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Can Participation in a University Service-Learning Course Increase Progress Toward Degree and Graduation Rates for Undergraduate Students?

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Abstract

As universities confront the reality that students are not equally served by higher education, they are increasingly incorporating evidence-based practices to support individuals facing systemic, institutional, and economic barriers. Service-learning courses support academic and socioemotional outcomes for university students; however, less is known about the degree to which they may improve attainment for historically underserved students. This study examined the association between participation in a service-learning course, Campus Connections (CC), and undergraduate student success. Propensity score matching was used to create relatively comparable groups of undergraduates who participated in the CC course and those who did not. Results indicated that CC participation was associated with higher levels of student success (e.g., GPA, degree progress) and suggested an even stronger association for structurally underserved student populations (i.e., students with first generation status, Pell grant status, and/or racially minoritized identity). Implications for service-learning and future research directions are considered.

Keywords: student success, service-learning, mentoring, campus belonging, underserved student populations

Students who leave college without an undergraduate degree earn less income, are less likely to be satisfied in their careers, and are less civically engaged than their counterparts who graduate (Baum et al., 2010; Hanson, 2022; Knox et al., 1993; Trostel, 2015). In addition, many of these students are left with significant amounts of debt without having realized the financial benefits of a degree (Gladieux & Perna, 2005). Students with identities that are structurally underserved by higher education (e.g., first generation, racially minoritized, or Pell grant recipients) have lower graduation and retention rates than their peers (Engle & Tinto, 2008). In response to this inequality, many universities are adopting evidence-based teaching practices to attempt to close equity gaps. Service-learning is a high-impact practice (HIP) that is shown to increase college students' knowledge, academic engagement, interactions with faculty, and perceived support in the campus environment (Kuh, 2008; National Survey of Student Engagement, 2013). Service-learning has been associated with improvements in student GPA (Mungo, 2017), retention (Song et al., 2017), graduation rates (Mungo, 2017; Reed et al., 2015), access to social capital (D'Agostino, 2010), civic-related outcomes (Weiler et al., 2013), and professional development (Haddock et al., 2013).

Less is known, however, about the effectiveness of specific service-learning courses or experiences and their impact on subpopulations of students. For universities to effectively deploy resources, it is critical that

we assess the impact of service-learning courses and better understand for whom these courses are most effective. This study aimed to assess the associations between participating in a service-learning course and key indicators of student success (e.g., GPA, credits completed by the end of junior year, graduation rates) and investigate whether these associations were more pronounced for students who identify as members of groups historically underserved by higher education.

Academic Attainment in Higher Education

Recent data suggest that the 6-year completion rate for college students in the United States is around 64% and has hovered around that level for the past decade without improvement (National Center for Education Statistics, 2021). However, graduation rates among Black, Hispanic, and Indigenous students are significantly lower: 40%, 54%, and 39%, respectively. Higher education attainment also varies significantly by socioeconomic status. Sixty percent of students from the highest income quartile obtain a bachelor's degree within 8 years of high school graduation, versus 15% of students from the lowest income quartile (Cahalan et al., 2021). Among students enrolled in postsecondary education, 69% of students from the highest income quartile obtain a degree, versus 26% of students from the lowest income quartile. First-generation college students, who often identify as students of color and have low income, also are more likely to drop out after their first year and graduate at lower rates than their continuing-generation peers (Choy, 2001).

Despite rising costs of higher education and slower wage growth in recent decades, most analyses indicate that the benefits of a college degree outweigh the costs (Abel & Deitz, 2014). Indeed, a college degree is associated with higher earning potential, greater job security, and expanded career opportunities, as well as greater likelihood of having health care coverage and engaging in healthy lifestyle behaviors (Baum et al., 2010; Witham et al., 2014). Given its association with key indicators of economic and physical well-being, equal access and opportunity to pursue a college degree is a prerequisite for a just society. Thus, higher education institutions have a responsibility to take action to address gaps in attainment for students of color, low-income students, and first-generation students. To guide institutions in how to do this, identifying practices that are efficacious is a priority; however, few robust evaluations of specific programs exist.

