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Benefits of Service-Learning on Students' Achievement and Degree Attainment Outcomes: An Investigation of Potential Differential Effects for Low-Income and First-Generation Students

Ashley S. Hufnagle, Yu-Chi Wang, Krista M. Soria, Geoffrey Maruyama, and Andrew Furco

Abstract

Previous researchers have demonstrated a positive association between enrolling in service-learning courses and achievement and graduation outcomes for college students. Less is known about whether results associated with service-learning hold for students from underrepresented backgrounds. Using propensity score matching, we explored whether enrollment in service-learning courses is related to 4-year retention and graduation outcomes of students who are low-income, first-generation college attendees, and who are both low-income and first-generation college attendees. We found positive relationships of service-learning course enrollment with higher achievement and higher odds of retention for students in the low-income category and the first-generation category. We also found a positive relationship between service-learning course enrollment and persistence for students who were both low-income and first-generation status. Implications of service-learning as a potential way of supporting the success of first-generation and low-income students are discussed.

Keywords: service-learning courses, graduation rates, persistence, retention, grade point average, research university

Scholars have provided ample documentation for the various individual benefits of college degree completion, including higher wages, increased job security, greater life expectancy, and better health. Indisputable societal benefits from having more individuals with college credentials include lower crime rates, increased rates of philanthropy and volunteerism, and higher civic engagement (Trostel, 2015). Recent shifts in workforce demands have made attainment of a college degree increasingly valuable: 2.8 million of the 2.9 million jobs with high salaries, benefits, paid time off, and health insurance created during the post-recession recovery went to employees with a bachelor's degree (Jones & Berger, 2019). The societal importance of postsecondary degree completion has caught the attention of national and state policymakers, who have advocated for increased college degree attainment among U.S. citizens. For instance, the Lumina Foundation (2017) established a national goal to have 60% of adults earning degrees or certificates by 2025, and state-level policymakers in 43 states have established goals for postsecondary degree attainment (Jones & Berger, 2019).

Looming against the backdrop of the national calls for increased degree completion rates are significant and persistent disparities in the degree completion rates of low-income and first-generation college students. For instance, students who receive Pell grants (federal grants awarded

to students from families with lower incomes) are more likely than their peers to drop out of public, private nonprofit, and private for-profit 4-year institutions without earning a degree within 8 years of enrollment (National Center for Education Statistics, 2018). Only 37.7% of first-time, full-time Pell grant recipients completed a 4-year degree within 8 years, compared to 54.5% of students who did not receive a Pell grant (Yuen, 2019). First-generation students—those who are the first in their families to attend college—also have lower degree completion rates at 4-year colleges (65%) than students whose parents have a bachelor's degree (83%; Cataldi et al., 2018).

To help reduce the college degree attainment gap between low-income and first-generation students and their peers, institutions often provide programmatic opportunities to students, such as specialized intensive advising programs (Engle & Tinto, 2008; Swecker et al., 2014) or summer bridge programs (Engle & Tinto, 2008; Suzuki et al., 2012; Townsend & Sloan, 2016). Others have explored whether other high-impact educational practices, such as learning communities, writing-intensive courses, and e-portfolios, may benefit first-generation or low-income students (Conefrey, 2018). Kuh (2008) suggested that such high-impact educational practices improve student outcomes because they require students to dedicate significant time and effort toward purposeful tasks, increase students' interactions with faculty and peers, increase students' experiences with diversity by putting students in contact with others who are different from them, provide students with opportunities to receive frequent feedback on their performance, and provide students with deep, meaningful experiences on and off campus. High-impact educational practices can produce positive outcomes for low-income and first-generation students, who are less likely to seek out those experiences. Nevertheless, to date few scholars (e.g., Bringle et al., 2010) have explored whether a particular high-impact practice—enrollment in a service-learning course—is associated with low-income and first-generation students' success.

