The Relationship between Service-Learning and Degree Completion

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Only about half of all students who enroll in colleges and universities in the United States earn a four-year degree at the institution where they begin their studies, and many postsecondary institutions are seeking ways to increase the graduation rates of their students. Both student characteristics and institutional factors influence a student's likelihood of graduating, so it is important for colleges and universities to determine which institutional practices have a significant impact on degree completion. In this longitudinal, ex post facto study, a cohort of 3,458 undergraduate students who matriculated in 2005 at a large, urban public research university in the Mid-Atlantic region of the United States were followed for six years to explore the differences between students who took service-learning courses while enrolled (SL students) and those who did not take service-learning courses (non-SL students). Although SL students and non-SL students had similar pre-college academic characteristics, SL students were more successful while enrolled in college. They earned more credits, had a higher average college GPA, and they graduated at a significantly higher rate than did non-SL students, despite having greater financial need while enrolled. Discrete-time survival analysis showed that service-learning course completion during the third, fourth, and sixth years of enrollment was a significant predictor of graduation for students in this cohort who persisted until the third year. These findings demonstrate that the impact of service-learning on degree completion is substantial, even when traditional predictors for graduation are also considered.

Higher education degree completion rates in the United States are unacceptably low. The national average for finishing a bachelor's degree within six years of starting college has hovered around 50% for several decades (Nelson Laird, Chen, & Kuh, 2008; Tinto, 2003). At four-year public universities and colleges, the persistence to completion rate for students finishing at the same institution where they began is even lower at 45.5% (Tinto, 2012).

In global comparisons, the United States has steadily fallen behind other nations in college completion, ranking 15th among 29 countries compared in a recent study by the National Center for Public Policy and Higher Education (2008). Among 25- to 34-year-olds, the nation has fallen to 10th in the proportion of the population with an associate's degree or higher. This trend reflects the lack of significant improvement in the rates of college participation and completion in recent years, and points to a decline in educational capital among Americans (National Center for Public Policy and Higher Education).

The economic benefits of earning a college degree are far-reaching. In 2008, the median income for Americans with a bachelor's degree working full-time year-round was $21,900 higher than the median income for those with only a high school degree. Among Americans between the ages of 20 and 24, unemployment rates are 2.6 times higher for high school graduates when compared with college graduates (Baum, Ma, & Payea, 2010). Federal, state, and local governments also reap benefits from college graduates through increased tax revenues and lower spending on income support programs. For example, in 2008, less than 2% of individuals aged 25 and older in households with at least a bachelor's degree relied on the federal Food Stamp Program, while 8% of households with only high school graduates received these benefits. The difference in proportions is similar for households utilizing the National School Lunch Program (Baum et al.).

Colleges and universities across the U.S. are enrolling increasing numbers of historically underrepresented groups such as minority and first-generation students (Pike & Kuh, 2005), and degree completion rates for these groups lag behind national averages. Of the students who enrolled in four-year institutions in the fall of 1995 with the goal of completing a bachelor's degree, only 46% of African Americans and 47% of Hispanics had completed a bachelor's degree within six years, while 67% of white students graduated during the same period of time (Swail, Redd, & Perna, 2003). Even with the availability of financial aid, such as the Pell Grant, students from low-income families are less likely than those from higher-income families to earn a bachelor's degree (Swail et al.). Given the increased enrollment and lower graduation rates of these historically underrepresented student groups, many

postsecondary institutions are actively seeking ways to help minorities and low-income students persist and complete their university degrees (Swail et al.).

Theoretical Framework

Understanding the factors that correlate with persistence and degree completion is essential to increasing the number of college graduates. Tinto (1975) laid the foundation for studying the factors most often associated with student attrition and persistence in college. His conceptual model defines the complex processes that cause individuals to drop out of college. Astin (1991) provides a simpler framework that focuses on the importance of considering both inputs (i.e., student and institutional characteristics) and environmental factors (i.e., institutional practices) when evaluating student outcomes in education.

Student characteristics commonly associated with persistence and degree completion include academic preparedness, gender, race/ethnicity, financial aid, and concern about financing college. In many studies, female students are more likely to persist than male students (Arredondo & Knight, 2006; Astin, 2005; Attewell, Heil, & Reisel, 2011; Chimka, Reed-Rhoads, & Barker, 2007; Guillory, 2008; Lewallen, 1993; Mohn, 2006; Terenzini & Pascarella, 1978). In most studies, white and Asian students are more likely to be completers than black or Hispanic students (Arredondo & Knight; Astin; Attewell, Heil, & Reisel; Guillory; Lewallen; Mohn; Terenzini & Pascarella). Both high school GPA and SAT scores show positive correlations with student persistence in college (Arredondo & Knight; Astin; Attewell, Heil, & Reisel; Chimka, Reed-Rhoads, & Barker; Lewallen; Mohn; Terenzini & Pascarella). Inability to pay tuition is positively correlated with attrition, while financial aid that offsets need is positively correlated with persistence (Astin; Attewell, Heil, & Reisel; Bowen, Chingos, & McPherson, 2009; Gross, Hossler, & Ziskin, 2007). The most prominent institutional characteristic that positively correlates with persistence and degree completion is selectivity, the degree to which an institution admits only those students who demonstrate high levels of academic preparedness prior to admission (Astin).

Selectivity, however, does not guarantee high graduation rates; in addition, high graduation rates have been demonstrated at institutions that enroll students with lower levels of academic preparedness. This phenomenon underlies the belief that institutional practices can play a key role in increasing student retention and degree completion (Astin, 2005), particularly high-impact educational practices that increase student engagement (Kuh, Cruce, Shoup, Kinzie, & Gonyea, 2008; Nelson Laird, Chen, & Kuh, 2008).