Service-Learning, Academic Attainment, and Equity

One avenue that colleges and universities are pursuing to support student attainment is the adoption of high-impact practices (HIPs). HIPs are evidence-based teaching practices that have positive outcomes for many postsecondary students (Kuh, 2008; Kuh et al., 2013). Participation in these practices has been associated with increases in persistence from first to second year, STEM degree attainment, sense of belonging, satisfaction in relationships with faculty, self-reported personal and practical gains, and deep learning (Conefrey, 2021; Dinh & Zhang, 2021; Kuh, 2008; Ribera et al., 2017; Soria & Johnson, 2017). Importantly, some evidence suggests that certain HIPs and the timing of when these classes are taken (Do et al., 2024) are particularly supportive for students of color, first-generation students, and low-income students. For example, first-generation students who engaged in one or more HIPs during their first year in college (e.g., learning communities and writing-intensive courses) reported higher self-efficacy (Conefrey, 2021), which has been positively associated with academic performance among first-generation students (Majer, 2009). Additionally, Do et al. (2024) found that participation in a service-learning course during the first year of college benefited students' long-term academic outcomes, such as GPA and graduation within 4–6 years, among students underrepresented in higher education. Hufnagle et al. (2023) found similar positive associations between low-income first-generation students' enrollment in a service-learning course and retention and persistence.

Other research suggests that racial/ethnic identity moderates the association between participation in HIPs and indicators of academic success, with greater improvements in retention rates among Black students and in first-year GPA among Hispanic students, relative to White students (Finley & McNair, 2013). Service-learning, a HIP that requires students to apply knowledge from the classroom to real-world settings (Kuh, 2008), has been a common practice within higher education institutions for many years, and is associated with improvements in academic and psychosocial outcomes (Kuh, 2008;

Mungo, 2017; Song et al., 2017; Weiler et al., 2013). Moreover, certain features of service-learning may make it especially meaningful for students that have historically been underserved. In addition to emphasizing reflection and meaning making (Kuh, 2008), a core component of service-learning is social interaction, with both peers and the broader community (Wang & Calvano, 2018). Thus, one pathway by which service-learning may improve outcomes for postsecondary students is through increasing sense of belonging.

Belonging, in the college context, is a student's subjective experience of affiliation and identification with the college community (Hoffman et al., 2002). Multiple theoretical models of student persistence emphasize the role of belonging (e.g., Milem & Berger, 1997; Tinto, 1993), and evidence supports associations between belonging and student engagement and persistence among university students (Gopalan & Brady, 2020). Importantly, students who identify as racial-ethnic minorities or first generation tend to report lower sense of belonging than their peers. Thus, students who hold these identities and others traditionally underserved by higher education may benefit most from service-learning. Indeed, prior work indicates that service-learning has differential effects based on students' socioeconomic status, with students from lower/working-class backgrounds experiencing greater increases in sense of belonging than their middle/upper class peers (Soria et al., 2019). More research is needed to understand why these benefits may not appear for students with middle/upper class backgrounds. Some students may not have personal or lived experiences with certain systemic barriers, or they may already have established connections and networks across the university system. Without critical analysis, privileged students may not recognize how their own positionality shapes their understanding of systemic inequality and engagement with service-learning. Limited research has examined sociodemographic moderators of HIPs that, theoretically, may be more effective for underserved students, like service-learning. However, identifying which students may benefit most from these types of experiences is essential for optimizing funding for service-learning.

Service-learning, although beneficial in many ways, is not immune to systemic barriers that can hinder equitable access and impact. One major critique of service-learning has been the economic burden placed on students, particularly those from low-income backgrounds (many of whom also identify as first generation), who may struggle to balance unpaid service-learning commitments with paid employment (Butin, 2006). Additional costs, such as transportation and materials, can further exacerbate these challenges (Eby, 1998). Moreover, service-learning courses often assume students have flexible schedules and the resources needed to fully engage, inadvertently excluding those with additional personal, family, or work obligations (Butin, 2006). Although efforts to reduce burdens to students, such as in the course examined in this study, are commendable, it is important to acknowledge and address the broader systemic issues in the field. Recognizing and mitigating these barriers requires ongoing critical reflection and structural reform, ensuring service-learning programs promote equitable participation and outcomes.

Critics also highlight that when service-learning partnerships are short term, they may harm the communities they are meant to serve. Short-term projects may fail to address long-term structural issues, leaving community members without sustained support and potentially creating feelings of abandonment or frustration when student volunteers leave at the end of the course (Eby, 1998; Stoecker & Tryon, 2009). To maximize its potential, service-learning must balance the benefits of experiential learning with a commitment to equity. This balance requires institutions and instructors to address the systemic issues inherent in service-learning—such as by providing stipends, transportation assistance, or alternative pathways for participation—and to foster authentic, reciprocal partnerships with communities. By integrating these structural reforms, service-learning can continue to advance equitable participation and outcomes.