This article explores the relationship between enrollment in a service-learning course and beneficial academic outcomes for first-generation and low-income students, specifically focused on 4th-year cumulative grade point average, persistence, and graduation within 4 years. We explore whether service-learning courses have differential effects on students' academic outcomes based upon their family income (Pell grant recipient status) and parents' educational attainment (i.e., whether their parents attended college or not).

Conceptual Framework

Bean and Eaton's (2001) psychological model of college student retention provides a broad conceptual framework for this study. This psychological model of retention indicates that students' entry characteristics upon arrival to campus influence their initial institutional and environmental interactions. Institutional interactions then spur recursive psychological processes that lead to intermediate outcomes of social and academic integration. Students' perceived level of academic and social integration then sets the stage for the attitudes, intentions, and behaviors that ultimately determine students' persistence and retention outcomes.

Specifically, students enter institutions of higher education with psychological attributes shaped by their unique lived experiences, abilities, and self-assessments (Bean & Eaton, 2001). Bean and Eaton suggested that paramount among the psychological factors that students possess when entering college are assessments of their academic self-efficacy (e.g., "Do I feel confident that I have what it takes to perform well academically here?"; Bandura, 1997), normative beliefs (e.g., "Do the important people in my life think that attending college or attending this institution, in particular, is a good idea?"), and past behaviors (e.g., "Have I had academic and social experiences that have prepared me to succeed in college?").

After arrival to campus, Bean and Eaton (2001) identified three psychological levers (students' self-efficacy assessments; coping behaviors; and locus of control, one component of Weiner's (1986) larger theory of attribution), upon which we hope to draw, that if present or enhanced may lead to improvements in students' academic and social integration. These levers represent a student psychological profile of high perceived self-efficacy, awareness of a wide range of coping behaviors and which work best for them, and the ability to identify the aspects of their college experience that they have control over. Institutional efforts can

open productive pathways for influencing students' self-assessments, behaviors, and attributions, and thus offer potential entry points for setting into action the overarching process of improved student retention (Bean & Eaton, 2001).

As students interact with the institution and its representatives in various academic, institutional, and social realms while continuing to interact with others outside the institution, they engage in continual refinement of their self-assessments in light of their experiences. Positive feedback from their environment and institution can motivate them to engage in adaptive strategies, making them feel more comfortable and further aiding in their integration. Ultimately, this improved sense of integration leads to a more specific set of attitudes: institutional fit ("I fit in at this school") and institutional loyalty ("I feel I made the right choice to come here" and "Being at *this* school is important to me"), which correspondingly increase students' retention (Bean & Eaton, 2001). We propose that service-learning courses represent one type of practice that institutions can intentionally implement to set this larger retention process into motion.

Research on Service-Learning Courses and Students' Success

Service-learning courses have both theoretical and empirical support for being effective. Service-learning courses are theorized to positively impact students' academic outcomes by enhancing their academic skills (Yeh, 2010), increasing interactions with faculty and classmates (Eyler & Giles, 1999; Hatcher & Oblander, 1998; Keup, 2005–2006; Sax & Astin, 1997), and bolstering students' self-efficacy (Hatcher & Oblander, 1998; Yeh, 2010). Consistent with these theories, scholars have produced a wealth of information on the benefits of SL courses on college students' success. Enrollment in service-learning courses has been linked to students' intention to return (Gallini & Moely, 2003; Keup, 2005–2006), retention (Bringle et al., 2010), grade point average (Astin et al., 2000), and intention to graduate (Bringle et al., 2010). A few qualitative studies have also investigated students' participation in service-learning courses, what skills they perceived they gained from their experience, and their resulting intentions to return to their university and graduate (Lee, 2005; Yeh, 2010). Complementing the quantitative research, these latter studies found that service-learning experiences were perceived differently by students of different social classes. Regardless of personal backgrounds, however, students who completed a service-learning experience possessed a heightened sense of civic responsibility (Lee, 2005). Yeh (2010) also found that students self-reported service-learning as vital to their college experience.

Taken collectively, Lee and Yeh's qualitative research has identified four major themes that may help explain the impact and outcomes of service-learning participation. Students reported that participating in service-learning (1) built skills and improved their interpersonal understanding, (2) developed resilience, (3) helped them find personal meaning, and (4) developed their "critical consciousness."