Service-learning is a high-impact educational practice that integrates meaningful community service with instruction and reflection in a credit-bearing course. Empirical studies are beginning to demonstrate the positive impact of service-learning class completion on student outcomes. These positive impacts include increases in student academic efficacy and course grades (Markus, Howard, & King, 1993), sense of civic responsibility (Astin & Sax, 1998), and pro-social decision making (Batchelder & Root, 1994). In a recent meta-analysis, Celio, Durlak, and Dymnicki (2011) evaluated the effect sizes for service-learning outcomes in 62 studies with control group designs. Outcomes fell into five categories: attitudes toward self, attitudes toward school and learning, civic engagement, social skills, and academic achievement. Of the five areas, academic achievement showed the largest average effect size, providing strong evidence that service-learning can be an effective practice for encouraging students' academic success.

To date, few studies have investigated the relationship between students' participation in service-learning classes and their subsequent degree completion. Bringle, Hatcher, and Muthiah (2010) recently investigated the relationship between service-learning enrollment and fall-to-fall retention. The study found a positive relationship between enrollment in a fall service-learning course and intentions to continue at the same campus, even when pre-course intentions were covaried out. The same relationship was found between enrollment in service-learning courses and actual re-enrollment at the same campus the following year, but the relationship does not persist after controlling for pre-course intentions.

No large-scale, longitudinal studies currently exist that have investigated the relative impact of student characteristics and service-learning class participation on degree completion. Studies that compare degree completion patterns across time for students involved in service-learning classes with those who take no service-learning classes at all are particularly needed.

Research Questions

The purpose of this study was to identify the differences between students who take service-learning courses and those who do not, and to examine the longitudinal relationships between student characteristics, service-learning class participation, and degree completion in a large group of undergraduate students who begin as first-time college students at one institution. There were two research questions: (a) How do students who complete service-learning classes differ from students who do not participate in service-learning classes? (b) Is service-learning class participation a significant predictor for degree completion?

Method

This study utilized a quantitative nonexperimental *ex post facto* research design (McMillan, 2011) to investigate the influences of the independent variables on degree completion at a large, urban public research university in the mid-Atlantic region of the United States. Institutional data were provided by the university's Office of Planning and Decision Support for a cohort of students who entered the university during a single semester. Data were provided for all students in the cohort for each semester during the six-year period covered by the Integrated Postsecondary Education Data System (IPEDS) Graduation Rate Survey (GRS). The GRS is the measure used by the National Center for Education Statistics for disclosure and/or reporting purposes under the Student Right-to-Know Act. Files were downloaded from the university's central records system, a database which includes student information maintained electronically by the offices of admissions, financial aid, and records and registration. The design was chosen specifically because the data utilized are routinely available at most postsecondary institutions.

Participants

Participants for this study included all full-time first-time undergraduate students who were part of the fall 2005 cohort and for whom the university maintained verifiable student records (N = 3,458). The sample comprised 98% of the entering freshmen from that semester; the remaining 2% began as part-time students and are not included in the IPEDS GRS calculation. Records for 16 students in the original cohort file could not be located in the central records database by university staff, so these students were omitted from the files provided by the institution. It is assumed that these 16 individuals did not complete their first semester of enrollment and would be considered non-completers in the GRS calculation. The demographic characteristics for the sample were similar to those of the overall degree-seeking undergraduate population at the university at that time. At the time of matriculation 40% were men, 58% were white and non-Hispanic, and 90% were in-state residents at the time of matriculation. The average high school GPA for the cohort was 3.24 (on a four-point scale), and the average combined SAT score for the verbal and mathematics tests was 1077. Based on their FAFSA (Free Application for Federal Student Aid), 59% had documented financial need at some point during the course of their enrollment, and 29% received Pell Grant support for at least one semester. While 80% of black and Hispanic students had documented financial need, the proportion of white and Asian students with documented need was significantly lower at 52%. Seventy-eight percent received financial aid, which included gifts and other support that was not based on financial need.