Campus Connections: A Service-Learning Course

Campus Connections (CC) is a service-learning course developed at Colorado State University (CSU) in which undergraduate students serve as mentors to local youth (ages 10–18). The program was established as a response to the local community's call for additional and more effective services for youth and their families (see Haddock et al., 2013; Weiler et al., 2013, 2014). In

CC, mentors spend time building meaningful relationships with youth, providing academic support, engaging in prosocial activities (e.g., art, sports), showing youth the university campus, sharing a meal, and, if desired by the youth, engaging in dialogue and activities focused on social justice. This semester-long program brings youth to campus for weekly 4-hour sessions over the course of 12 weeks. Each session includes, on average, 24 one-on-one mentoring pairs (i.e., one youth mentee and one undergraduate student mentor). These pairs are grouped into small "Mentor Families," each of which has a designated "Mentor Coach." Throughout CC, students are supported by their Mentor Family peers, Mentor Coach, and on-site faculty members and graduate students in the Marriage and Family Therapy (MFT) program (see Haddock et al., 2013; Weiler et al., 2014). Acting under the auspices of the Department of Human Development and Family Studies (HDFS), MFT trainees and faculty members guide undergraduate students in emotion coaching and deescalation strategies, redirection, relationship building, and help them to address any problems that arise during mentoring sessions. They also avoid overburdening mentors with youth concerns by providing clinical support to youth through brief therapy sessions, assessments, and interventions, as needed.

Consistent with the literature, CC is designed to foster students' sense of belonging on campus through active and engaged learning (i.e., service-learning experiences, opportunities for small group learning in Mentor Families), engagement in social and leadership activities (e.g., building connections with fellow mentors, leading in the Mentor Coach role), seamless student experience (i.e., accessible service-learning on campus), inclusive learning environment (e.g., emphasis on social justice and inclusion), and faculty mentoring and support (Baumeister & Leary, 1995; Dost & Mazzoli Smith, 2023; Goodenow, 1993; Tinto, 2012; Van Ryzin, 2011). The inherent relational nature of the CC experience provides ample opportunities for forging bonds with youth mentees, peers, graduate trainees, and faculty. Mentors have a network from whom they can seek assistance and support. Our previous research has shown that this mentoring community contributes to a felt sense of belonging among youth and student mentors in the program (Weiler et al., 2014).

Within the curriculum, students are engaged in ongoing team-building activities, celebrations of success, and opportunities to brainstorm solutions to challenges with their peers. Students are called upon to apply critical thinking skills, their own lived experiences, cultural knowledge, and classroom-based learning in supporting their mentees. CC enrolls a significant number of historically underserved students through partnerships with campus cultural resource centers and learning communities that primarily serve students of color and/or who identify as first generation to college. Not only are students trained in mentoring best practices, program logistics, and adolescent development, the curriculum facilitates a sense of belonging through an explicit focus on trauma-informed approaches and a social justice framework (e.g., impacts of racism, transphobia, lower income status, understanding and interrupting implicit bias, intersectionality) to support youth and mentor well-being. A trauma-informed lens helps students understand the potential impact of trauma on themselves and their mentees, providing tools for supporting participants' emotional experiences to promote a sense of belonging in the program. Mentors also gain competencies to participate in social justice activities with their mentee, which promotes belonging by facilitating meaningful conversations about how identity shapes lived experiences and experiences of belonging. To solidify and extend their learning, students also engage in weekly reflective journaling, case documentation, activity planning, reading discussions, and other assignments (Haddock et al., 2013; Weiler et al., 2013).

Although participating in HIPs, including service-learning courses, offers many documented benefits for students underrepresented in higher education, there are potential costs, both tangible and intangible, as well. These costs can sometimes act as barriers to their full participation, potentially limiting the benefits they might otherwise gain from these experiences. For example, service-learning courses often require a significant time commitment outside regular class hours, which could potentially impact low-income and first-generation college students specifically, who may work full or part time to support themselves or their families. However, CC was designed to be an accessible service-learning course for students seeking this type of experience. CC occurs on the college campus, limiting

transportation barriers and associated costs; counts as an upper division elective; occurs exclusively during the semester weeks; values knowledge and expertise beyond that learned within the academy; and explicitly applies a social justice framework.

