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Investigation of the Effect of First-Year Seminars on Student Success

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Abstract. The first-year seminar (FYS) has been widely implemented at colleges and universities as a strategy for facilitating student success. However, empirical evidence indicates that the observed effects of FYS on retention and academic performance are mixed. Drawing on data from first-time full-time degree-seeking cohorts from Fall 2010 through Fall 2014, this study estimates the effects of FYS participation and FYS grades on retention, academic performance, and completion. The results reveal that FYS participants were retained at higher rates into the sequential Fall terms than FYS nonparticipants. FYS participation, FYS grades, first-Fall attempted credits, and application submission advanced days were found as significant predictors of retention and 6-year graduation. Additionally, earning a higher FYS grade than a "B" is associated with an increased likelihood of retention and graduation. The implications of this study are discussed.

Over the last decade, the focus of higher education in the United States has shifted from improving college access to retention, progression, completion, and student success (Kelly & Schneider, 2012). The first-year seminar (FYS), as one of the high-impact practices (HIPs; Kuh, 2008), has been widely implemented at colleges and universities as a strategy for facilitating retention and student success. About 90% of the higher education institutions in the United States offer FYS courses (Padgett & Keup, 2011; Young & Hopp, 2014). The FYS courses are specifically designed to assist first-year college students with the transitional and developmental challenges they may face; to equip them with essential knowledge, skills, and abilities for college success; and to enhance the academic and/or social integration and college success (Barefoot, 1992; Goodman & Pascarella, 2006). The modern iteration of the FYS, which began as University 101 at the University of South Carolina by John Gardner in the 1970s (Koch & Gardner, 2014), typically is a small-size class that focuses on helping students in their transition to college as well as their social and academic development. It introduces first-year students to a variety of topics related to campus resources, college life, and/or disciplines and majors as well as to essential skills for college success. FYS courses seek to help students learn about their institutions and about themselves to strengthen their intellectual and practical competencies in a manner that will increase their likelihood of succeeding at and ultimately graduating from their institutions (Upcraft et al., 2005).

The FYS is one of the most widely researched first-year initiatives in higher education, and a large body of literature indicates that FYS participation bridges a student's successful transition from high school to college and promotes academic performance and the likelihood of persistence into the second year (e.g., Barton & Donahue, 2009; Fidler, 1991; Jenkins-Guarnieri, et al., 2014-2015; Pascarella & Terenzini, 2005). However, a significant portion of the literature on FYS programs calls into question their impact on retention and academic performance (Clark & Cundiff, 2011; Permzadian & Crede, 2016). Some studies have identified large positive effects on GPA and retention (e.g., Blackett, 2008; Swanson et al., 2017; Woolfork-Barnes, 2017), while others have reported very small effects or even negative effects of FYS on students' GPA and retention rate (e.g., Cavote & Kopera-Frye, 2004; Wolf-Wendel et al., 1999). Recently, a meta-analysis revealed a small average FYS effect on both first-year grades and the 1-year retention rate (Permzadian & Crede, 2016). However, it also suggested the impacts of FYS on 1-year retention and first-year grades are substantially moderated by FYS characteristics, institutional and instructional characteristics, population studied, and study characteristics. The inconsistent findings of the FYS impact call for a close examination of FYS using sophisticated methodologies.

However, methodologically, identifying and estimating average treatment effects of an educational intervention, such as FYS courses, from nonexperimental data collected in educational settings poses challenges to educational researchers (Bifulco et al., 2017; Li, 2017). Given that the majority of FYS studies use ex post facto design, many of the FYS studies lack methodological rigor (Jenkins-Guarnieri et al., 2014-2015; What Works Clearinghouse, 2016), although a few studies are more rigorous using methodologies such as propensity score matching (Clark & Cundiff, 2011; Lang, 2007; Schnell & Doetkott, 2002-2003). In addition, longitudinal studies of this effect are lacking in the literature (Schnell & Doetkott, 2002-2003; Swanson et al., 2017). Only a small number of studies focused on retention beyond the second year (Friedman, 2012).

To address the gap in the FYS literature and combat methodological challenges, in the absence of randomized control groups, we employed a probit econometric model and a general linear model (GLM) to estimate the effects of FYS enrollment and FYS grades if students completed an FYS course on various student outcomes. We pulled data from the earlier first-time full-time (FTFT) degree-seeking cohorts of Fall 2010 and Fall 2011, prior to the launch of the FYS, to use as our control group. Using the institutional longitudinal data from FTFT cohorts, we provided estimates of the effects of FYS participation and FYS grades on student success measured by retention to the second Fall, first-Fall GPA without FYS performance, and 6-year graduation at a large, public R1 university. Two research questions guide this study:

(a) Compared with FYS nonparticipants in the earlier time period (control group), did FYS participants retain to the second Fall and graduate within 6 years at a higher rate? and

(b) What are the predictive powers of FYS participation and FYS grades on the likelihood of retaining to the second Fall and graduating within 6 years, and first-Fall term GPAs (without FYS performance) when controlling for other variables?

It is our hope to provide empirical evidence of FYS participation and its impacts on student success metrics at large public research universities, specifically, and higher education institutions in general, and contribute to a broad knowledge base by inspiring college leadership and policymakers to examine FYS and student outcomes at their home campuses more closely such that students may benefit more from FYS.

In this article, "FYS participants" are students who enrolled in at least one FYS course section (either in the first Fall or Spring term), regardless of whether they completed the course; otherwise, students are classified as FYS nonparticipants. FYS grade is a letter grade that a student earned from the FYS course(s). If the student took an FYS section in both Fall and Spring term, the Fall record was counted.

Theoretical Framework

The conceptual frameworks adopted for this study combine theoretical perspectives or frameworks related to college student retention, persistence, and success, as well as empirical studies on the impact of FYS and HIPs on desired student outcomes. Specifically, we used Astin's (1984) theory of involvement, Kuh's (2001, 2009) engagement perspectives, and Tinto's (1975, 1987, 1993) theory of college student departure, which have been widely used to deepen FYS research (Friedman, 2012; Schnell & Doetkott, 2002-2003).

Tinto (1975, 1987, 1993) suggested that student attrition is largely dependent on the impact of students' academic and social integration to their campus norms on their commitments to their institution and their goals of graduating. Similarly, Astin (1984, 1999) and Kuh (2001, 2009) both emphasized student involvement or engagement and the ways in which these experiences shape students' college trajectories. From the standpoints of policy and practice, any educational policy and practice directly increasing student involvement and engagement should boost persistence and graduation.

FYS and Student Outcomes

The general goals of FYS are commonly set to facilitate first-year students with their academic and social transition to college and further increase academic performance and retention for first-year students (Clark & Cundiff, 2011; Padgett & Keup, 2011; Porter & Swing, 2006; Upcraft et al., 2005). As a widespread popular program, the FYS program has been implemented in many colleges and universities (Padgett & Keup, 2011; Young & Hopp, 2014). An increasingly large body of literature has examined the FYS effect on student outcomes, and the weight of evidence shows that FYS has positive impacts on first-year grades and 1-year retention, the two commonly assessed student success indicators (Pascarella & Terenzini, 2005;

Permzadian & Crede, 2016). The majority of the studies compared outcomes in 1-year retention and first-year GPA between students who enrolled in or completed an FYS course and those who did not. Some studies extended 1-year retention to 2-year retention (e.g., Jamelske, 2009; Lang, 2007; Schnell & Doetkott, 2002-2003) and other outcomes (e.g., Al-Sheeb et al., 2018; Zerr & Bjerke, 2016). Rarer still, some examined longitudinal outcomes of FYS beyond the second year (Fidler, 1991; Miller & Lesik, 2014-2015; Schnell et al., 2003; Shanley & Witten 1990; Woolfork-Barnes, 2017). Studies also found that FYS grades are predictors of student outcomes measured by retention, cumulative GPA, and graduation (Hyers & Joslin, 1998; Starke et al., 2001; Zimmerman, 2000).