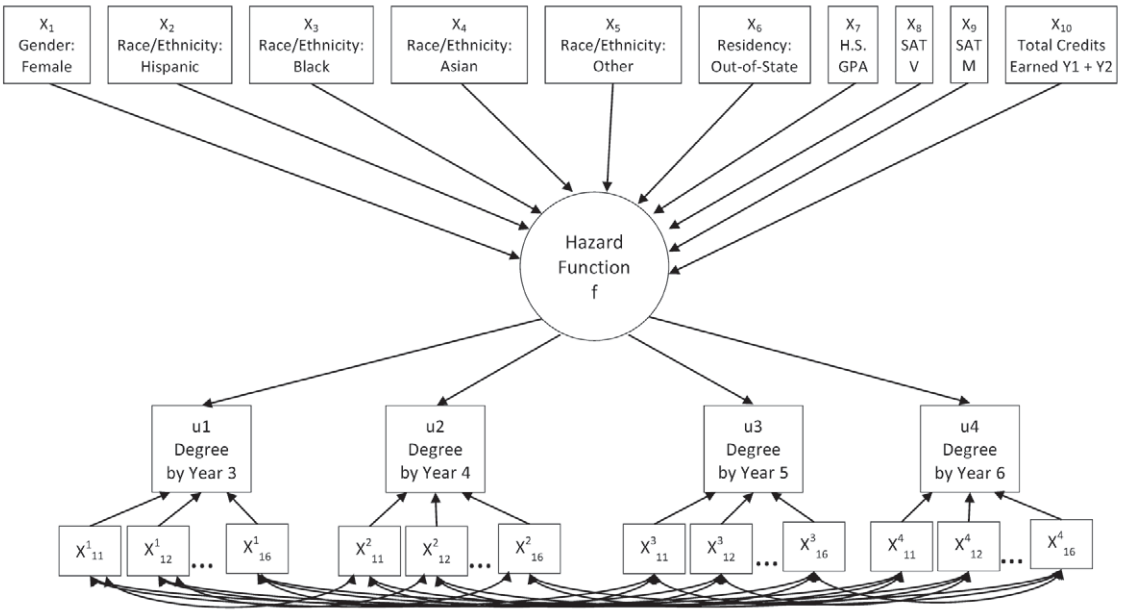
Analysis

Variables used in this study were limited to data routinely collected and/or maintained by the university. Researchers began the analysis process with five data files obtained from the university's central records database by institutional staff. These included: demographic and academic characteristic for each student at the time of admission; courses completed by these students for each semester during the six-year period; academic progress data on the students for each semester during the six-year period; financial aid data; and data on degrees awarded to students in the cohort. A sixth file was constructed by the researchers identifying service-learning courses for each semester during the time frame of the study. This file was created by cross-referencing a list of designated service-learning courses from the central database with records from the university's Service-Learning Office. This extra step was necessary to ensure that all service-learning courses identified for use in this analysis met explicit guidelines for the university's service-learning course designation. Course designation requires that every student in the class completes a minimum of 20 hours of service during the semester, and it requires documentation that the instructor incorporates reflection on the service into the course activities or assignments. During the six-year period of this study, the number of undergraduate class sections taught each year as designated service-learning courses ranged from 51 to 98, with an average of 82. Every academic college or school offered at least one service-learning course each year.

The six data files were cleaned and merged using SAS to yield a single longitudinal record for each student. From the final dataset, descriptive statistics were generated, and comparisons were made between students who participated in service-learning and those who did not. Specifically, continuous variables were tested using independent samples t-tests, and categorical variables were tested using Chi-square analyses and z-tests for difference of proportion. These tests were used to answer the first research question: How do students who complete service-learning classes differ from students who do not participate in service-learning classes?

To answer the second research question, a predictive model for the likelihood of degree completion was tested using discrete-time survival analysis. Discrete-time survival analysis is a class of statistical methods that allows researchers to study both the occurrence and timing of events[1] and their effects on an outcome (Allison, 2010). Discrete-time survival

Figure 1
Initial Discrete-time Survival Analysis Model Tested for Predicting the Odds of Degree Completion



Note. This model tests the effects of the time invariant student characteristics (X_1 through X_{10}) and the time varying covariates (X_{11} through X_{16}) for each year on the proportional odds assumption for the outcome, denoted as f. The time-invariant predictors were also allowed to correlate with each other and with each of the time-varying predictors. These correlations are not displayed due to the complexity of the diagram.

analysis has been used for predicting student attrition or drop-out (Chimka, Reed-Rhoads, & Barker, 2007; Mohn, 2006). The use of discrete-time survival analysis in studying degree completion allows the researcher to account for covariates that are time-dependent (i.e., characteristics such as financial need/aid and academic progress that change from year-to-year) and to account for students who remain enrolled throughout the period of study but who do not graduate. Discrete-time survival analysis is able to include all of these key variables that research has shown to be correlated with degree completion, thus ensuring that the effects of each variable are measured in relation to the others during each year of enrollment. Discrete-time survival analysis provides an effective way to determine the relative impact of service-learning among these other predictors for graduation across a period of time.

Several pre-screening strategies were employed to ensure that data met the assumptions for use of discrete-time survival analysis and allowed for successful model convergence. Because some of the academic schools within the university are more selective than others, one concern was that different disciplines would vary systematically by group on the outcome variable or the predictors in such a way that a single model for predicting degree completion would not converge. For this reason, a simple logistic regression model was constructed using cumulative data for each student to predict the likelihood of graduating. This model was compared by group using the student's academic discipline at the time of graduation or last enrollment. Fit statistics for the model were good, and parameter estimates were similar for all but three groups: (a) students who had not declared their major, (b) students in the health professions, and (c) students in social work. Graduation rates for these groups also differed from the other disciplines. Researchers concluded that these disciplines were outliers with respect to the dependent variable, so a decision was made to exclude the students (n = 420) from further model testing. In addition, because the outcome of interest was graduation, and no student graduated in the first two years, only students who persisted in years three through six (n = 2,402) were selected for discrete-time survival analysis. Of the subsample remaining, an additional 107 records were excluded because of missing data among the covariates. This left a final sample of 2,295 students.

The initial theoretical model for degree completion that the researchers tested is displayed in Figure 1. Analyses were conducted using Mplus. Due to the number and complexity of parameters, as well as model misidentification, the initial model failed to converge. The researchers removed covariates and reintroduced them one-by-one. The logistic regression model that had been used to pre-screen the data served as a guide for selecting covariates. During the

Table 1
Variables Examined Using Discrete-Time Survival Analysis

Variable	Level of Measurement	Time Type	Initial Model	Final Model
Gender: Female (reference group: male)	Dichotomous	Invariant	X_1	
Race/Ethnicity: Black (reference group: white)	Dichotomous	Invariant	X_2	
Race/Ethnicity: Hispanic (reference group: white)	Dichotomous	Invariant	X_3	
Race/Ethnicity: Asian (reference group: white)	Dichotomous	Invariant	X_4	
Race/Ethnicity: Other (reference group: white)	Dichotomous	Invariant	X_5	
Residency Status: Out-of-State (reference group: In-State)	Dichotomous	Invariant	X_6	
High School GPA	Continuous	Invariant	X_7	X_1
SAT Verbal Score	Continuous	Invariant	X_8	X_2
SAT Mathematics Score	Continuous	Invariant	X_9	X_3
Cumulative GPA after Last Semester of Enrollment	Continuous	Invariant		X_4
Number of Credits Earned in Years 1 and 2	Continuous	Varying	X_{10}	X_5
For Each Discrete Time Period n[a] (Year 3, Year 4, Year 5, Year 6)				
Degree Earned in Year *n* (1 = degree awarded, 0 = student still enrolled, missing = student dropped out or graduated in a preceding year)	Dichotomous	Varying	u^n	u^n
Amount of Financial Need in Year *n* (in Dollars)	Continuous	Varying	X^n_{11}	
Amount of Financial Aid Awarded in Year *n*	Continuous	Varying	X^n_{12}	
Number of semesters of Pell support in Year *n*	Continuous	Varying	X^n_{13}	
Number of Service-Learning Credits Earned during Year *n*	Continuous	Varying	X^n_{14}	X^n_6
Number of Non-SL Credits Earned during Year *n*	Continuous	Varying	X^n_{15}	X^n_7
Cumulative GPA at the End of Year *n*	Continuous	Varying	X^n_{16}	