Prior evaluations of CC reflect the mutually beneficial nature of the mentoring relationship. Effects on youth are promising and include reductions in substance use and other behavioral problems, as well as improvements in sense of belonging (Haddock et al., 2020). Findings also suggest that youth who experience higher quality mentoring relationships and whose mentor is attuned (i.e., mentor's capacity to respond flexibly to youth's cues, needs, and desires) benefit more from CC (Weiler, Boat, & Haddock, 2019; Weiler, Chesmore, et al., 2019). Importantly, CC is similarly beneficial for undergraduate student mentors, the majority of whom participate in their first 3 years of college. Qualitative findings indicate that students experience significant personal growth and professional development through their participation in CC (Weiler et al., 2013). Quasi-experimental evaluations of CC also show that, compared to students who do not participate in CC, students in CC show greater increases in positive civic attitudes, community service self-efficacy, self-esteem, interpersonal and problem-solving skills, political awareness, civic action, and self-reported flourishing (Maples et al., in press; Weiler et al., 2013). Many of these outcomes are associated with academic achievement. To understand the full scope of benefits of CC to undergraduate students, a direct investigation of the association between CC and indicators of academic achievement is needed.

The Present Study

CC has demonstrated positive effects on civic attitudes and socioemotional outcomes for undergraduate student mentors (Haddock et al., 2013; Maples et al., in press; Weiler et al., 2013). As an extension of this prior work and with collaboration of the university's Institutional Research Office, the current study evaluated the impact of CC on students' academic achievement. We tested whether participation in CC was positively associated with key indicators of student success (GPA, completed credits at the end of the junior year, graduation rates) after controlling for the self-selection bias of choosing to enroll in service-learning coursework. Additionally, this study examined the relationship between participation in CC and student success for students structurally underserved by higher education. Three research questions guided this study:

1. After matching similar nonparticipating students, were there significant differences in GPA and credits completed at the end of junior year between those who do, and do not, participate in CC?
2. After matching similar nonparticipating students, were there significant differences in 4-, 5-, and 6-year graduation rates between those who do, and do not, participate in CC?
3. Do these associations between CC participation and student success differ for students who had at least two demographic attributes that were underserved by higher education?

Method

Data Source

The population used for this study includes all individuals who started as first-time undergraduate students at CSU in a summer or fall semester between 2007 and 2016 and persisted to the end of their third year. These data, which were compiled by the Institutional Research Office at CSU in February 2019, were sourced from the student information system and were Institutional Review Board exempt. Table 1 provides the student counts by cohort and group status (i.e., control and CC) as well as timing of treatment (first, second, or third undergraduate year). As shown below, most (approximately 90%) students take the course in their second year, but some do take the course in their first year.

Operational Definitions of Study Outcomes

For the purpose of this study, student success was operationalized as (1) degree progress at the end of the student's third spring semester (junior year) and (2) graduation rates. Degree progress was measured by a 4-point-scale cumulative grade point average (GPA) and cumulative completed credits at the end of the student's third spring semester. Graduation rates were measured after 4, 5, and 6 years of enrollment and evaluated whether a student graduates by the end of the specified summer. For instance, 4-year graduation was measured at the end of summer 2018 among students

Table 1. Sample Size by Cohort Year and Participation Status

	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016
Control	3,642	3,614	3,610	3,709	3,789	3,842	3,784	3,725	4,117	4,141
CC	73	121	127	185	198	189	170	166	168	160
CC in First Year	0	0	1	3	24	19	17	30	35	25
CC in Second Year	0	3	28	66	98	101	63	83	104	90
CC in Third Year	73	118	98	116	76	69	90	53	29	45
Total	3,715	3,735	3,737	3,894	3,987	4,031	3,954	3,891	4,285	4,301

who started in either the fall or summer semester of 2014.

Data Analysis Plan

As described above, these data come from the CSU system of record as of February 2019, and outcomes were limited by this timepoint. Therefore, four outcome groups were matched using the described analysis:

1. 6-year graduation includes the 2007–2013 cohorts
2. 5-year graduation includes the 2007–2014 cohorts
3. 4-year graduation includes the 2007–2015 cohorts
4. Junior year degree progression outcomes includes the 2007–2016 cohorts

To utilize the propensity score process across these four outcomes groups as well as the full population and the structurally underserved population, there are eight logistic regressions, and matching was performed for each of these eight groups.