Method

FYS at This Institution

The institution in which this study took place is a 4-year public R1 university located in the Southwestern region of the United States (we use "this Institution" hereafter). This Institution is a Hispanic-serving institution (HSI) and a minority-serving institution (MSI) with an undergraduate enrollment for Fall 2018 of 25,288. Among these students, 34% were Pell recipients, and 66% identified themselves as from an ethnic or racial minority group. While its position as an MSI with a large low-SES population makes this Institution somewhat unique among R1 institutions, national projections of high school graduates indicate that public higher education will look much more like this Institution in the future (Bransberger & Michelau, 2016).

The FYS at this Institution is a 2- or 3-credit course launched in Fall 2012. It introduces students to this Institution's academic expectations and the five university undergraduate learning outcomes. All FYS courses use active learning, social interactions and collaboration, self-reflection, and critical thinking to help students gain an understanding of the general education (GE) curriculum and academic success requirements, but they vary by the extent to which they incorporate discipline-specific content. All incoming first-year students are required to take an FYS course during their first academic year or before completing 30 credits. The majority of FYS courses adopt letter-grade grading, while a few use satisfactory/unsatisfactory grading.

Data Sources and Participants

Institutional enrollment data from Fall 2010 through Fall 2014 were used for this study. We selected FTFT degree-seeking cohorts, as the FYS course was required for these students. The cohorts from Fall 2010 and Fall 2011 occurred before the FYS launched in Fall 2012 and thus served as the control group of FYS nonparticipants. A total of 15,882 participants were included in the data analysis for this study. Table 1 presents the characteristics of

the participants in the total sample, the Fall 2010–Fall 2011 cohorts, and the Fall 2012–Fall 2014 cohorts.

Table 1
Characteristics of the Participants

Variable		**Fall 2010-2014 (*N* = 15,882)**		**Fall 2010-2011 (*N* = 5,620)**		**Fall 2012-2014 (*N* = 10,262)**	
		n	**%**	***n***	**%**	***n***	**%**
Sex	Female	9,024	56.8	3,121	55.5	5,903	57.5
	Male	6,858	43.2	2,499	44.5	4,359	42.5
Pell recipient status	Pell recipient	5,613	35.3	1,966	35.0	3,647	35.5
	Non-Pell recipient	10,269	64.7	3,654	65.0	6,615	65.5
Race and Ethnicity	American Indian or Alaska Native	39	0.25	17	0.3	22	0.2
	Asian	2,561	16.1	872	15.5	1,689	16.5
	Black or African American	1,281	8.1	481	8.6	800	7.8
	Hispanic	4,346	27.4	1,336	23.8	3,010	29.3
	Native Hawaiian or Other Pacific Islander	282	1.8	117	2.1	165	1.6
	Nonresident alien	341	2.2	122	2.2	219	2.1
	Two or more races	1,463	9.2	442	7.9	1,021	9.9
	Unknown	163	1.0	84	1.5	79	0.8
	White	5,406	34.0	2,145	38.2	3,261	31.8
Mother's Education	Less than HS graduate	1,092	6.9	355	6.3	737	7.2
	HS graduate or equivalent	4,569	28.8	1,641	29.2	292	28.5
	Some college	4,455	28.1	1,568	27.9	2,888	28.5
	Bachelor's level degree	4,858	30.6	1,743	31.0	3,115	30.4

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Variable		Fall 2010-2014 (*N* = 15,882)		Fall 2010-2011 (*N* = 5,620)		Fall 2012-2014 (*N* = 10,262)	
		n	%	*n*	%	*n*	%
	Master's level degree	0	0.0	0	0.0	0	0.0
	Not indicated	907	5.7	313	5.6	594	5.8
Father's Education	Less than HS graduate	1,121	10.9	352	6.3	769	7.5
	HS graduate or equivalent	4,725	29.8	1,655	29.5	3,071	29.9
	Some college	3,696	23.3	1,300	23.1	2,395	23.3
	Bachelor's level degree	4,613	29.1	1,758	31.3	2,855	27.8
	Master's level degree	1	0.0	0	0.0	1	0.0
	Not indicated	1726	7.1	555	9.9	1,171	11.4
Campus residency	No	13,276	83.6	4,591	81.7	8,685	84.6
	Yes	2,606	16.4	1,029	18.3	1,577	15.4

Variables of Interest

The variables included in the analysis were student variables, enrollment variables, and outcome measures. Student variables were high school unweighted GPA (HSGPA), SAT or ACT scores, sex, race/ethnicity, Pell recipient status, age, and father's and/or mother's highest education level. To separately identify the contribution of participation and FYS grades to college retention and completion, we must distinguish the gain associated with the FYS course from other factors that are known to affect college performance. For this reason, we included in our statistical model factors that are often cited as influencing college achievement (Adelman, 1999, 2006; Attewell et al., 2012; Kuh et al., 2006; Pascarella & Terenzini, 2005). HSGPAs were acquired from students' official high school transcripts and measured on a 4-point scale. The SAT and ACT scores were from the official test agencies of ETS and ACT. Test scores were not required for admissions, so most students submitted scores for only one of the exams. To handle missing scores, we used ACT/SAT concordance tables to estimate for those whose SAT scores were missing. Age, sex, and race/ethnicity were self-reported. The race and ethnicity categories were based on the Integrated Postsecondary Education Data System (IPEDS) definition (see Table 1). Pell recipient status refers to whether a student

received a Pell Grant, which is awarded mostly to low-income students based primarily on the student's or parents' income for the previous year (Wei & Horn, 2002). Father's and mother's highest education was self-reported and was categorized on a range from *less than high school to doctorate*. We also included the number of advance days a student applied for admissions (i.e., *application submission advanced days*), calculated by taking the beginning date of the Fall semester and subtracting the date the student submitted the application, as Pike et al. (2011) demonstrated that students who apply earlier for university admissions are more motivated to attend and succeed in college.

To collect student enrollment information for this study, we included the variables cohort term, FYS courses offered in the Fall and Spring terms of the first year, application submission advanced days, an indicator of FYS enrollment for Fall or Spring of the first year, beginning-of-term (BOT) GPA and credits for the term in which a student takes an FYS course for the first time, BOT cumulative GPA and credits, subject of FYS, instructor type of FYS, and career semester credits. Instructor type was designated as permanent faculty; administrator; administrator letter of appointment (LOA; i.e., part-time instructors); LOA, temporary (i.e., nontenure-track teaching faculty or visiting faculty); graduate assistant; and other, as instructor type has been found in previous studies to moderate the relationship between FYS and retention and performance (Permzadian & Crede, 2016). To single out the FYS effect from other campus-wide student success initiatives, such as the *15-to-Finish* enrollment intensity initiative that has been identified as a significant predictor of student retention and graduation at this Institution (Crooker et al., 2021) and in other studies (Adelman, 1999, 2006; Attewell et al., 2012; Attewell & Monaghan, 2016; Doyle, 2011), we collected career semester credits, which are the credit hours attempted in the first Fall term during the undergraduate career, similar to the methodology of Attewell and colleagues (2012).

Outcome measures for this study were retention, first-Fall GPA (without FYS performance), and 6-year graduation. Retention was measured by Fall-to-Fall retention, which was determined based on enrollment information collected at each Fall semester beginning-of-term census. The methodology aligned with the federally accepted definition of the first-year retention utilized for IPEDS reporting. Term-specific GPA data were collected from the end-of-term enrollment census. We focused our examination on the first-Fall GPA without FYS performance to estimate the FYS effect due to the possible correlation between first-Fall GPA and FYS grades. Graduation information involved a 6-year graduation rate, which indicated the percentage of students from the Fall FTFT cohort who graduated within 6 years (150% of normal time), also identical to the IPEDS methodology.