However, the substantial research evidence described here on the efficacy and importance of service-learning has provided little evidence on the question of whether enrollment in service-learning has a similar relationship with students' graduation and achievement (measured here as grade point average) for students who are low-income *and* first-generation status. As noted earlier, this research helps address that shortcoming of the literature.

Methodology

Participants and Context

We collected institutional data from the 2013 cohort of first-year, non-transfer students (N = 5,541) at a large, public research university in the Midwest. The university is an original Carnegie engaged institution and has a campuswide center that provides resources and professional development for faculty to aid in transforming their courses into service-learning as well as general oversight of implementation of service-learning practices.

Institutional Review Board approval for human participants was secured prior to data collection. Of this cohort, 49.4% had enrolled in at least one service-learning course during their 4 years in college. We reduced the full cohort sample of participants after utilizing propensity score matching procedures (described in more detail below) to match students who enrolled in a service-learning course (n =

2,734) and students who did not ever throughout their college years enroll in a service-learning course (n = 2,807). The demographic breakdown of the final matched sample is reported in Table 1.

We separated students into four separate categories: (1) Neither Pell eligible nor first-generation students: 3,506 (63.27% of the dataset); (2) Pell eligible but not first generation (Pell only): 728 (13.14%); first generation but not Pell eligible (first generation only): 612 (11%); or both first generation and Pell eligible: 695 (12.54%). We ran propensity score matching separately for each of these groups so that students were exact matched within categories (e.g., students who were both Pell eligible and first generation who were enrolled in a service-learning course were matched with similar students who were also both Pell eligible and first generation who were not enrolled in a service-learning course).

Table 1. Demographic Information for Matched Sample (N = 5,541)

Variable	*n*	%	Treatment *n*	Control *n*
Gender				
Male	2,626	47.4	1,113	1,513
Female	2,915	52.6	1,621	1,294
Race/ethnicity				
American Indian	52	0.9	29	27
Asian	615	11.0	352	263
Black	216	3.8	163	53
Hawaiian	24	0.4	11	13
Hispanic	165	3.0	89	76
International	282	5.1	107	175
White	4,176	75.3	1,981	2,195
Unknown	5	0.1	0	5
Variable	***M***	***SD***	***M (SD)***	***M (SD)***
Age	18.1	0.5	18.1 (.4)	18.1 (.5)
Total transfer credits	15.4	15.2	12.4 (13.7)	18.2 (16.2)
Composite ACT score	28.1	8.0	25.08 (7.4)	26.2 (9.12)
AP credits	11.0	12.9	8.8 (11.41)	13.2 (14.0)

Number of Students in Each Low-Income/First-Generation Status Combination Category After Stratification (N = 5,541)

Variable	*n*	%*
Neither Pell recipient nor first generation	3,506	63.27
Pell grant recipient only	728	13.14
First-generation status only	612	11.00
Both Pell recipient and first-generation status	695	12.54

Note: For 5 students in this data set, the variable Race was unknown, and these students could not be exact matched.
* Percentage totals less than 100 due to rounding.

Within each category, we "full matched" students based on the following covariates: international student status (dummy coded as yes/no); age; total transfer credits; AP credits; composite ACT score; honors college status (yes/no); dummy-coded (yes/no) versions of each non-White race/ethnicity identity category (specifically, American Indian or Native American, Asian, Black, Hispanic, Hawaiian or Pacific Islander); and dummy-coded (yes/no) versions of students' college of enrollment (Human Development, Liberal Arts, Design, Business/Management, Agriculture, Biological Sciences, Engineering). This final covariate of students' college of enrollment allowed us to account for service-learning participation requirements in particular colleges.