Propensity Score Models

Propensity score matching was the primary inferential analysis technique utilized in this study. Propensity score matching allows for a comparison of statistically similar groups (participants/nonparticipants) with the goal of understanding what the outcome would have been for a participant if they had not participated (Maruyama et al., 2023; Murnane & Willet, 2011; Reynolds & DesJardins, 2009; Rosenbaum & Rubin, 1985). Matching was based on the probability obtained by a logistic regression model with the treatment as an outcome. The treatment (participating in CC) and control (not participating) groups were created by matching students with similar propensities using the probability that was created by the logistic regression model. This process was intended to approximate random assignment in order to understand what the outcomes would have been for CC participants if they had not had the opportunity to participate.

The third research question was addressed by utilizing this process only among students who had two or more of the following attributes: first generation, racially minoritized, or Pell grant recipient. Students with two or more of these identities are referred to as structurally underserved populations throughout this article. The premise for this third research question was grounded in the belief that data should be disaggregated to most effectively support equity (Montenegro & Jankowski, 2020). The intent of running the analysis among structurally underserved students was to allow the impact of CC to vary (disaggregate the treatment effect) for students with identities that were underserved. Disaggregating the regression results in this manner was an attempt to explore the interaction between structurally underserved students within higher education and the impact of CC on student success. This exploration of an interaction effect does not account for micro and macro structural systems that first-generation students, students of color, or Pell grant recipients must overcome to participate in the CC program (Harris & Patton, 2019) but still informs our knowledge of the effect of HIPs on students with these identities.

Matching Process

Logistic regressions were used to predict participation in CC among each outcome group. The probability of participating in CC (output from propensity score models) was used to statistically match one nonparticipant to one CC participant. The matching was performed using one-to-one nearest neighbor without replacement with Stata18's psmatch2. An area of common support was defined by a caliper equal to

one fourth of a standard deviation of each outcome group's propensity score. Defining the common support area enhances the quality of the one-to-one matching process (Baser, 2006). The intent of the analysis was that after matching, any differences in outcomes would be correlated with the treatment effect of participating in CC. However, the ability to match nonparticipants to the participant group based on the likelihood of participating in CC (the logistic regression prediction) is only as strong as the model that is predicting participation (Baser, 2006).

Propensity Score Predictor Variables

The propensity score predictor variables selected for this study were associated with either the treatment condition (participating in CC) or the outcome variable of degree progress (i.e., GPA and credits completed by end of junior year) or graduation (Guo & Fraser, 2010; Reynolds & DesJardins, 2009) and available in the institution's student information system. The student-level variables used in this study were organized into two primary categories: demographic characteristics (gender, racial minority status, Pell recipient status, first-generation status, high school performance metric) and academic major. All of the variables were categorical except high school academic preparation, which was measured using the Colorado Commission of Higher Education's Index score (Colorado Department of Higher Education, n.d.). It was a composite score derived from high school GPA or high school rank and overall ACT or SAT test scores.

Treatment Variable

Participation in CC was defined as enrollment in the credit-bearing course at any point during a student's first 3 years at the university, since the majority (over 75%) of students who participate in CC do so by their third year.

Average Treatment Effect of the Treated

The primary statistic used to determine the magnitude of the association between participation and student success was the average treatment effect among the treated (ATT; Austin, 2011; Medaglio et al., 2022). Notably, a variety of matching techniques (beyond nearest neighbor) are available, and results may be sensitive to the matching technique. This study did not evaluate alternative matching techniques because nearest neighbor matching is widely used and appropriate when there is a large overlap in the probability of selecting the treatment (propensity score) across both the treatment and control groups (Baser, 2006; Zhao et al., 2021). Within this study nearly all of the CC students were matched with a non-CC student using the recommended caliper. This procedure resulted in a small change in the treated group's sample size between the unadjusted and adjusted headcounts from Tables 5–8 in the Results section.

Substantively, the ATT was the percentage point difference in graduation rates or GPA/completed credits difference between CC participants and nonparticipants after the nonparticipants had been adjusted by matching. If the propensity model assumptions were completely satisfied, these differences would approximate the magnitude of the impact of CC on student progress and completion. However, the variables included in the propensity score models were limited to what was available within the institution's system of record. Missing variable bias was certainly a factor since these general variables do not account for all the reasons a student would choose to participate in CC.

Probability of Participating in CC

The propensity scores were calculated for each outcome group overall and among structurally underserved populations. Table 2 shows the logistic regression coefficients and model fit statistics for the models that predicted CC participation for each outcome group among the full population, and Table 3 shows the same information among the structurally underserved populations.

Propensity score models should include all covariates that have a theoretical relationship (supported by prior research) with either the treatment or the ATT outcome (Baser, 2006). As displayed in Table 2 and Table 3, the majority of the predictor variables were significantly associated with participating in CC, and those that were not (e.g., residency for tuition purposes, first-generation status, racially minoritized status) were known from prior research to be significantly associated with graduation rates at the university (Institutional Research, Planning and Effectiveness, 2017).