Empirical Strategy

As all incoming first-year students were required to take an FYS course during their first academic year or prior to completing 30 credits (some students still did not enroll in any FYS section during their first year of college and were excluded from analysis), we grouped

Fall 2010 and Fall 2011 data before FYS implementation with Fall 2012, Fall 2013, and Fall 2014 data to compare outcomes of FYS participants with FYS nonparticipants in terms of retention, performance, and completion, controlling for variables that have been found associated with student outcomes in the existing literature.

To address the first research question of this study, we compared FYS participants and nonparticipants regarding retention and graduation rates using descriptive statistics and chi-square tests. To answer the second research question of this study, we employed a probit model to estimate the likelihood of retention to the second Fall and 6-year graduation, focusing on the effects of FYS participation and FYS grades, and used a GLM to estimate the first-Fall GPA without FYS performance. A decision tree random forest was performed to determine the importance of the variables selected in predicting retention, first-Fall GPA, and graduation. We used no FYS grade, female, non-first generation, non-Pell, American Indian or Alaska Native, bachelor's for parent's education, not enrolled in an FYS section, term code Fall 2010, subject TCA (an FYS course offered by the College of Hospitality), instructor type: temporary as the reference group for the model estimates. In addition, we calculated the odds ratios for retention and graduation by FYS participation and FYS grade. To create a comparison group for the odds ratio calculation, we set student age, HSGPA, SAT scores, first-Fall career semester credits, and application submission advanced days to the average as a *composite group*. This composite group served as a basis of student profile, which helps illustrate and visualize the comparison of the student performance.

Results

Retention and Graduation Rates by FYS Enrollment and FYS Grade

Table 2 presents the descriptive statistical results of FYS and student outcomes measured by retention to second Fall, third Fall, fourth Fall, and 4-year and 6-year graduation. Overwhelming statistical evidence revealed that FYS participants were retained at higher rates than FYS nonparticipants to the second Fall (78.7% vs. 74.2%, $\chi^2(1, N = 15{,}882) = 42.65$, $p < .01$), third Fall (70.0% vs. 64.1%, $\chi^2(1, N = 15{,}882) = 60.50$, $p < .01$), and fourth Fall terms (64.4% vs. 56.6%, $\chi^2(1, N = 15{,}882) = 97.22$, $p < .01$) (see Table 2). Moreover, we found overwhelming statistical evidence that 4-year (18.0% vs. 12.2%, $\chi^2(1, N = 15{,}882) = 104.99$, $p < .01$) and 6-year (46.4% vs. 40.4%, $\chi^2(1, N = 8{,}603) = 22.83$, $p < .01$) graduation rates were significantly higher for FYS participants than FYS nonparticipants (see Table 2).

Overall, FYS students were retained and graduated within 6 years at a higher rate than were FYS nonparticipants (see Figures 1 and 2). The retention rate to the second Fall for students earning a C+ in FYS was 77.9%, while for FYS nonparticipants it was 72.6% (see Figure 1). Six-year graduation rate for students earning a B in FYS was 43.2%, while for FYS nonparticipants it was 40.5% (see Figure 2).

Table 2
Descriptive Results of Student Outcomes by Fall FYS Enrollment

Student outcomes		Not retained/ Not graduated (#/%)	Retained/ graduated (#/%)	Total	χ^2	*p*
Retained to second fall	Not enrolled in FYS	2,359 (25.8)	6,785 (74.2)	9,144		
	Enrolled in FYS	1,437 (21.3)	5,301 (78.7)	6,738		
	Total	3,796	12,086	15,882	42.65	0.001**
Retained to third fall	Not enrolled in FYS	3,284 (35.9)	5,860 (64.1)	9,144		
	Enrolled in FYS	2,023 (30.0)	4,715 (70.0)	6,738		
	Total	5,307	10,575	15,882	60.50	0.001**
Retained to fourth fall	Not enrolled in FYS	3,965 (43.4)	5,179 (56.6)	9,144		
	Enrolled in FYS	2,399 (35.6)	4,339 (64.4)	6,738		
	Total	6,364	9,518	15,882	97.22	0.001**
Four-year graduation	Not enrolled in FYS	8,031 (87.8)	1,113 (12.2)	9,144		
	Enrolled in FYS	5,526 (82.0)	1,212 (18.0)	6,738		
	Total	13,557	2,325	15,882	104.99	0.001**
Six-year graduation	Not enrolled in FYS	3,958 (59.6)	2,681 (40.4)	6,638		
	Enrolled in FYS	1,052 (53.6)	912 (46.4)	1,964		
	Total	5,010	3,593	8,603[a]	22.83	0.001**

[a]The total does not add up to 15,882 because the Fall 2013 and Fall 2014 cohorts do not have 6-year graduation information.

** $p < .01$.

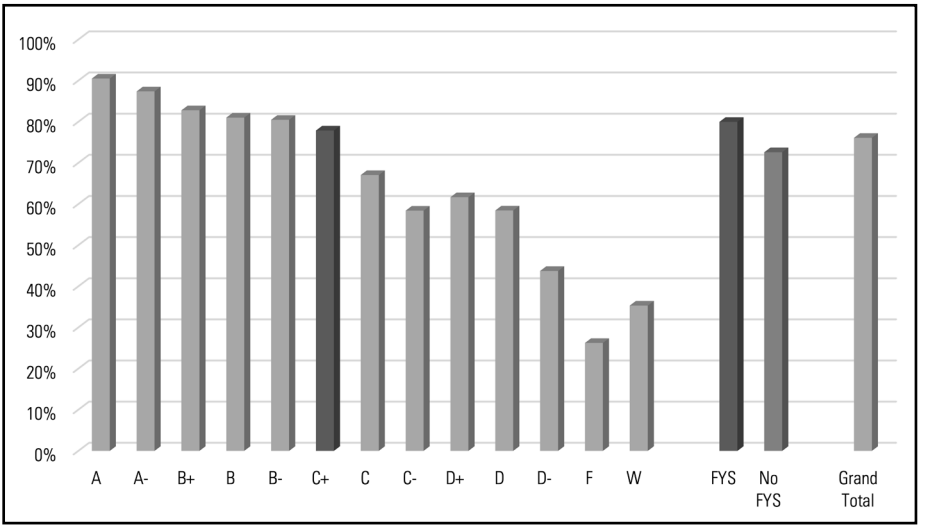

Figure 1. Retention rate by FYS grade.

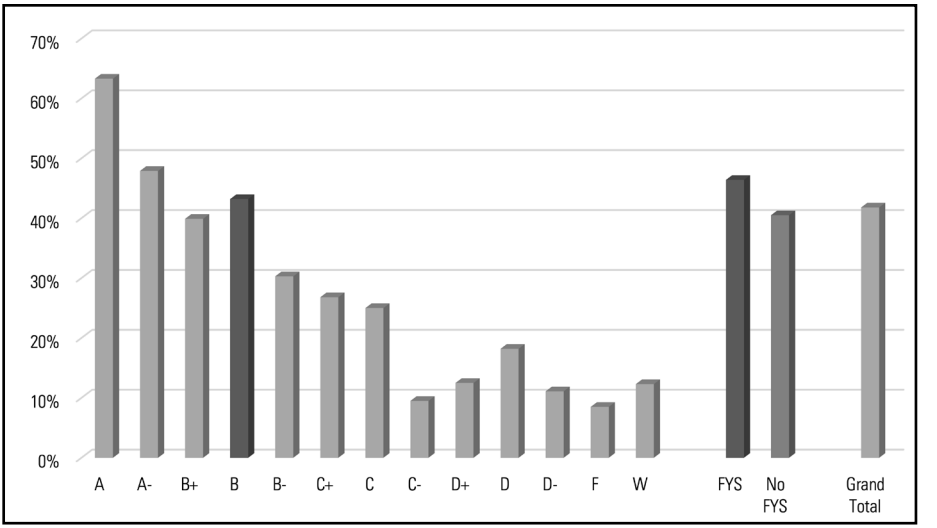

Figure 2. Six-year graduation rate by FYS grade.