Within the four categories, in some instances covariates had no variability. The "both Pell and first generation" and "first generation only" groups did not contain any honors college students. Additionally, in the "both" category, there were no international students. Looking at the standardized differences (differences between the two groups divided by the standard deviation of the control group) across the covariates, propensity score matching was needed, as many of the differences between groups were well above .25. For each of the four categories, we compared optimal full, optimal pair, nearest neighbor with replacement, and nearest neighbor without replacement styles of matching to select the matching option that worked best across all four categories. Full matching was the best method across all four categories.

Measures

Covariates

We selected as covariates (called conditioning variables in PSM) in our propensity score matching procedure measures that have been theoretically or empirically related to either the outcome or treatment variables (Stuart, 2010). These variables included previously identified predictors of students' enrollment in a service-learning course, of participation in community service, and of retention/graduation (Astin & Sax, 1998; Cruce & Moore, 2007; Lester et al., 2013; Marks & Jones, 2004; Mitchell et al., 2017; Nuñez, 2009; Serow & Dreyden, 1990).

As covariates, we included students' cumulative precollege credits earned in high school, composite ACT score (as a measure of past achievement), total transfer credits, and cumulative AP credits. We converted SAT scores to ACT scores when ACT scores were missing. We also included students' biological sex (male or female), age at admission, and dichotomous variables (yes/no) for race (Asian, American Indian or Native American, Hispanic, Hawaiian or Pacific Islander, Black) and international student status. Given variability in service-learning course options and students' enrollment in service-learning courses within seven large first-year-student-admitting colleges, we included students' college of enrollment as a dummy-coded covariate (e.g., College of Biological Sciences, College of Liberal Arts).

We also included participation in specific university programs aimed at retention: Trio Student Support Services (a federal grant program for first-generation and low-income students) and the President's Emerging Scholars program (aimed at improving retention rates of students at risk of dropping out). Additional variables we included were whether students were members of the university's honors college (0 = no, 1 = yes) or involved in a community engagement program (0 = no, 1 = yes). Finally, we included whether students lived on campus (0 = no, 1 = yes), participated in a living learning community as a freshman (0 = no, 1 = yes), were a student athlete (0 = no, 1= yes), and participated in a first-year seminar (0 = no, 1 = yes). Taken together, these variables control for a number of other types of campus engagement, providing a more sensitive test of the impacts of service-learning.

Independent Variable

We used institutional data of students' registration in classes to capture whether students had ever enrolled in a service-learning course (0 = no, 1 = yes).

Dependent Variables

As having all students graduate in a 4-year time frame is set as an ideal by educators, administrators, and policymakers alike, our outcome variable of interest was students' graduation status (more specifically, whether they had withdrawn, were still enrolled, or had graduated) by the end of their 4th year in college. We also investigated students' achievement, as measured by 4th-year cumulative grade point average, because grade point average is a reliable

predictor of engagement and graduation (Kuh et al., 2006).

Data Analyses

We used propensity score matching techniques to create a matched comparison group of students who never participated in service-learning across their college years. This comparison group allowed us to assess the effects of participation in service-learning while controlling for background and other variables previously found to be related to academic outcomes. To the extent that groups differ on variables aside from the treatment, those variables, if uncontrolled, could lead to misinterpretation of findings. The purpose of propensity score matching is to reduce selection bias by controlling for extraneous variables in quasi-experimental studies and, therefore, strengthen causal arguments.

We first utilized Johnson's (2018) R program functions, which call upon MatchIt (Ho et al., 2011), Optmatch (Hansen & Klopfer, 2006), and Matching (Sekhon, 2011) packages to compute propensity scores (in this case, the estimated probability that students enroll in a service-learning course) for individual students. Next, we stratified the data such that students were matched with comparison others within their low-income/first-generation status category ("neither Pell grant recipient nor first-generation student," "first-generation student only," "Pell grant recipient and first-generation student," and "Pell grant recipient only"). We then used optimal full matching on the remaining covariates so that students who enrolled in a service-learning course were fully matched with students who never enrolled in a service-learning course. Students were matched within each of the four low-income/first-generation status categories based on propensity scores. We discarded individuals who had propensity scores that fell outside the range of propensity scores that included students in both groups, in order to avoid inclusion of individuals so unique that no reasonable comparisons could be made to them from the other condition (e.g., Thoemmes, 2012). This process resulted in a matched data set of comparable treatment (enrolled in a service-learning course) and comparison (never enrolled in a service-learning course) students.

