing for class had the greatest impact on on-time graduation, with both related to less likelihood of on-time graduation. In

addition to these items, working harder than one's own expectations, writing papers or reports that are between 5-19 pages or 20 pages or more, foreign language coursework, studying abroad, participating in co-curricular activities, relaxing and socializing, speaking clearly and effectively and greater overall satisfaction of educational experiences were positively related to four-year graduation; however, perceiving greater challenges from exams, and working on- or off-campus, were related to less likelihood of on-time graduation. A couple of NSSE items that did not behave as expected based on the literature are: having serious conversation with diverse people and preparing for class being related to less likelihood to graduation on time. However, it is worth noting that among all the NSSE predictors, none of them show any practical effect size (odds ratio > 1.5) in the regression models.

Table 5. Logistic Regression on 06-12 NSSE Items Predicting 4-Year Graduation

| Code | Label | Item Name | Forward Regression | | | | | |
|------|-------|-----------|---|---|---|---|---|---|
| | | | B | SE | Wald χ2 | OR | 95% C.I. | |
| (Constant) | | | -2.36*** | 0.39 | 36.15 | | | |
| Gender | | | | | | | | |
| | Male | | 0.09* | 0.03 | 8.69 | 1.22 | 1.07 | 1.39 |
| Ethnicity | | | | | | | | |
| | White | | 0.020 | 0.09 | 0.05 | 1.08 | 0.68 | 1.71 |
| | Ethnic Minority | | 0.038 | 0.10 | 0.13 | 1.10 | 0.67 | 1.81 |
| *Senior Cumulative GPA* | | | *0.76\*\*\* a* | *0.09* | *79.45* | *2.14* | *1.81* | *2.53* |
| *Number of Gaps Exluding Summer* | | | *-1.03\*\*\* b* | *0.07* | *225.84* | *0.36* | *0.31* | *0.41* |
| *Pell Grant Eligibility* | | | *0.26\*\*\* a* | *0.04* | *35.79* | *1.69* | *1.42* | *2.00* |
| | | | | | | | | |
| **NSSE Items** | | | | | | | | |
| Code | Label | Name | | | | | | |
| 1r. | Worked harder than you thought you could to meet an instructor's standards or expectations | WORKHARD | 0.10** | 0.0428 | 5.56 | 1.106 | 1.017 | 1.203 |
| 1u. | Had serious conversations with students of a different race or ethnicity than your own | DIVRSTUD | -0.092** | 0.0351 | 6.8591 | 0.912 | 0.851 | 0.977 |
| 3c. | Number of written papers or reports of 20 pages or more | WRITEMOR | 0.11* | 0.0503 | 4.6655 | 1.115 | 1.01 | 1.23 |
| 3d. | Number of written papers or reports between 5 and 19 pages | WRITEMID | 0.11* | 0.037 | 8.0661 | 1.111 | 1.033 | 1.194 |
| 5. | The extent to which your examinations during the current school year have challenged you to do your best work | EXAMS | -0.10** | 0.0305 | 10.8645 | 0.904 | 0.852 | 0.96 |
| 7e. | Foreign language coursework | FORLNG04 | 0.11*** | 0.0332 | 10.0727 | 1.111 | 1.041 | 1.186 |
| 7f. | Study abroad | STDABR04 | 0.073* | 0.0354 | 4.2424 | 1.076 | 1.004 | 1.153 |
| *9a.* | *Preparing for class (studying, reading, writing, doing homework or lab work, analyzing data, rehearsing, and other academic activities)* | *ACADPR01* | *-0.12\*\*\** | *0.0209* | *31.739* | *0.889* | *0.853* | *0.926* |
| 9b. | Working for pay on campus | WORKON01 | -0.057** | 0.021 | 7.425 | 0.944 | 0.906 | 0.984 |
| 9c. | Working for pay off campus | WORKOF01 | -0.095*** | 0.018 | 28.004 | 0.909 | 0.878 | 0.942 |
| 9d. | Participating in co-curricular activities (organizations, campus publications, student government, fraternity or sorority, intercollegiate or intramural sports, etc.) | COCURR01 | 0.057** | 0.0195 | 8.4578 | 1.058 | 1.019 | 1.1 |
| 9e. | Relaxing and socializing (watching TV, partying, etc.) | SOCIAL05 | 0.059** | 0.0201 | 8.7736 | 1.061 | 1.02 | 1.104 |
| *9f.* | *Providing care for dependents living with you (parents, children, spouse, etc.)* | *CAREDE01* | *-0.20\*\*\** | *0.0416* | *22.1658* | *0.822* | *0.758* | *0.892* |
| 11d. | Speaking clearly and effectively | GNSPEAK | 0.12** | 0.0389 | 9.455 | 1.127 | 1.044 | 1.216 |
| 12. | Overall, how would you evaluate the quality of academic advising you have received at your institution? | ADVISE | 0.074* | 0.036 | 4.2476 | 1.077 | 1.004 | 1.156 |
| Overall Model Evaluation | | | | | | | | |
| | Likelihood Ratio Test | | 717.26*** | | | | | |
| | Score Test | | 680.37*** | | | | | |
| | Wald Test | | 566.25*** | | | | | |
| -2 Log Likelihood | | | 5844.25 | | | | | |
| Goodness-of-fit test | | | | | | | | |
| | Hosmer & Lemeshow | | 15.32 | | | | | |