Likelihood and Odds Ratios for Retention by FYS Enrollment and FYS Grade

Model Coefficients

Tables 3.1 through 3.4 present the probit model coefficients for retention to the second Fall. The pseudo-R^2 of the model is 0.16. The results revealed that FYS grade, first-Fall career semester credits, application submission advanced days, and cohort term, along with HSGPA and SAT scores, were statistically significant predictors of retention to the second Fall (see Tables 3.1 through 3.4). The results from a decision tree random forest revealed that HSGPA, application submission advanced days, SAT scores, FYS grade, and first-Fall career semester credits were the most important predictors of retention to the second Fall (see Table 4). Age, sex, Pell recipient status, race/ethnicity, father's or mother's education, and instructor type were not significant predictors of retention to the second Fall.

We estimated the likelihood of second-Fall retention for FYS participants and nonparticipants and calculated odds ratios among students who earned a different grade for FYS, as the FYS grade was a significant predictor of retention from the results of the probit model (see Tables 3.1 through 3.4). The estimated coefficient on the indicator variable for a student enrolling in an FYS in the first Fall (Fall FYS) was negative and statistically significant (see Table 3.3). The coefficient estimate on the indicator variable for a student enrolling in an FYS in the first Spring (Spring FYS) was negative but not statistically different from zero.

At first glance, it may seem that these results suggested that the FYS may result in poorer retention behavior; however, we noted that the marginal impact of enrolling in an FYS was not being captured only by this indicator variable. Students who enrolled in an FYS also received a course letter grade. We separately measured the influence of a student in an FYS earning each respective grade, including A, A–, B+, B, B–, C+, C, C–, D+, D, D–, F, AD (Audit), I (Incomplete), S (Satisfactory), and W (Withdrawal). The impacts of FYS grade appeared in Table 3.1. The total marginal impact of enrollment in an FYS would include the indicator variable associated with the relevant course grade, the subject prefix in which the student's enrolled FYS was attempted (see Table 3.1), the instructor effect (see Table 3.2), and the term the student enrolled in the FYS (Fall FYS or Spring FYS) and term code (see Table 3.3). To aid with the interpretation, we constructed odds ratios as explained later in this section.

We used our calculated composite group to examine the odds ratios for retaining to the second Fall by FYS enrollment and FYS grade. Table 5 presents ratios that measured the probability a student enrolled in an FYS earning a particular letter grade and was retained divided by the probability of retaining with no FYS enrollment. A ratio greater than 1 indicated that the probability of retaining with the indicated letter grade was greater than the probability of retaining with no FYS. Table 6 presents the ratios that measured the probability of retaining while earning an A grade in an FYS versus the other letter grade outcomes in an FYS. The ratios greater than 1 indicated that students earning an A in an FYS were more likely to retain relative to the other letter grades.

Table 3.1
Model Coefficients for Retention to the Second Fall (FYS Grade Effects)

	Estimate	**Std. error**	***z* value**	**Pr (>|z|)**
FYS final grade A	1.6595	0.2423	6.8495	0.0001**
FYS final grade A-	1.5950	0.2467	6.4646	0.0001**
FYS final grade B+	1.3950	0.2475	5.6367	0.0001**
FYS final grade B	1.3061	0.2453	5.3252	0.0001**
FYS final grade B-	1.3208	0.2511	5.2610	0.0001**
FYS final grade C+	1.1124	0.2559	4.3473	0.0001**
FYS final grade C	0.9659	0.2493	3.8751	0.0001**
FYS final grade C-	0.7346	0.2651	2.7706	0.0056**
FYS final grade D+	0.7647	0.2882	2.6531	0.0080**
FYS final grade D	0.6581	0.2611	2.5206	0.0117*
FYS final grade D-	0.3185	0.3043	1.0467	0.2952
FYS final grade F	-0.0897	0.2472	-0.3630	0.7166
FYS final grade AD	0.7318	0.6204	1.1796	0.2382
FYS final grade I	0.7992	0.3258	2.4535	0.0141*
FYS final grade S	1.0998	0.5631	1.9531	0.0508
FYS final grade W	0.0354	0.2557	0.1385	0.8899
Subject BUS	-0.0854	0.1001	-0.8531	0.3936
Subject CFA	-0.0981	0.0991	-0.9897	0.3223
Subject COE	-0.0671	0.1194	-0.5619	0.5742
Subject COLA	-0.0223	0.0843	-0.2650	0.7910
Subject EGG	0.0463	0.0906	0.5110	0.6093
Subject GSC	-0.1286	0.0936	-1.3735	0.1696
Subject HON	0.7912	0.5169	1.5308	0.1258
Subject HSC	-0.0188	0.0949	-0.1980	0.8430
Subject SCI	-0.1903	0.0907	-2.0976	0.0359*

Note. Subject prefix represents the FYS course offered by that college. BUS: College of Business; CFA: College of Fine Arts; COE: College of Education; COLA: College of Liberal Arts; EGG: College of Engineering; GSC: College of Urban Affairs; HON: Honors College; HSC: School of Integrated Health Sciences; SCI: College of Sciences. *$p < .05$. **$p < .01$.

Table 3.2
Model Coefficients for Retention to the Second Fall (Instructor Effects)

	Estimate	Std. error	*z* value	Pr (>|z|)
Administrative	0.0152	0.0742	0.2052	0.8374
Administrative LOA	0.0447	0.0826	0.5417	0.5880
Graduate assistant	0.0065	0.0658	0.0994	0.9208
LOA	0.1321	0.0643	2.0556	0.0398*
Other	-0.0183	0.3316	-0.0553	0.9559
Permanent	0.1312	0.0614	2.1370	0.0326*

*$p < .05$.

Table 3.3
Model Coefficients for Retention to the Second Fall (Pre-College and Enrollment Effects)

	Estimate	Std. error	*z* value	Pr (>|z|)
Age	0.0004	0.0150	0.0285	0.9773
Fall FYS	-0.5348	0.2599	-2.0572	0.0397*
Spring FYS	-0.2101	0.2581	-0.8140	0.4156
Last high school unweighted GPA	0.2823	0.0348	8.1045	0.0001**
First fall career semester credits	0.0229	0.0091	2.5342	0.0113*
SAT combined scores	0.0005	0.0001	5.4140	0.0001**
Application submission advanced day	0.0010	0.0002	5.030	0.0001**
Sex male	-0.0443	0.0279	-1.5893	0.1120
Pell recipient Y	0.0535	0.0288	1.8598	0.0629
Term code_Fall 2011	-0.0091	0.0438	-0.2081	0.8352
Term code_Fall 2012	-0.6080	0.0585	-10.3997	0.0001**
Term code_Fall 2013	-0.6918	0.0569	-12.1585	0.0001**
Term code_Fall 2014	-0.7508	0.0560	-13.4042	0.0001**

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

Table 3.4
Model Coefficients for Retention to the 2nd Fall (Race and Ethnicity and Parents' Edu Effects)

	Estimate	Std. error	*z* value	Pr (>|z|)
Asian	0.3610	0.2435	1.4824	0.1382
Black or African American	0.1226	0.2447	0.5013	0.6162
Hispanic	0.1613	0.2420	0.6665	0.5051
Native Hawaii or Pacific Islanders	0.2432	0.2589	0.9393	0.3476
Nonresident alien	0.1033	0.2641	0.3909	0.6958
Two or more	0.1605	0.2443	0.6570	0.5112
Unknown race	0.2614	0.2758	0.9476	0.3433
White	0.0873	0.2417	0.3613	0.7179
Mother ed less than HS	0.0984	0.0669	1.4716	0.1411
Mother ed HS graduate	0.0297	0.0378	0.7855	0.4321
Mother ed some college	-0.0233	0.0355	-0.6557	0.5120
Mother ed not indicated	0.0756	0.0691	1.0939	0.2740
Father ed less than HS	-0.0979	0.0648	-1.5109	0.1308
Father ed HS graduate	-0.1160	0.0379	-3.0585	0.0022**
Father ed some college	-0.0494	0.0381	-1.2986	0.1941
Father ed master's level	-3.6479	36.5735	-0.0997	0.9206
Father ed not indicated	-0.1729	0.0537	-3.2231	0.0013**