We examined whether the matching procedures balanced the distributions of covariates in the treatment and control groups by first reviewing the standardized mean differences before and after matching (the mean differences between the two groups divided by the standard deviation of the control group). We detected no large imbalances (standard deviation difference above .25) after matching in each analysis, meeting the threshold suggested by Rosenbaum and Rubin (1985) for valid use of PSM techniques. We also examined the overall imbalance test (Hansen & Bowers, 2008) and found that no variable showed imbalance large enough after matching to warrant its inclusion in the analyses comparing service-learning students with peers who did not participate in service-learning (the criterion for inclusion is having a standardized difference between groups exceeding .05). Our visual inspections of histograms of propensity scores pre- and post-matching showed that the magnitude of standardized differences was substantially reduced, and histograms of standardized differences of all terms pre- and post-matching suggested that the standardized differences post-matching were centered on zero and that no systematic differences existed after matching (Thoemmes, 2012). These findings show that PSM decreased differences for any covariates on which treatment and control groups differed markedly compared to before matching procedures were implemented. Decreasing differences lessens the likelihood that those variables could explain differences found between students enrolled versus not enrolled in service-learning.

To control for the remaining differences between groups after matching that exceeded .05 standard deviations (*SD*), we included the following variables in our analyses looking at the effects of service-learning: For the Pell only group, we controlled for American Indian (*SD* = 0.068), Hawaiian (*SD* = 0. 07), and the College of Biological Sciences (*SD* = 0.065); for the first-generation only group, we controlled for the College of Agriculture (*SD* = 0.09), Composite ACT score (*SD* = 0.05), and International Student Status (*SD* = 0.07); for the both Pell and first-generation group, we controlled for the College of Biological Sciences (*SD* = 0.09); and for the neither Pell nor first-generation group, we controlled for the College of Biological Sciences (*SD* = 0.09).

To investigate differences in achievement, we conducted a regression analysis to predict the 4th-year cumulative grade point average of students who had enrolled

in a service-learning course versus their matched peers who had never enrolled in a service-learning course within each of the four low-income/first-generation status combination categories. We used a multinomial logistic regression to predict the odds of students' persistence (i.e., continued enrollment in college) over withdrawing and the odds of graduating in 4 years over withdrawing, based on whether they were enrolled in a service-learning course during their time in college (Schulzetenberg et al., 2020). We split the file into the four low-income/first-generation status combination categories ("neither Pell grant recipient nor first-generation student," "first-generation student only," "Pell grant recipient and first-generation student," and "Pell grant recipient only") to examine the differential effects of enrollment in a service-learning course on those groups. We used *p*-values ($p < .05$) as our cutoff for statistical significance in our analyses.

Results

First, we conducted a regression analysis to predict students' average cumulative college grade point average within each of the low-income/first-generation status combination categories, controlling for the covariates that still had slight variability (0.05–0.25 standardized differences) after matching, as noted above. Next, we used multinomial regression to predict students' odds of persistence over withdrawal and odds of graduation over withdrawal in 4 years, again controlling for the covariates that still had slight variability (0.05–0.25 standardized differences) after matching in each category. Below we summarize the results for the four groups.

Neither Pell Nor First Generation

We optimal full matched students who participated in service-learning courses who were neither Pell nor first generation with students who did not participate in service-learning and were neither Pell nor first generation. After matching, these students did not differ significantly (i.e., greater than .05 standardized differences) on the covariates, so we proceeded with the regression analysis for grade point average and the multinomial regression analyses for persistence and graduation. Within this category, students who participated in service-learning courses had, on average, a .08 higher grade point average than those who never participated in service-learning courses ($B = .08$, $\beta = .138$, $t = 4.07$, $p < .001$). They also had significantly greater odds of continuing to be enrolled over withdrawing (persistence: $e^{\beta} = 1.76$, $p < .001$) and of graduating over withdrawing (graduation: $e^{\beta} = 1.86$, $p < .001$) at the 4-year mark.