Note. [a]For the covariates listed for each discrete time period, *n* refers to the sequence number for the time period. For Year 3, *n* = 1; for Year 4, *n* = 2; for Year 5, *n* = 3; and for Year 6, *n* = 4.

testing process, bivariate correlations for several year-to-year covariates revealed that four predictors which were hypothesized to be time varying (financial need, financial aid, semesters with Pell grant support, and cumulative college GPA) were highly correlated across time within individuals. In essence, these characteristics proved to be relatively stable for this population throughout a student's enrollment. For these variables, cumulative values were substituted as time-invariant predictors instead of the year-to-year values. By removing covariates and reintroducing them one at a time, the researchers were able to identify both the time-invariant predictors and the time-varying covariates that are most significant in predicting a student's likelihood of graduating. Table 1 displays a complete list of the covariates initially tested as well as the predictors selected for the final discrete-time survival analysis model.

Results

Descriptive Statistics and Group Comparisons

Of the 3,458 students in the complete sample, 832 (24%) took at least one service-learning class during the period of the study. The percentage of students within each academic discipline who participated in service-learning ranged from a low of 8% (students who did not declare a major) to a high of 56% (students majoring in dental hygiene). Among the disciplines included in discrete-time survival analysis for degree completion, the percentage ranged from 13% to 37%. For several demographic characteristics, the proportion of students in specific groups who took service-learning courses (SL students) differed significantly from those students who did not take service-learning courses (non-SL students). Detailed frequency distributions and comparisons are displayed in Tables 2 and 3. The percentage of female SL students was higher than the percentage of female non-SL students, χ^2 (1, N = 3,458) = 6.54, p = .011. Black/African American and Asian students were more likely to be SL students, while white students were less likely to have taken service-learning courses, χ^2 (4, N = 3,458) = 25.34, p = .000. With respect to their pre-college academic characteristics, SL students and non-SL students were similar. There were no significant differences in average SAT scores on either the verbal or mathematics tests, and, although the average high school GPA for SL students was significantly higher than the mean GPA for non-SL students, the effect size for this difference was small.

SL students and non-SL students differed most sig-

Table 2
Characteristics of Students who Took Service-Learning Courses (n = 832) and Students who did Not Take Service-Learning Courses (n = 2,626)

	Non-SL Students		SL Students			
Characteristic	*n*	%	*n*	%	$\chi^2(df)$	*p*
Gender					6.54(1)	.011
Male students	1074	41	299	36		
Female students	1548	59	536	64		
Race/Ethnicity					25.34(4)	.000
White	1556	59	433	52		
Black or African American	487	19	203	24		
Hispanic or Latino	96	4	27	3		
Asian	291	11	122	15		
Other	193	7	50	6		
Residency					2.59(1)	.107
In-State	2345	89	763	91		
Out-of-State	278	11	72	9		
Documented Financial Need					19.56(1)	.000
Students Without Need	1198	46	307	37		
Students With Need	1428	54	525	63		
Financial Aid					30.51(1)	.000
Students Without Financial Aid	637	24	126	15		
Students With Financial Aid	1989	76	706	85		
Pell Grant Support					4.03(1)	.045
Students Without Pell Support	1897	72	571	69		
Students With Pell Support	729	28	261	31		
Degree Completion Within Six Years					163.51(1)	.000
Non-completers	1373	52	224	27		
Completers	1250	48	611	73		

nificantly on measures of academic progress. SL students had a higher average GPA (M = 2.92, SD = 0.65) than the cumulative GPA for non-SL students (M = 2.57, SD = 0.93), a difference of moderate effect size. The total number of service-learning credit hours earned by SL students ranged from 0 to 14 (M = 3.28,

Table 3
Group Differences for Students who Took Service-Learning Courses (n = 832) and Students who did Not Take Service-Learning Courses (n = 2,626)

		Non-SL Students		SL Students					
	N	*M*	*SD*	*M*	*SD*	*df*	*t*	*p*	Cohen's *d*
Academic Characteristics Upon Matriculation									
High School GPA	3382	3.20	0.51	3.30	0.50	3380	-4.67	.000	0.188
SAT Verbal Score	3315	543	84.2	538	84.9	3313	1.46	.145	-0.059
SAT Mathematics Score	3315	535	77.1	535	82.9	1295	-0.08	.935	0.003
Academic Progress Indicators at the End of the Last Semester of Enrollment									
Number of Semesters Enrolled	3457	7	3.9	10	2.6	2116	-21.31	.000	0.691
Cumulative Institutional Credit Hours Earned	3457	88	53.1	122	34.1	2188	-22.04	.000	0.705
Cumulative Institutional GPA	3457	2.57	0.93	2.92	0.65	1999	-12.04	.000	0.403
Financial Aid									
Cumulative Financial Need (in dollars) for Students who Applied for Aid	1953	29,143	25,490	37,869	29,118	836	-6.07	.000	0.329
Total Aid Received (in dollars) by Students with Aid	2695	25,177	24,606	37,461	29,033	1085	-10.03	.000	0.476
Number of Semesters Supported for Students Receiving Pell	990	4.32	2.95	5.57	3.01	988	-5.84	.000	0.422
Degree Completion									
Time to Completion in Years (Students who Graduated)	1859	4.59	0.71	4.64	0.74	1859	-1.56	.119	0.071

SD = 2.02). In the first year of enrollment, only 2% of students in the sample took service-learning courses. The percentage rose to 10% in year two, and remained constant at 9% through year five. In year six, the proportion of SL students dropped to 6%. The average SL student during year one earned 2.2 service-learning credit hours. This measure includes students who enrolled in a service-learning course but did not pass the course. The average number of credit hours earned for service-learning courses rose slightly each subsequent year until the mean in year six was 3.4 credits. In terms of total credit hours earned per year, SL students surpassed non-SL students each year of the study. The yearly differences were significant, and the effect sizes were moderate. The year-to-year comparison can be found in Table 4.