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

Table 4
Variables and Their Importance in Predicting Retention to the Second Fall, First-Fall GPA, and 6-Year Graduation

Retention to the second fall		First-fall GPA		Six-Year Graduation	
Variable	**Importance**	**Variable**	**Importance**	**Variable**	**Importance**
Unweighted high school GPA	426.29	Unweighted high school GPA	4185.77	Unweighted high school GPA	370.59
Application submission advanced days	362.50	Application submission advanced days	2276.38	Application submission advanced days	284.56

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Retention to the second fall		First-fall GPA		Six-Year Graduation	
Variable	**Importance**	**Variable**	**Importance**	**Variable**	**Importance**
SAT combined score	302.71	SAT combined score	2216.45	SAT combined score	225.98
FYS grade	168.24	FYS grade	2048.50	First-fall career semester credits	87.80
First-fall career semester credits	113.20	First-fall career semester credits	756.39	FYS grade	52.10
Age	73.45	Age	506.09	Age	50.60
First generation status	46.66	Pell recipient status	299.65	First generation status	33.60
Pell recipient status	44.48	First generation status	293.81	Sex (Female)	33.02
Sex (Female)	43.98	Sex (Female)	293.38	Pell recipient status	32.47
Underrepresented minority (URM)	42.80	URM	287.89	URM	31.39
FYS no grade	26.99	FYS no grade	261.02	Fall FYS	14.55
Subject COLA	20.42	Fall FYS	212.35	Instructor GA	11.81
Fall FYS	20.10	Subject SCI	147.27	FYS no grade	11.64
Instructor GA	19.47	Spring FYS	126.49	Instructor ADM	10.74
Instructor temporary	17.33	Instructor GA	119.06	Spring FYS	9.93
Subject SCI	16.67	Subject COLA	100.52	Subject COLA	9.89
Spring FYS	16.36	Instructor LOA	89.68	Instructor temporary	8.76
Subject GSC	15.85	Subject EGG	85.88	Instructor LOA	8.69

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Retention to the second fall		First-fall GPA		Six-Year Graduation	
Variable	**Importance**	**Variable**	**Importance**	**Variable**	**Importance**
Instructor LOA	15.57	Instructor temporary	85.52	Instructor permanent	8.39
Instructor permanent	15.41	Subject HON	85.22	Subject HSC	8.33
Subject HSC	14.30	Subject HSC	84.13	Subject TCA	7.80
Instructor ADMLOA	14.12	Instructor permanent	71.55	Subject BUS	7.54
Subject BUS	13.95	Subject TCA	68.66	Instructor ADMLOA	7.33
Subject EGG	13.94	Instructor ADM	68.34	Subject EGG	7.22
Instructor ADM	13.77	Subject BUS	63.47	Subject CFA	7.07
Subject CFA	12.11	Instructor ADMLOA	59.07	Subject SCI	6.93
Subject TCA	11.48	Subject GSC	54.67	Subject GSC	5.62
Subject COE	9.20	Subject CFA	53.73	Subject COE	3.05
Subject HON	5.34	Subject COE	47.88	Subject HON	2.55

Table 5, Table 6, and Figure 3 present the comparison of retention odds ratio and retention likelihood by FYS enrollment and FYS grade for Hispanic students. Since the probit model suggested race/ethnicity did not significantly predict retention to the second Fall (see Tables 3.1 through 3.4), we presented examples of Hispanic student comparisons. The results show that the odds of a student being retained to the second Fall increased by 68% given the A grade relative to a non-FYS student. The odds of a student being retained to the second Fall increased by 37% given the C grade relative to an FYS nonparticipant (see Table 5). The odds of a student being retained to the second Fall increased by 166% given the A grade relative to the F grade and by 23% relative to a student who earned a C in the FYS (see Table 6).

Table 5
Retention Odds Ratios by FYS Enrollment

Description	Odds Ratio
Pr(RET 2nd Fall|Grade=F)/Pr(RET 2nd Fall|No FYS)	0.629
Pr(RET 2nd Fall|Grade=D-)/Pr(RET 2nd Fall|No FYS)	0.921
Pr(RET 2nd Fall|Grade=D)/Pr(RET 2nd Fall|No FYS)	1.166
Pr(RET 2nd Fall|Grade=D+)/Pr(RET 2nd Fall|No FYS)	1.238
Pr(RET 2nd Fall|Grade=C-)/Pr(RET 2nd Fall|No FYS)	1.218
Pr(RET 2nd Fall|Grade=C)/Pr(RET 2nd Fall|No FYS)	1.366
Pr(RET 2nd Fall|Grade=C+)/Pr(RET 2nd Fall|No FYS)	1.448
Pr(RET 2nd Fall|Grade=B-)/Pr(RET 2nd Fall|No FYS)	1.551
Pr(RET 2nd Fall|Grade=B)/Pr(RET 2nd Fall|No FYS)	1.544
Pr(RET 2nd Fall|Grade=B+)/Pr(RET 2nd Fall|No FYS)	1.582
Pr(RET 2nd Fall|Grade=A-)/Pr(RET 2nd Fall|No FYS)	1.656
Pr(RET 2nd Fall|Grade=A)/Pr(RET 2nd Fall|No FYS)	1.676

Table 6
Retention Odds Ratios by FYS Grade

Description	Odds Ratio
Pr(RET 2nd Fall|Grade=A)/Pr(RET 2nd Fall|Grade=F)	2.663
Pr(RET 2nd Fall|Grade=A)/Pr(RET 2nd Fall|Grade=D-)	1.819
Pr(RET 2nd Fall|Grade=A)/Pr(RET 2nd Fall|Grade=D)	1.437
Pr(RET 2nd Fall|Grade=A)/Pr(RET 2nd Fall|Grade=D+)	1.353
Pr(RET 2nd Fall|Grade=A)/Pr(RET 2nd Fall|Grade=C-)	1.376
Pr(RET 2nd Fall|Grade=A)/Pr(RET 2nd Fall|Grade=C)	1.227
Pr(RET 2nd Fall|Grade=A)/Pr(RET 2nd Fall|Grade=C+)	1.157
Pr(RET 2nd Fall|Grade=A)/Pr(RET 2nd Fall|Grade=B-)	1.081
Pr(RET 2nd Fall|Grade=A)/Pr(RET 2nd Fall|Grade=B)	1.085
Pr(RET 2nd Fall|Grade=A)/Pr(RET 2nd Fall|Grade=B+)	1.059
Pr(RET 2nd Fall|Grade=A)/Pr(RET 2nd Fall|Grade=A-)	1.012

Perhaps surprisingly, the model showed that a student earning a D letter grade in FYS was still 1.166 times more likely to retain to the second Fall than was a student who had no FYS experience (see Table 5). While this finding may not be significant, a literal interpretation of the model suggested that after controlling for known factors influencing

retention to the second Fall, performance in the FYS is indicative of this retention. Again, intuitively, as student performance fell further below the "A" level, the likelihood of retention fell as well. Also, letter grades in the "A–" to "C" range may not imply significantly lower rates of retention; the model suggested systemic underperformance for non-"A" grade earners.

Figure 3 also illustrates the probability of retention to the second Fall for the composite group. For the composite group, the probability of retaining to the second Fall was about 54% without enrolling in FYS (the dotted line), and the institution average retention rate for the FTFT degree-seeking cohort was about 76% (the dashed line) for this group of students. For students enrolled in FYS who earned a "C" or better grade, the likelihood of retaining to the second Fall increased (the solid line).