Pell Only

Controlling for whether the student was enrolled in the College of Biological Sciences ($B = .16$, $SE = .08$) and whether the student was American Indian ($B = .03$, $SE = .18$) or Hawaiian or Pacific Islander ($B = .03$, $SE = .35$), students who were Pell grant recipients who participated in a service-learning course had, on average, a .098 higher final grade point average than those who were Pell grant recipients but did not participate in a service-learning course ($B = .098$, $\beta = .16$, $SE = .045$, $t = 2.18$, $p < .03$). Those in this category who participated in service-learning were also more likely to have persisted over withdrawing, when controlling for American Indian, College of Biological Sciences, and Hawaiian ($e^{\beta} = 2.52$, $p < .001$). Pell-only students' odds of graduating at the 4-year mark was marginally significant ($p < .07$).

First Generation Only

Service-learning participation had a marginally significant relationship with first-generation students' grade point averages, after controlling for being in the College of Agriculture, international student status, and composite ACT score ($B = .115$, $\beta = .091$, $SE = .05$, $t = 1.772$, $p = .077$). Students in this category who participated in service-learning also had significantly greater odds of persisting over withdrawing at the 4-year mark (persistence, $e^{\beta} = 2.236$, $p = .013$).

Both Pell and First Generation

After controlling for being enrolled in the College of Biological Sciences, there was no significant relation of service-learning participation with grade point average for students who were both Pell-eligible and first-generation status ($B = .07$, $\beta = .11$, $SE = .05$, $t = 1.406$, $p = .16$). However, students who were both first generation and Pell grant recipients did have greater odds of persisting over withdrawing at the 4-year mark (persistence, $e^{\beta} = 2.773$, $p < .004$).

Collectively, the results suggest that for all four groups, students who enrolled in a service-learning course during their col-

lege career had significantly greater odds of representing at least one of our outcomes of interest (achievement as measured by grade point average, continued enrollment/persistence in college, graduation in 4 years). Overall, the variance in grade point average accounted for by enrollment in a service-learning course was 1–2%.

Discussion

Improving degree attainment rates among low-income and first-generation students has been established as a national imperative. In response, researchers have sought evidence-based pedagogical practices that may impact students' retention/persistence in college and, ultimately, improve students' odds of graduation. Although researchers have documented the benefits that service-learning can have on retention across the college years, very few studies have attempted to parse out whether there are differential effects of service-learning participation on 4-year graduation or persistence outcomes for first-generation students or students from low-income families. This study addressed that shortcoming, investigating whether enrollment in a service-learning course had different relationships with academic outcomes for first-generation students, low-income students (operationalized as Pell grant recipients), or students who fell into both demographic categories.

Results from this study demonstrate a positive relationship, either statistical significance or marginal significance, of service-learning participation with achievement (as measured by 4th-year cumulative grade point average) for students in both the Pell only and first generation only categories compared to their matched peers who did not participate in a service-learning course. Additionally, students who enrolled in service-learning courses (across all four categories) had significantly greater odds of persistence (over withdrawal) at the 4-year mark compared to their matched peers. For students in the Pell only category, the odds of graduation (over withdrawal) also approached significance.

The benefits of enrollment in service-learning courses (on all three outcomes of interest: achievement, odds of persistence, and odds of graduation) were also present for non-first-generation and non-Pell students, replicating prior research (e.g., Song et al., 2017) and supporting the positive impacts of service-learning courses on all students' academic outcomes.

The results of this study extend prior research on the effectiveness of service-learning courses for underrepresented, low-income, and first-generation students. Collectively, the pattern of results found in this study suggests that enrollment in a service-learning course may offer benefits, regardless of students' low-income/first-generation status combination category, but particularly for improving students' odds of persistence/continued enrollment in college.