\* p < .05    \*\* p < .01    \*\*\* p < .001

[a] = small effect size, [b] = medium effect size, [c] = large effect size.
Gender and ethnicity were dummy coded in the regression models. For gender, males are compared with females. For ethnicity, White and ethnic minority students are compared with international students.

## Conclusions & Implementations

This analysis revealed the potential to use NSSE results to inform program development and monitor performance in areas of student engagement that significantly impact student academic success. In this article, we conducted a series of studies based on the National Survey of Student Engagement and student records. First, we compiled the 6 year results of NSSE from 2006 to 2012 together with student

records. Then we conducted regression analysis on NSSE results and student data and examined how student engagement was related to various student outcomes, i.e., first-year student retention, first-year student GPA, senior time to graduation and on-time graduation.

The study supports previous research that shows that pre-college characteristics are strong predictors of student academic success. Being male was associated with a slightly higher likelihood of retention after first-year in college and graduation within four years. Gender was related to GPA, with females showing higher GPAs. Ethnicity did not relate to first-year retention and senior on-time graduation, but it did relate to performance: ethnic minorities achieved lower GPAs after first year in college compared to their white counterparts, while international students achieved higher GPAs than whites. Besides demographic factors, SAT/ACT scores accounted for a large percentage of variance of first-year student GPA. The results are consistent with the literature that admission criteria and previous academic preparation are still some of the most important predictors of student success (Truell & Woosley, 2008). This study also shows that academic success was strongly dependent on the individual's academic trajectories: early success facilitates later success. Higher ACT/SAT scores predicted higher first-year GPA, student engagements were predictive of better performance, previous GPA and successfully passing classes also predicted shorter time to degree completion and on-time graduation. This is consistent with previous research (Berger & Milem, 1999) that earlier academic success promoted later higher achievement. This study showed how continuity in student enrollments, i.e. not taking non-summer gaps, was associated with shorter time or greater likelihood of four year graduation.

Another interesting finding of the study is that when separating students into two groups based on their spring semester GPA, different variables predicted retention for the two student groups. For students with lower GPA, having an unmet financial need did not impact retention. Conversely, for higher performing students (those with 2.0 GPA and higher), having an unmet financial need decreased the likelihood of dropping out. Satisfaction with school also functioned differently for these two groups: it did not affect lower performing students' departure of school, but for higher performing students, higher levels of satisfaction of college experience significantly increased their likelihood of retention. This was the only NSSE item that showed any effect size, with none of the other NSSE engagement items having a meaningful effect size. This result suggests that the reasons for persisting in college could be different depending on the student performance and that an array of engagements and activities could be provided that positively impact each individual student. In future studies that focus on predicting the retention of first-year students, it would be prudent to conduct separate analysis for different student groups based on their academic performance and characteristics.

This study demonstrated that greater financial need does not directly impede student success. Having an unmet financial need increased both the likelihood of first-year retention and four-year graduation. While Pell Grant eligibility showed a more complex result: students who were eligible for this grant generally took a longer time to graduate, but were also more likely to graduate in four years. It is possible that students with unmet financial needs treasure the educational experiences more than students from more wealthy families, and they are spending great efforts to stay in college. Greater financial needs may mean that they are spending more time to make ends meet, but they are also aware that they need to graduate in as short a time as possible to get out of the financial strain.

This study suggested that both behavioral engagement and perception of college experiences were related to student outcomes. Among the NSSE items, a few appeared to have significant impact on multiple measures of student achievement, e.g., working harder than one thought to meet the faculty's expectations, writing medium and long papers, doing foreign language coursework, studying abroad, and participating in co-curricular activities. In contrast, working for pay either on- campus or off-campus, taking care of dependents, and coming to class without completing assignments or readings were associated with more undesirable outcomes: students who are engaged in these behaviors are less likely to perform well or graduate on time. In terms of perception, the more positively students evaluated their overall experience and the less challenge they perceived of exams and academic requirements, the more likely it was for students to achieve higher GPA, and graduate on time. This is consistent with Berger & Milem (1999) that engagement and perception influence each other to foster student success.

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