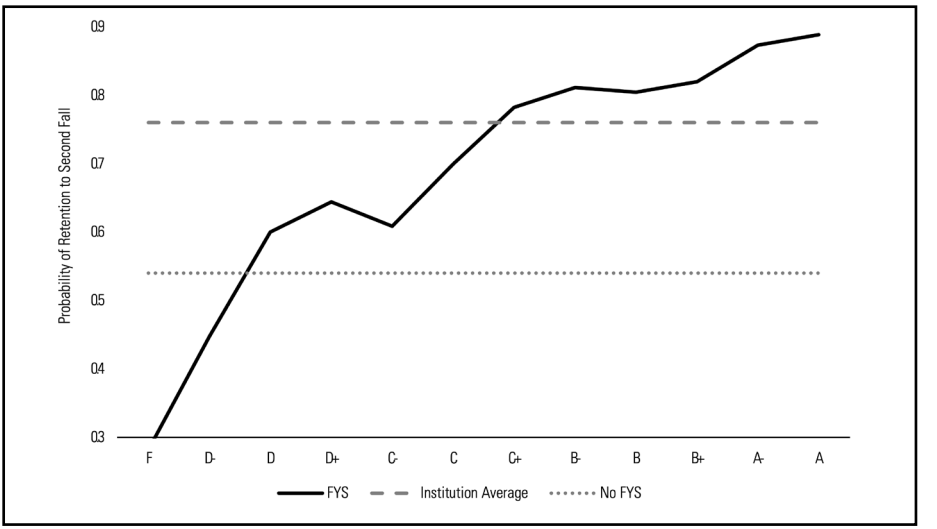

Figure 3. FYS grade and retention likelihood for Hispanic, female, non-Pell recipient, Fall 2012, permanent instructor, COLA, mother ed bachelor, father ed HS graduate.

FYS, FYS Grade, and First-Fall GPA

Tables 7.1 through 7.4 present the model coefficients for the first-Fall GPA without FYS. Overall, the model explains about 33% of the total variation in first-Fall GPA, $F(61, 13{,}181) = 107.6$, $p < .001$. The results indicated that FYS grade, first-Fall career semester credits, application submission advanced days, FYS subject, and instructor type of FYS, along with HSGPA, SAT score, age, and sex, were the most important and statistically significant predictors of first-Fall GPA, while Pell recipient status, race and ethnicity, and parent's highest education were not significant for first-Fall GPA (see Tables 7.1 through 7.4 and Table 4).

As with retention, we examined the marginal impact of attempting an FYS broken down across several variables, including the indicator variable capturing the student's letter grade in the course and the FYS course subject prefix (see Table 7.1), the FYS instructor type (see Table 7.2), the term type the student enrolled in the FYS (Fall FYS and Spring FYS), and the term code (see Table 7.3).

The model also indicated that students who participated in the FYS (see Table 7.3) and earned a "C" or better letter grade (see Table 7.1) were expected to earn a higher first-Fall GPA than FYS nonparticipants, holding other factors constant.

Table 7.1
Model Coefficients for First-Fall GPA (FYS Grade Effects)

	Estimate	**Std. error**	***t* value**	**Pr (>|z|)**
FYS final grade A	1.6114	0.3633	4.4350	0.0001**
FYS final grade A-	1.4610	0.3647	4.0060	0.0001**
FYS final grade B+	1.2652	0.3652	3.4642	0.0005**
FYS final grade B	1.1619	0.3648	3.1850	0.0015*
FYS final grade B-	1.0853	0.3668	2.9584	0.0031**
FYS final grade C+	0.9720	0.3701	2.6260	0.0086**
FYS final grade C	0.8243	0.3672	2.2449	0.0248*
FYS final grade C-	0.6070	0.3753	1.6175	0.1058
FYS final grade D+	0.5327	0.3878	1.3738	0.1695
FYS final grade D	0.4982	0.3742	1.3316	0.1830
FYS final Grade D-	0.3322	0.4007	0.8292	0.4070
FYS final grade F	-0.4378	0.3663	-1.1951	0.2321
FYS final grade AD	1.3111	0.7628	1.7187	0.0857
FYS final grade I	0.7408	0.4021	1.8423	0.0655
FYS final grade S	0.9937	0.4795	2.0722	0.0383*
FYS final grade W	-0.2768	0.3712	-0.7459	0.4558
Subject BUS	-0.0413	0.0690	-0.5987	0.5494
Subject CFA	0.0585	0.0682	0.8585	0.3907
Subject COE	-0.0350	0.0804	-0.4352	0.6634
Subject COLA	0.0717	0.0548	1.3075	0.1911
Subject EGG	-0.0057	0.0589	-0.0968	0.9229
Subject GSC	0.0308	0.0620	0.4966	0.6195
Subject HON	0.3373	0.3701	0.9114	0.3621

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	Estimate	Std. error	*t* value	Pr (>|z|)
Subject HSC	-0.1815	0.0658	-2.7593	0.0058**
Subject SCI	-0.4495	0.0593	-7.5783	0.0001**

Note. Subject prefix represents the FYS course offered by that college. BUS: College of Business; CFA: College of Fine Arts; COE: College of Education; COLA: College of Liberal Arts; EGG: College of Engineering; GSC: College of Urban Affairs; HON: Honors College; HSC: School of Integrated Health Sciences; SCI: College of Sciences. *$p < .05$. **$p < .01$.

Table 7.2
Model Coefficients for First-Fall GPA (Instructor Effects)

	Estimate	Std. error	*t* value	Pr (>|z|)
Administrative	-0.0201	0.0515	-0.3898	0.6967
Administrative LOA	0.0227	0.0623	0.3651	0.7151
Graduate assistant	0.0620	0.0478	1.2974	0.1945
LOA	-0.0196	0.0448	-0.4366	0.6624
Other	0.3137	0.2156	1.4548	0.1457
Permanent	0.0998	0.0430	2.3237	0.0202*

*$p < .05$.

Table 7.3
Model Coefficients for First-Fall GPA (Pre-College and Enrollment Effects)

	Estimate	Std. error	*t* value	Pr (>|z|)
Age	0.0532	0.0100	5.3247	0.0001**
Fall FYS	-0.7191	0.3692	-1.9475	0.0515
Spring FYS	0.5186	0.0370	14.0072	0.0001**
Last high school unweighted GPA	0.6842	0.0226	30.3250	0.0001**
First fall career semester credits	0.0279	0.0058	4.8376	0.0001**
SAT combined scores	0.0010	0.0001	16.3704	0.0001**
Application submission advanced day	0.0005	0.0001	3.8386	0.0001**
Sex male	-0.0832	0.0177	-4.7020	0.0001**
Pell recipient Y	0.0075	0.0183	0.4118	0.6805
Term code_Fall 2011	-0.5930	0.0294	-20.1662	0.0001**
Term code_Fall 2012	-0.4568	0.0409	-11.1679	0.0001**
Term code_Fall 2013	-0.5434	0.0400	-13.6015	0.0001**
Term code_Fall 2014	-0.5215	0.0395	-13.1974	0.0001**

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

Table 7.4
Model Coefficients for First-Fall GPA (Race and Ethnicity and Parents' Edu Effects)

	Estimate	Std. error	*t* value	Pr (>|z|)
Asian	0.2396	0.1718	1.3946	0.1632
Black or African America	0.0885	0.1730	0.5115	0.6090
Hispanic	0.1820	0.1712	1.0629	0.2878
Native Hawaii or Pacific Islanders	0.0132	0.1810	0.0731	0.9417
Nonresident alien	0.2085	0.1829	1.1400	0.2543
Two or more	0.1111	0.1726	0.6435	0.5199
Unknown race	0.2973	0.1899	1.5652	0.1176
White	0.1514	0.1711	0.8849	0.3762
Mother ed less than HS	-0.0194	0.0420	-0.4616	0.6444
Mother ed HS graduate	-0.0367	0.0240	-1.5298	0.1261
Mother ed some college	-0.0192	0.0225	-0.8504	0.3951
Mother ed not indicated	-0.0728	0.0443	-1.6424	0.1005
Father ed less than HS	-0.0703	0.0411	-1.7089	0.0875
Father ed HS graduate	-0.0725	0.0241	-3.0121	0.0026**
Father ed some college	-0.0532	0.0239	-2.2295	0.0258*
Father ed master's level	-1.6723	0.9481	-1.7638	0.0778
Father ed not indicated	-0.0835	0.0348	-2.3978	0.0165*

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

Odds Ratios and Likelihood of 6-Year Graduation by FYS Enrollment and FYS Grade

Model Coefficients

Tables 8.1 through 8.4 present the model coefficients for 6-year graduation. The pseudo-R^2 of the model is 0.13. The results indicate again that advanced application submission day, first-Fall career semester credits, and FYS grade, along with HSGPA and SAT scores, were the most important and statistically significant predictors of 6-year graduation, while Pell recipient status, instructor type of FYS, and race and ethnicity were not significant for 6-year graduation (see Tables 8.1 through 8.4 and Table 4).