Higher education practitioners seeking to ameliorate patterns of inequality in degree completion rates may find service-learning courses to be a potential universally useful pedagogical mechanism for improving the odds of students' success. Although some may argue that the modest effect sizes diminish meaningfulness of the findings, even modest effects can impact retention and graduation rates of underrepresented students. For grade point average, modest effects can be the difference between being on academic probation or not, which may subsequently result in dropping out and not graduating.

Further, positive effects of service-learning appeared even after controlling for a range of background variables in the PSM analyses, including prior achievement, demographic variables, college of enrollment (and, implicitly, major field types), and other campus engagement measures. Positive relations of enrollment in a service-learning course with persistence remained even after controlling for measures such as participation in programs specifically aimed at boosting retention for underrepresented students. This finding suggests that enrollment in service-learning courses may have the potential to positively impact these groups of students above and beyond programs with similar goals that are already being implemented, and over and above any variability in service-learning that is shared with any of the covariates, for their relations with academic outcomes are already removed.

Because the unique variance in outcomes accounted for by service-learning courses was modest, service-learning should be viewed as beneficial but not a cure-all fix. At the same time, however, encouraging students to take service-learning courses may offer supplementary benefits to the current constellation of practices and resources

aimed to engage and support low-income and first-generation university students.

Our results are also consistent with Bean and Eaton's (2001) psychological model of student retention, offering empirical evidence for connections between service-learning courses and students' retention and graduation outcomes. Although we did not specifically measure any of the psychological processes outlined in Bean and Eaton's theory, thinking about how an institutional practice like service-learning may operate within this larger conceptual framework of retention may allow us to hypothesize why we see this pattern of results demonstrating the impact of service-learning on students' retention outcomes. Specifically, service-learning courses may potentially be impactful because of the psychological (e.g., sense of belonging), social (engaging in activities that have direct community benefits), and academic benefits derived from such courses, which can in turn increase students' academic integration. Future research is necessary to test this process-based explanation. Among academic benefits, service-learning courses have been associated with increases in students' problem-solving skills (Greenberg, 1997), improved cognitive development (Giles & Eyler, 1994), better academic performance, and more time spent studying (Sax & Astin, 1997). Through service-learning, students may well gain skills to more effectively cope, cultivate an internal locus of control, and boost their sense of academic and social self-efficacy in the university environment, all of which increase their academic integration and, consequently, their long-term academic outcomes (Bean & Eaton, 2001).

This study also contributes to the field by implementing a more rigorous methodological and statistical approach, propensity score matching, to address this research question. Randomized control trials, although considered the gold standard for estimating the effects of interventions on outcomes, are not possible when students select their own college experiences. In nonrandomized studies, treatment selection (in this study, enrollment in a service-learning course) is often related to student characteristics (such as demographics or past achievement). As a result, baseline characteristics of treated subjects often differ systematically from those of untreated subjects (Austin, 2011). Therefore, when estimating the relation of treatment (enrollment and presumed participation in a service-learning course) with outcomes, one must account for systematic differences in baseline characteristics between treated and untreated students. By matching students on propensity scores measuring the likelihood of enrolling in service-learning courses based on included covariates at baseline, we were able to design and analyze a nonrandomized study in a way that mimics if not captures some elements of a randomized control trial (Austin, 2011). Analyzing these data in this fashion allowed us to make more precise comparisons by reducing the potential bias of confounding variables (in this case, our included covariates), and helps to strengthen arguments in support of potentially causal relationships. Further, utilizing propensity score matching may provide more equivalent comparison groups, as randomization does not guarantee equivalency.

Additionally, there is growing interest in using archival data to estimate the relations of educational interventions and programming with student outcomes (Austin, 2011). The current study harnessed institutional record data to investigate the relations of service-learning participation with students' achievement and graduation outcomes. Future studies of service-learning may benefit from this expanded use of archival institutional data.