With respect to measures of financial aid and ability to pay, SL students were also different than non-SL students. A significantly larger proportion of SL students had documented financial need than the percentage of non-SL students with need, χ^2 (1, N = 3,458) = 19.55, p = .000, and a larger fraction of SL students received financial aid at some point while enrolled, χ^2 (1, N = 3,458) = 30.51, p = .000. In addition, the percentage of SL students receiving Pell support was higher than the percentage of non-SL students with Pell aid, χ^2 (1, N = 3,458) = 4.03, p = .045. Frequency distribution comparisons are displayed in Table 2. With an average total financial need of $37,869 while enrolled, SL students in this sample proved to be significantly needier than non-SL students, whose total need averaged $29,143. Total aid awarded to SL students averaged $29,033, while average total aid for non-SL students was $25,177. In addition, SL students were supported by Pell grants for more semesters (M = 5.57, SD = 3.01) than non-SL students (M = 4.32, SD = 2.95). Overall, SL students had a higher level of financial need, received more total aid, and were the recipients of Pell assistance for more semesters while enrolled. The effect size for each of these significant differences was moderate.

The six-year graduation rate for the overall sample was 54%, but the proportion of students who graduated varied between some subgroups. The overall graduation rate for white students and Asian students (55%) was only slightly higher than the graduation rate for black and Hispanic students (51%). Low-income students graduated with a slightly higher frequency (56%) than students without documented financial need (50%). The most significant variation was between SL students and non-SL students. The graduation rate for non-SL students was 48%. Among SL students, however, the proportion of students who graduated was significantly higher at 73%, χ^2 (1, N = 3, 458) = 163.51, p = .000, and there was no significant difference in the time it took SL students to complete their degree. Among minority and low-income students, the differences in graduation rates were also significant. Those who took service-learning classes graduated at significantly higher rates than did minority and low-income students who did not take service-learning classes, (71% vs. 29% for minority and 72% vs. 28% for low income).

Discrete-Time Survival Analysis for Predicting Degree Completion

During the model testing process, several covariates had no significance in predicting graduation among this sample. The following variables were thus excluded from the final model: gender, all race/ethnicity indicators, residency status, financial need, financial aid, and number of semesters with Pell support. Figure 2 displays a representation of the final discrete-time survival analysis model. Table 5 displays the model summary with parameter estimates. Table 6 displays the correlations, means, and standard deviations for the variables in the final model. The time-invariant characteristics were the most significant predictors for likelihood of completion. Negative parameter estimates for the three pre-college academic characteristics (high school GPA, SAT verbal score, and SAT math score) are somewhat misleading because all three variables are positively correlated with degree completion. This occurrence is likely due to multicollinearity among the

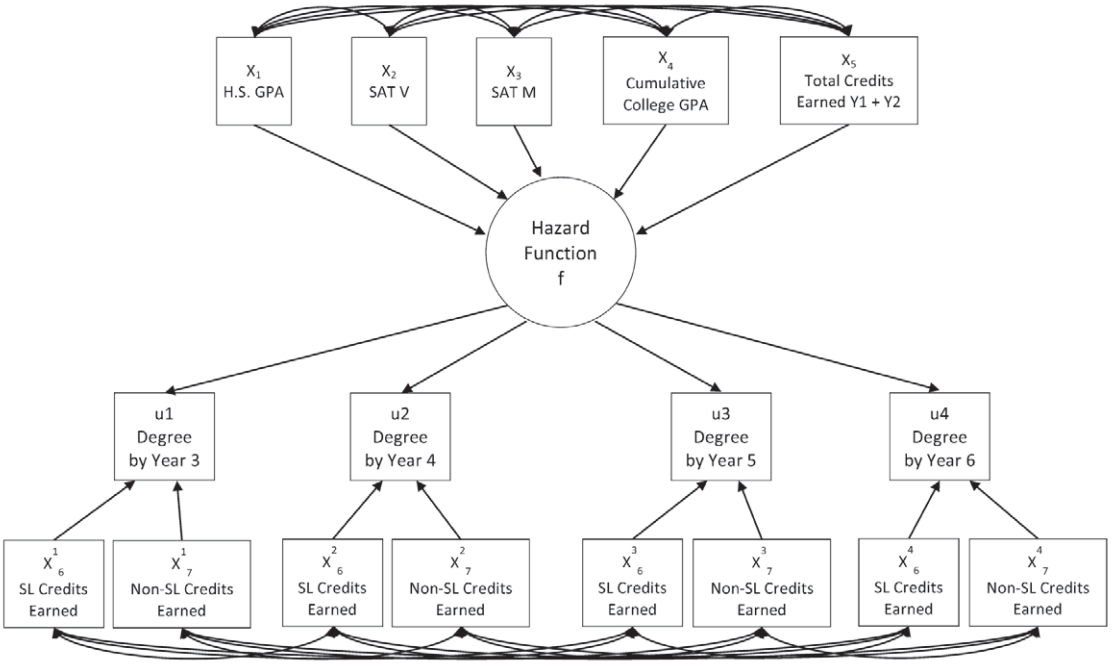
Table 4

Comparison of Total Credit Hours Earned by Year for Students Enrolled in Service-Learning Courses (SL students) and Students Not Enrolled in Service-Learning Courses (non-SL students)