Table 8.1
Model Coefficients for Six-Year Graduation (FYS Grade Effects)

	Estimate	Std. error	*z* value	Pr (>|z|)
FYS final grade A	0.2220	0.1352	1.6418	0.1006
FYS final grade A-	0.0831	0.1575	0.5279	0.5976
FYS final grade B+	-0.0774	0.1672	-0.4629	0.6434
FYS final grade B	-0.0656	0.1552	-0.4226	0.6726
FYS final grade B-	-0.3794	0.1928	-1.9676	0.0491*
FYS final grade C+	-0.2756	0.2074	-1.3286	0.1840
FYS final grade C	-0.5281	0.1952	-2.7056	0.0068**
FYS final grade C-	-1.2162	0.3466	-3.5085	0.0005**
FYS final grade D+	-0.7895	0.4531	-1.7426	0.0814
FYS final grade D	-0.7807	0.2543	-3.0703	0.0021**
FYS final grade D-	-0.7756	0.4401	-1.7624	0.0780
FYS final grade F	-1.2160	0.2163	-5.6224	0.0000**
FYS final grade I	-0.0653	0.3309	-0.1975	0.8435
FYS final grade S	-0.0323	0.9674	-0.0333	0.9734
FYS final grade W	-1.1149	0.2908	-3.8342	0.0001**
Subject BUS	-0.2037	0.1762	-1.1559	0.2477
Subject CFA	-0.0597	0.1590	-0.3755	0.7073
Subject COE	0.1879	0.2312	0.8129	0.4163
Subject COLA	-0.0515	0.1390	-0.3705	0.7110
Subject EGG	-0.3153	0.1508	-2.0907	0.0366*
Subject GSC	-0.1016	0.1760	-0.5773	0.5637
Subject HON	0.4882	0.9412	0.5187	0.6039
Subject HSC	-0.5108	0.1452	-3.5179	0.0004*
Subject SCI	-0.4553	0.1771	-2.5714	0.0101*

Note. Subject prefix represents the FYS course offered by that college. BUS: College of Business; CFA: College of Fine Arts; COE: College of Education; COLA: College of Liberal Arts; EGG: College of Engineering; GSC: College of Urban Affairs; HON: Honors College; HSC: School of Integrated Health Sciences; SCI: College of Sciences. *$p < .05$. **$p < .01$.

Table 8.2
Model Coefficients for Six-Year Graduation (Instructor Effects)

	Estimate	**Std. error**	***z* value**	**Pr (>|z|)**
Administrative	-0.2232	0.1164	-1.9177	0.0551
Administrative LOA	0.3447	0.1399	2.4640	0.0137*
Graduate assistant	0.0504	0.1129	0.4460	0.6556
LOA	-0.0620	0.1230	-0.5035	0.6146
Permanent	-0.2232	0.1164	-1.9177	0.0551

*$p < .05$.

Table 8.3
Model Coefficients for Six-Year Graduation (Pre-College and Enrollment Effects)

	Estimate	**Std. error**	***z* value**	**Pr (>|z|)**
Age	-0.0294	0.0218	-1.3464	0.1782
Fall FYS	0.8408	0.1641	5.1242	0.0001**
Spring FYS	0.8527	0.1732	4.9246	0.0001**
Last high school unweighted GPA	0.7383	0.0438	16.8433	0.0001**
First-fall career semester credits	0.0624	0.0112	5.6073	0.0001**
SAT combined score	0.0008	0.0001	6.8039	0.0001**
Application submission advanced day	0.0024	0.0002	9.9344	0.0001**
Sex male	-0.1421	0.0344	-4.1289	0.0001**
Pell recipient Y	0.0204	0.0366	0.5562	0.5578
Term code_Fall 2011	0.0459	0.0411	1.1178	0.2636
Term code_Fall 2012	-0.4168	0.0995	-4.3640	0.0001**

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

Table 8.4
Model Coefficients for Six-Year Graduation (Race and Ethnicity and Parents' Edu Effects)

	Estimate	Std. error	z value	Pr (>|z|)
Asian	0.4044	0.3228	1.2527	0.2103
Black or African America	0.2923	0.3254	0.8983	0.3690
Hispanic	0.3498	0.3217	1.0875	0.2768
Native Hawaii or Pacific Islanders	0.4011	0.3383	1.1858	0.2357
Nonresident alien	0.7019	0.3442	2.0393	0.0414*
Two or more	0.2288	0.3252	0.7036	0.4817
Unknown race	0.3808	0.3548	1.0733	0.2832
White	0.3446	0.3211	1.0733	0.2831
Mother ed HS graduate	-0.0266	0.0473	-0.5622	0.5740
Mother ed less than HS	0.0530	0.0865	0.6123	0.5404
Mother ed not indicated	0.0541	0.0873	0.6192	0.5358
Mother ed some college	-0.0094	0.0441	-0.2129	0.8314
Father ed HS graduate	-0.1247	0.0473	-2.6392	0.0083**
Father ed less than HS	-0.1991	0.0846	-2.3529	0.0186*
Father ed master's level	-0.2166	0.0700	-3.0935	0.0020**
Father ed not indicated	-0.0526	0.0460	-1.1447	0.2523
Father ed some college	0.4044	0.3228	1.2527	0.2103

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

As shown in Table 9, the results reveal that the odds of a student graduating within 6 years increase by 145% given the A grade, relative to a student who did not enroll in FYS. The odds of a student graduating within 6 years increased by 35% given the C grade, relative to a student who did not enroll in FYS (see Table 9). The odds of a student graduating within 6 years increased by 345% given the A grade, relative to the F grade student, and by 82% relative to a student who earned a C in the FYS (see Table 10).

Figure 4 illustrates the likelihood of graduating within 6 years. For the composite group, the average probability of graduating within 6 years was less than 27% without taking FYS (the dotted line); the institution average 6-year graduation rate was about 42% (the dashed line) for the FTFT degree-seeking cohort, and for students enrolled in FYS who earned a "B" or better grade, their likelihood of graduation within 6 years increased (the solid line; see Figure 4).