Limitations

Despite the benefits of propensity score matching, it is still a quasi-experimental method, so we cannot make definitive causal claims or generalize outside this population (e.g., Maruyama & Ryan, 2014). Although we controlled for a variety of covariates that we theoretically and practically believed would be related to student outcomes and potentially to participating in service-learning, there are likely other variables that we could not or did not measure. For example, even though we were able to control for some motivational and engagement variables, students who choose to participate in service-learning may have personality or motivational differences related to self-selection (such as their unique sense of agency) that could have resulted in differences in outcomes independent of participation in service-learning (Muturi et al., 2013).

Although Pell grant recipient status is a consistently used indicator of low income

status, it is not a perfect measure of low socioeconomic status, both because a significant percentage of college students do not complete the Free Application for Federal Student Aid (FAFSA) each year (Delisle, 2017; National College Access Network, 2018) and because the category does not distinguish between different levels of economic disadvantage. Completing the FAFSA is not only a time-consuming process that presumes some degree of financial knowledge (although it is currently being made simpler), but it may also raise additional barriers for people who do not have U.S. citizenship or do not read English fluently. Further, receiving a Pell grant is a binary variable; we did not capture income variation within this group of low-income students. Such variation could significantly affect students' experiences, so ideally future research will have the capacity to address the potential variation within Pell grant recipients rather than treating them as a uniform group.

Importantly, our broad-scale analyses grouped together all service-learning courses. We did not have access to specifics about effectiveness in implementation of high-quality service-learning practices for individual courses. Therefore, our findings represent an aggregate perspective with variability within both the service-learning and non-service-learning courses with respect to educational approaches. Although our institution is recognized as providing effective service-learning experiences and provides support to faculty in implementing those practices, there nevertheless is uncontrolled variability in quality across different courses in their capacity to successfully implement high-quality service-learning practices. Given our findings, we anticipate that we might have found even stronger effects if we had been able to focus on only service-learning courses that met criteria for high-quality implementation of service-learning practices.

Additionally, now that we have found support for the idea that service-learning courses benefit students' outcomes, future research can extend our findings by using models that track change over time (such as latent growth curve models; Singer & Willett, 2003) to begin to identify when during the college years a service-learning course might most benefit students across these four low-income/first-generation categories.

Conclusion

Due to the host of benefits that result from attaining a college degree, boosting graduation rates for first-generation students and students from low-income backgrounds has been set as a national priority (Jones & Berger, 2019; Lumina Foundation, 2017). Overall, our results found that low-income and first-generation students enrolled in service-learning courses showed higher achievement as well as greater persistence/retention outcomes compared to their peers. Improving the odds that first-generation and low-income students persist (over withdraw) at the 4-year mark represents a productive step toward achieving the overarching goal of boosting graduation rates for all students. Students are likely to reap benefits of a degree even if their timeline to graduation is greater than 4 years.

This pattern of findings appeared even in the context of a very broad perspective across many service-learning courses offered in diverse fields. We hope that others will "drill down" and look at how specific elements of service-learning in specific course types can affect outcomes. A recently developed tool, the Service-Learning Quality Assessment Tool (SLQAT), may offer a way to make these more nuanced analyses feasible (Furco et al., 2023).

Although service-learning courses alone are not enough to ameliorate the educational attainment gap, our results suggest service-learning's potential utility for helping to boost the achievement and degree attainment outcomes for low-income and first-generation students. Given the benefits of service-learning for students' long-term academic outcomes, we are hopeful that offering and promoting service-learning courses to first-generation students and those from lower income backgrounds may improve their academic successes, providing greater access to an entry point along a potential pathway to greater career success and, ultimately, a more equitable society at large.

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About the Authors

Ashley S. Hufnagle *is an assistant professor in the Department of Psychology at St. Catherine University.*

Yu-Chi Wang, Ph.D., *is the school climate research manager at GLSEN.*

Krista M. Soria *is an assistant professor in the Department of Leadership and Counseling at the University of Idaho.*

Geoffrey Maruyama *is a professor in the Department of Educational Psychology at the University of Minnesota, Twin Cities.*

Andrew Furco *is a professor in the Department of Organizational Leadership, Policy, and Development at the University of Minnesota, Twin Cities.*

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