		Non-SL Students		SL Students					
	N	*M*	*SD*	*M*	*SD*	*df*	*t*	*p*	Cohen's *d*
Year 1 (2005-06)	3454	27.5	12.49	32.6	12.40	-3.56	78	0.001	0.411
Year 2 (2006-07)	2931	24.9	10.55	28.1	9.85	-5.23	367	0.000	0.306
Year 3 (2007-08)	2557	25.9	10.27	29.2	8.91	-5.42	312	0.000	0.326
Year 4 (2008-09)	2329	26.0	9.39	28.0	7.87	-3.44	285	0.001	0.212
Year 5 (2009-10)	1300	19.9	10.36	25.1	8.64	-6.06	148	0.000	0.511
Year 6 (2010-11)	508	16.6	11.01	20.6	10.15	-2.02	32	0.052	0.360

Note. Statistics in this table are based on the students who were enrolled in service-learning courses for the stated year.

Figure 2
Final Discrete-time Survival Analysis Model for Predicting the Odds of Degree Completion



Note. This model tests the effects of the time invariant student characteristics (X_1 through X_5) and the time varying covariates (X_6 and X_7) for each year on the proportional odds assumption for the outcome, denoted as f.

variables, which can cause signs to flip. Among the time-varying characteristics, the number of service-learning credits earned was significant and positively correlated with degree completion in years three, four, and six, while non-SL credits were not significant in the model for any of the four years. Essentially, students who earn more SL credits in these years (i.e., by taking and passing a greater number of service-learning classes) increase their odds of graduating as they do so.

Discussion

The findings from this large-scale longitudinal study provide strong evidence that students who participate in service-learning courses during their undergraduate years are more likely to earn a baccalaureate degree than students who do not participate in service-learning coursework. In fact, SL credits were more significantly related to degree completion than non-SL credits in all but one year. This find-

Table 5
Summary of Final Discrete-Time Survival Analysis Model (N = 2,295)

Variable	*B*	*SE*	*OR*	z-score	*p*
High School GPA	-0.22	0.06	0.80	-3.64	.000
SAT Verbal Score	-1.07	0.33	0.34	-3.43	.001
SAT Math Score	-1.07	0.37	0.34	-3.05	.004
Cumulative College GPA at the End of the Last Semester of Enrollment	0.98	0.06	2.66	16.57	.000
Total Number of Credits Earned in Years 1 and 2	3.27	0.22	26.31	14.89	.000
Number of Service-Learning (SL) Credits Earned during Year 3	0.26	0.04	1.30	1.99	.046
Number of Non-SL Credits Earned during Year 3	6.18	0.52	482.99	1.30	.193
Number of Service-Learning (SL) Credits Earned during Year 4	0.15	0.05	1.16	3.35	.001
Number of Non-SL Credits Earned during Year 4	4.30	0.62	73.70	6.93	.000
Number of Service-Learning (SL) Credits Earned during Year 5	-0.03	0.08	0.97	-0.36	.719
Number of Non-SL Credits Earned during Year 5	0.45	0.73	1.57	0.61	.540
Number of Service-Learning (SL) Credits Earned during Year 6	0.34	0.17	1.40	1.98	.048
Number of Non-SL Credits Earned during Year 6	-1.32	1.25	0.27	-1.06	.289

Table 6
Zero-Order Correlations, Means, and Standard Deviations for Covariates in Final Discrete-Time Survival Analysis Model

	1	2	3	4	5	6	7	8	9	10	11	12	13
1. High School GPA	—												
2. SAT Verbal Score	.25**	—											
3. SAT Math Score	.34**	.53**	—										
4. Cumulative College GPA	.47**	.25**	.24**	—									
5. Credits Earned in Years 1 and 2	.47	.30	.32	.63	—								
6. SL Credits Earned in Year 3	.00	-.07	-.05*	.04	.03	—							
7. SL Credits Earned in Year 4	.06**	-.02	.01	.14**	.09**	.07*	—						
8. SL Credits Earned in Year 5	-.03	-.05	-.08**	.01	-.08	.02*	.03	—					
9. SL Credits Earned in Year 6	.02	-.06	-.07	.02**	-.06	-.04	-.01	.05	—				
10. Non-SL Credits Earned in Year 3	.23**	.05*	.07**	.59**	.50**	.06**	.13**	.02	.00	—			
11. Non-SL Credits Earned in Year 4	.11**	-.03	.00	.47**	.26**	.07**	.02	.05*	-.01	.56**	—		
12. Non-SL Credits Earned in Year 5	.01	-.02	.04	.25	.03**	.04	.03	.08**	.13**	.13**	.27**	—	
13. Non-SL Credits Earned in Year 6	.04	.04	.04	.16**	-.06	-.01	.00	.05	.04	-.05	-.04	.28**	—
M	3.27	.55	.54	2.88	.57	.26	.28	.23	.10	.26	.25	.19	.15
SD	.51	.09	.08	.65	.18	.01	.01	.01	.00	.11	.12	.12	.08

Note. For fitting this model, some data were standardized, so that values would fall between zero and ten. SAT scores were standardized by dividing all values by the constant 1000. Credit hours were standardized by dividing all values by the constant 100.
*$p < .05$. **$p < .01$.

ing is particularly notable for two reasons. First, only 24% of students in the cohort took a service-learning course while enrolled, and in any given year, the proportion of enrolled students taking service-learning never exceeded 10%. Despite relatively low participation, the correlation between service-learning and completion was highly significant. Second, during the process for testing and identifying a model that predicts the likelihood of graduation among this sample, several of the variables that the literature has shown to be highly correlated with completion were not as important as service-learning.