Table 9
Six-Year Graduation Odds Ratios by FYS Enrollment

Description	Odds Ratio
Pr(Grad 6 Years|Grade=F)/Pr(Grad 6 Years|No FYS)	0.552
Pr(Grad 6 Years|Grade=D-)/Pr(Grad 6 Years|No FYS)	1.019
Pr(Grad 6 Years|Grade=D)/Pr(Grad 6 Years|No FYS)	1.013
Pr(Grad 6 Years|Grade=D+)/Pr(Grad 6 Years|No FYS)	1.002
Pr(Grad 6 Years|Grade=C-)/Pr(Grad 6 Years|No FYS)	0.551
Pr(Grad 6 Years|Grade=C)/Pr(Grad 6 Years|No FYS)	1.349
Pr(Grad 6 Years|Grade=C+)/Pr(Grad 6 Years|No FYS)	1.717
Pr(Grad 6 Years|Grade=B-)/Pr(Grad 6 Years|No FYS)	1.563
Pr(Grad 6 Years|Grade=B)/Pr(Grad 6 Years|No FYS)	2.033
Pr(Grad 6 Years|Grade=B+)/Pr(Grad 6 Years|No FYS)	2.015
Pr(Grad 6 Years|Grade=A-)/Pr(Grad 6 Years|No FYS)	2.253
Pr(Grad 6 Years|Grade=A)/Pr(Grad 6 Years|No FYS)	2.452

Table 10
Six-Year Graduation and Odds Ratios for FYS Grade

Description	Odds Ratio
Pr(Grad 6 Years|Grade=A)/Pr(Grad 6 Years|Grade=F)	4.445
Pr(Grad 6 Years|Grade=A)/Pr(Grad 6 Years|Grade=D-)	2.406
Pr(Grad 6 Years|Grade=A)/Pr(Grad 6 Years|Grade=D)	2.421
Pr(Grad 6 Years|Grade=A)/Pr(Grad 6 Years|Grade=D+)	2.448
Pr(Grad 6 Years|Grade=A)/Pr(Grad 6 Years|Grade=C-)	4.447
Pr(Grad 6 Years|Grade=A)/Pr(Grad 6 Years|Grade=C)	1.818
Pr(Grad 6 Years|Grade=A)/Pr(Grad 6 Years|Grade=C+)	1.428
Pr(Grad 6 Years|Grade=A)/Pr(Grad 6 Years|Grade=B-)	1.568
Pr(Grad 6 Years|Grade=A)/Pr(Grad 6 Years|Grade=B)	1.206
Pr(Grad 6 Years|Grade=A)/Pr(Grad 6 Years|Grade=B+)	1.217
Pr(Grad 6 Years|Grade=A)/Pr(Grad 6 Years|Grade=A-)	1.088

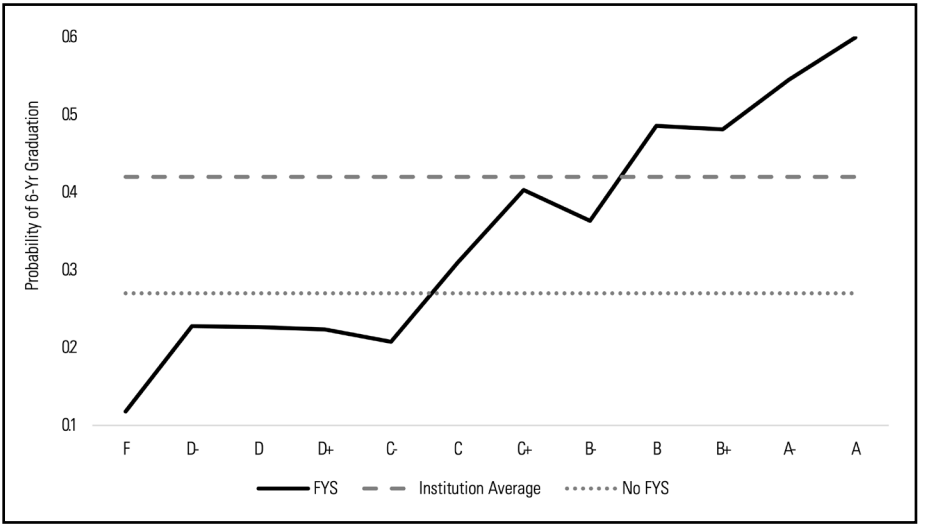

Figure 4. FYS grade and 6-year graduation likelihood for Hispanic, female, non-Pell recipient, Fall 2012, permanent instructor, COLA, mother ed bachelor, father ed HS graduate.

Discussion, Conclusion, and Implication

The purpose of this study was to explore how the FYS and FYS grades relate to student retention, academic performance, and graduation, in addition to other variables that have been widely examined in the student success literature. It was not intended to establish a causal relationship between FYS and FYS grades and these desirable student outcomes. Although participants of this study were drawn from several FTFT cohorts before and after FYS launched, the results of this study are limited to the FYS courses offered at one R1 institution, which is not representative of all types of FYS courses at different colleges and universities (Pike et al., 2011). Future cross-institutional collaboration would help identify the impact of the institutional type.

Regardless of these limitations, the findings of this study contribute to the knowledge base of FYS effectiveness in several ways. First, this study provides empirical evidence showing the positive effects of FYS participation and FYS grades on retention, GPA, and graduation, which echoes prior studies of FYS that collectively suggest that FYS enrollment increases the likelihood of retention and graduation (e.g., Barton & Donahue, 2009; Fidler, 1991; Jenkins-Guarnieri et al., 2014-2015; Miller & Lesik, 2014-2015; Pascarella & Terizinni, 2005; Porter & Swing, 2006; Schnell et al., 2003).

The findings confirm that student engagement makes a difference in student success. From the student involvement, integration, and engagement perspectives (Astin, 1984; Kuh, 2009; Tinto, 1975), student engagement in purposefully educational activities, like

FYS, is positively correlated to student success (Pascarella & Terenzini, 2005). From the institutional perspective, actively engaging and supporting students upon their embarking in higher education would encourage students to strive for their educational goals (Schnell & Doetkott, 2002-2003). We argue not only that FYS should operate as a GE course, but it could also be a vehicle of student engagement. Therefore, it is essential for the institution to intentionally create curricula and other learning opportunities and provide resources and a variety of purposeful educational activities to engage students (Kuh, 2001, 2009).

Second, methodologically, we employed a probit model and a GLM to estimate the effects of FYS participation and FYS grades on the likelihood of retention to the second Fall and 6-year graduation, and we calculated odds ratios of retention and graduation likelihood by FYS participation and FYS grades. The methods have not commonly been used in the studies of the FYS effectiveness, and this may inspire researchers, IR professionals, and campus leaders to examine the FYS effect at their home campuses in a more rigorous fashion. To examine the FYS effect, future studies may use other robust analytic approaches, for example, difference-in-differences (e.g., Furquim et al., 2020), synthetic control methods (e.g., Crooker et al., 2021; Li, 2017), or propensity score matching (Clark & Cundiff, 2011; Lang, 2007; Schnell & Doetkott, 2002-2003; Herzog, 2014). Using instrumental variables would also account for the confounding of the self-selection bias (Pike et al., 2011).

We also included the credits enrolled in the first Fall term to closely examine the effect of FYS in conjunction with the effects of other possible campus-wide student success initiatives, such as *15-to-Finish* programs. The findings of this study confirm what researchers have discovered in *15-to-Finish* effectiveness studies (Adelman, 1999, 2006; Attewell & Monaghan, 2016; Attewell et al., 2012; Crooker et al., 2021; Doyle, 2011). These studies reveal the importance of timely accumulation of credits and progress toward baccalaureate degree completion, especially during the first year of college. At an institutional level, encouraging FTFT students to enroll in at least 15 credits, especially in the first Fall semester, could ultimately improve student performance.

Application submission advanced day as a proxy of motivation to attend this Institution was a significant predictor of student performance. The idea of application submission advanced days assumes that more motivated students would complete their applications to college earlier than less motivated students would (Pike et al., 2011). The mechanism of this proxy of motivation and commitment deserves further investigation.

Finally, this research supports the literature indicating the predictive role FYS enrollment plays in retention, academic performance, and graduation (Hyers & Joslin, 1998; Starke et al., 2001; Zimmerman, 2000). More importantly, this research further supports findings that FYS grades, along with earlier signs such as attendance, classroom engagement, completion of assignments, and midterm grade, can serve as a useful, early indicator of student struggles in college (Fidler & Shanley, 1993). This finding has dramatic implications when one considers the ubiquity of institutional policies requiring all first-year students to enroll

in an FYS section (Padgett & Keup, 2011; Young & Hopp, 2014). Given the requirement of near-universal enrollment of first-year students, this research serves as evidence of the additional benefit of FYS grades in allowing institutions to identify students for targeted, proactive interventions that could promote student success in college.

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