Strong academic progress, measured by credits earned and college GPA, is a significant factor in predicting completion in this sample, a finding that supports prior research which has shown that college GPA is positively correlated with persistence (Mohn, 2006; Terenzini & Pascarella, 1978). The demographic variables that have traditionally been correlated with degree completion were not particularly important among this student cohort. Neither gender, nor race/ethnicity, nor out-of-state residency was significant as a covariate in the model tested. Furthermore, financial need and financial aid variables were also insignificant. This finding is contrary to studies that have found financial need to be strongly correlated with attrition (Astin, 2005; Attewell, Heil, & Reisel, 2011; Bowen, Chingos, & McPherson, 2009; Gross, Hossler, & Ziskin; 2007), while aid tends to have a positive correlation with persistence (Astin; Attewell, Heil, & Reisel; Bowen, Chingos, & McPherson; Gross, Hossler, & Ziskin; Mohn, 2006). Among the covariates determined to be predictors for degree completion in this sample, participation in service-learning courses was significant.

The strength of the relationship between academic progress (i.e., undergraduate GPA) and degree completion and the relationship between service-learning and degree completion might lead one to wonder whether these two predictors are related. In fact, bivariate correlations between the variables in the final model (Table 6) reveal that completion of service-learning credits is not highly correlated with overall academic progress (college GPA) on a year-to-year basis. Although the correlation is statistically significant in years four ($r = .14$) and six ($r = .02$), the significance is essentially a function of the large sample size and the correlation has no practical significance. In other words, the impact of service-learning on degree completion is independent of the influence of a student's GPA.

For this sample, the relative lack of importance of traditional predictor variables, such as race/ethnicity and financial need/aid, in predicting which students will successfully graduate provides support for the claim that what universities do matters. The university in this study enrolls a large percentage of minority, first-generation, and low-income students. During the period of this study, the university initiated a variety of academic and social support programs aimed at supporting the success of all of its undergraduate students. These initiatives have been successful in improving student outcomes, particularly first- to second-year retention rates. Increasing student enrollment in service-learning classes is an institutional goal reflected in the university's Strategic Plan and in its SACS/COC (Southern Association of Colleges and Schools Commission on Colleges)

Quality Enhancement Plan. Data from this study provide strong evidence that increasing enrollment in service-learning courses is an institutional goal that has the potential to increase graduation rates for all students, including those students who are most at risk for leaving higher education before they complete their bachelor's degrees.

Students in this sample who took service-learning courses in college differed from non-SL students in several key areas. SL students were more likely to be female than male, more likely to be African American or Asian than white, and more likely to be financially needy. They were also enrolled slightly longer than non-SL students, and they graduated at a much higher rate than students who did not take SL classes. Previous studies have found service-learning students more engaged (Bringle & Hatcher, 1996; Markus, Howard, & King, 1993). Students in this sample who completed at least one SL course while they were undergraduates may have remained enrolled longer due to higher levels of student-university engagement, thus demonstrating that service-learning is a strong positive contributor to student persistence, which ultimately leads to completion.

Data from this study tell an interesting story related to service-learning, graduation rates, and at-risk (i.e., minority and low-income) student populations. Nationally, minority and low-income students graduate at significantly lower rates than do white and more affluent students (Swail, Redd, & Perna, 2003). This was not the case in our cohort, where minority and low-income students graduated at rates similar to those of other student groups despite having matriculated with significantly lower levels of academic preparedness. Of the students who enrolled in service-learning courses during their undergraduate years, at-risk students took the same number of service-learning credit hours on average as did the other student groups. Minority and low-income students who took service-learning classes graduated at significantly higher rates than did minority and low-income students who did not take service-learning classes, (71% vs. 29% for minority and 72% vs. 28% for low income). We do not have data to explain these differences because we did not ask students about the ways in which service-learning class participation supported their ability to complete their university degree. At this time, we can only hypothesize about possible mechanisms that underlie this relationship for minority and low-income students.

One hypothesis is that service-learning courses provide minority and low-income students with an academic experience that highlights interdependent, rather than independent, norms, thereby increasing person-culture "match" in the university context for these students. Theories of person-culture "match" suggest that when the context is relevant to an individual, that person will experience greater psychological well-being, be more engaged with the setting, and, ultimately, perform better (Cross & Vick, 2001; Fulmer et al., 2010). Recent research has shown that first-generation students experience a cultural mismatch between the mostly middle-class, independent norms institutionalized in American universities and the relatively interdependent norms of their families and home communities (Stephens, Fryberg, Markus, & Johnson, 2012).

Service-learning courses may provide minority and low-income students with an academic experience in which collective, rather than individual, success is emphasized and where leadership opportunities are more varied than those available within the traditional classroom. For example, many service-learning classes involve team projects and/or collaborative service activities that meet real-world needs and that take place outside of the classroom. These types of interdependent experiences may increase minority and low-income students' motivation to graduate by generating a person-culture "match" that provides these students with opportunities to (a) identify their own strengths and interests within an academic environment, (b) recognize connections between their own interdependent goals and specific academic disciplines/majors, and (c) develop relationships with peers, faculty members, and community mentors who share similar goals. Future research is needed to investigate whether person-culture match theory is helpful in explaining the relationship between service-learning class participation and graduation rates for minority and low-income students.

Implications for Research

This study utilized the large institutional databases already being stored by most universities but seldom analyzed by service-learning researchers. Researchers interested in studying the impact of service-learning on student outcomes should not overlook these important data sources. A critically important database that made this study possible was the longitudinal, semester-by-semester database of designated service-learning classes across a six-year period. The creation of this type of database depends upon an approved university-wide common definition of what constitutes a service-learning course. Establishing such a definition and a university-wide tracking system of courses meeting this definition is an important first step for researchers interested in studying the long-term impacts of service-learning at their institutions. Because this quantitative study cannot answer questions related to "why" service-learning class participation during the third, fourth, and sixth years of enrollment had a positive impact on a

student's likelihood of completing college, qualitative and mixed methods studies are needed to further explore these questions.

This study also employed discrete-time survival analysis to explore whether service-learning was a significant predictor of undergraduate degree completion. Discrete-time survival analysis has some distinct advantages for understanding the variables that affect an event such as degree completion. There are many factors that affect the likelihood that a student will complete a college degree. Some variables do not change over time, but others may vary significantly during the course of a student's enrollment in college. Moreover, the time that it takes a student to complete a degree can also vary. A few students will complete a baccalaureate degree within three years; many will graduate within the expected four years; others will take five or six years, or even longer; and many will not finish at all. Discrete-time survival analysis can help researchers gain a better understanding of year-to-year patterns. This is particularly useful in understanding the impact that factors such as service-learning class enrollment have on degree completion, so this method has the potential to be useful as colleges and universities attempt to evaluate the effectiveness of institutional programs and practices that target students at particular points in their college career.

Implications for Practice

Empirical evidence already exists to support the claim that service-learning is a high-impact educational practice that positively impacts student learning (Astin & Sax, 1998; Batchelder & Root, 1994; Celio, Durlak, & Dymnicki, 2011; Markus, Howard, & King, 1993). This is the first published study that demonstrates a significant positive relationship between service-learning class participation and a higher likelihood of graduating. Increasing graduation rates is a critical ethical and financial issue for colleges and universities across the United States. The results of this study should be shared with top-level university administrators who are seeking ways to increase the graduation rate at their institution.

Limitations

One important limitation of this study is that it includes students from only one cohort at a single university. Quantitative studies that do not employ probability sampling are restricted in the generalizability of results and conclusions. In the case of this research, caution should be exercised when making inferences about undergraduate students in general. To further test the method of analysis used in this study, the research needs to be replicated with other cohorts and other institutions.

Among this sample there are also differences in the number and type of service-learning courses offered. Although a large number of service-learning courses across a variety of academic units were available to the students in our sample, course content (e.g., types of service and reflection activities) was not considered as a variable in these models. Academic disciplines were also collapsed to facilitate data analysis and interpretation. We grouped students by the college or school in which they were enrolled during the semester they graduated or the semester in which they were last enrolled. This was the simplest method of grouping, but it fails to account for students who had double majors that were in different academic units within the university. We made the decision to use the university's primary major only. Collapsing majors into broader groupings may diminish the effect of service-learning offerings that are more prevalent in smaller departments and programs.

Neither of the models we tested took into account academic progress that may have resulted from dual enrollment credits (college courses taken as a high school student), advanced placement (AP) credit, International Baccalaureate (IB) credit, or transfer credits earned at other institutions. Because these types of non-institutional academic credits undoubtedly have an effect on degree completion, their exclusion could have biased some of the estimated coefficients for other variables in the models.

Financial need and ability to pay are important factors for retention (Astin, 2005; Attewell, Heil, & Reisel, 2011; Bowen, Chingos, & McPherson, 2009; Gross, Hossler, & Ziskin; 2007; Mohn, 2006), but these variables were not significant in either of the models tested among this sample. The Free Application for Federal Student Aid (FAFSA) can be confusing for students and families, particularly first-generation college students whose support systems may be ill-equipped to deal with unfamiliar rules and requirements (Tinto, 2012). As a result, there are probably needy students who fail to apply for aid. These students may have dropped out or failed to graduate for financial reasons. Paid employment can also have a positive effect on a student's ability to pay, but it can have a negative effect on a student's academic success if the hours devoted to work limit the hours that the student is able to devote to their studies. Students who must work to finance their education may have fewer hours to spend participating in service-learning opportunities. We do not know which students have paid employment as a substitute for financial aid or as a supplement to financial aid, which somewhat limits the conclusions that can be drawn regarding financial variables and their relationship to service-learning course completion or their influence on degree completion.

Finally, these data cannot address the lingering

concern about whether students self-select into service-learning and, if so, whether students who self-select would have a different likelihood of graduating due to other student characteristics. Although this study did not utilize data regarding self-selection, the institution where this sample was enrolled routinely collects such information anonymously as part of an end-of-course survey that is sent to all students enrolled in service-learning classes. Unpublished results from these surveys, which are administered at the end of every semester, indicate that roughly half of all students who take SL classes report that they did not realize that the course involved service-learning when they registered, even though this fact is indicated on the course schedule. Based solely on the laws of probability, one could conclude that the relationship between self-selection and the impact of service-learning is not extensive in this sample.

The differences shown in graduation rates between SL students and non-SL students for our sample are both dramatic and significant. Additionally, discrete-time survival analysis has demonstrated that service-learning was a significant predictor for degree completion among this cohort of students. Each of these findings suggests that service-learning has the potential to become a more important factor in the quest for increasing the number and percentage of students who graduate from college.

Notes

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[1] The hazard function, represented below, is the most common method for explaining the distribution of events across discrete periods of time (e.g., academic years).

$$h_j = \Pr[T = j \mid T \geq j]$$

T is a discrete random variable that indicates the time period when an event (e.g., graduation) occurs, and hj is the probability of experiencing the event in time period j (e.g., fourth year of enrollment) given that it was not experienced before j (i.e., in the first three years of enrollment) (Muthén & Masyn, 2005). Maximum likelihood estimation is the most common approach to obtaining hazard probabilities for a population. In discrete-time survival models, the probability of observing the pattern of occurrences of an event in the data is expressed by the likelihood function. Discrete-time survival can be incorporated into a structural equation modeling (SEM) framework by estimating the hazard probabilities for each time period. This can be done simultaneously through a system of logistic models (Bauldry & Bollen, 2009).

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