Quality of Matching

The purpose of this section is to review how these eight logistic regression models' output (the predicted probability of CC

Table 2. Logistic Regression Coefficients, Propensity to Participate, Overall Population

	3rd spring GPA/ Completed credits	4-year graduation	5-year graduation	6-year graduation
Preparation index	−0.049 (0.023)*	−0.054 (0.025)*	−0.078 (0.026)*	−0.065 (0.029)*
Preparation index squared	0.000 (0.000)*	0.000 (0.000)*	0.000 (0.000)*	0.000 (0.000)*
Nonresident (tuition purposes)	−0.011 (0.039)	0.013 (0.042)	−0.008 (0.046)	0.010 (0.050)
Pell recipient	0.043 (0.041)	0.044 (0.043)	0.055 (0.046)	0.064 (0.050)
Female	0.423 (0.041)*	0.429 (0.043)*	0.411 (0.046)*	0.454 (0.051)*
First generation	0.085 (0.038)*	0.090 (0.040)*	0.066 (0.043)	0.077 (0.047)
Racially minoritized	0.058 (0.041)	0.049 (0.044)	0.073 (0.047)	0.116 (0.051)*
Major				
HDFS majors	1.584 (0.049)*	1.543 (0.052)*	1.533 (0.057)*	1.550 (0.062)*
Other majors in CC college	0.462 (0.051)*	0.433 (0.054)*	0.400 (0.058)*	0.442 (0.064)*
Psychology majors	1.135 (0.054)*	1.135 (0.057)*	1.120 (0.061)*	1.135 (0.068)*
Majors in the College of Liberal Arts	0.383 (0.047)*	0.371 (0.049)*	0.380 (0.052)*	0.424 (0.057)*
Constant	−0.727 (1.354)	−0.447 (1.436)	0.917 (1.530)	−0.035 (1.683)
N	32,620	29,117	25,650	22,432
Likelihood ratio chi-square	1,878	1,604.08	1,350	1,171.32
Degrees freedom	11	11	11	11
Pseudo R^2	0.204	0.197	0.193	0.197

Note. Cells display the regression coefficient with its standard error.
*$p < .05$.

participation for each outcome group) was used to create control groups that were statistically similar to the CC participants for each outcome group. It was critical to assess the quality of the match because validity of the ATT statistics (the focus of the subsequent Results section) was dependent on how well the control group represents the treatment group across all eight matching processes.

Kernel density plots were used to review the sample balance after matching (Medaglio et al., 2022). Appendix A graphs the density of students across their probability of participating in CC by participation status across all four outcome groups among all students, and Appendix B displays the same information for the samples that were limited to structurally underserved students.

Appendix A and Appendix B display dramatically different distributions in the probability of selecting the treatment before matching and identical distributions after matching. In other words, prior to matching, the probability distribution of nonparticipants was strongly skewed toward the right tail; however, after matching, the lines overlap. Although the matching does not control for all the self-selection biases in our ATT statistic (we know there are limitations in the data available to measure the likelihood of participation in CC), there were observable differences among probability of self-selecting into the treatment (CC course participation) that were eliminated once the matching was used.

Appendix A and Appendix B also show very similar probability distributions across the four outcome groups. This similarity was due to the outcome groups being highly overlapped and interdependent. For instance, all the students in the 6-year graduation group were included in all the

Table 3. Logistic Regression Coefficients, Propensity to Participate, Structurally Underserved Populations

	3rd spring GPA/ Completed credits	4-year graduation	5-year graduation	6-year graduation
Preparation index	−0.068 (0.056)	−0.077 (0.060)	−0.087 (0.064)	−0.083 (0.070)
Preparation index squared	0.000 (0.000)	0.000 (0.000)	0.000 (0.000)	0.000 (0.000)
Nonresident (tuition purposes)	−0.281 (0.135)*	−0.195 (0.138)	−0.222 (0.154)	−0.333 (0.180)
Pell recipient	−0.089 (0.098)	−0.067 (0.107)	−0.067 (0.116)	−0.060 (0.127)
Female	0.420 (0.094)*	0.440 (0.103)*	0.453 (0.112)*	0.534 (0.126)*
First generation	0.054 (0.113)	0.108 (0.125)	0.080 (0.131)	0.098 (0.143)
Racially minoritized	0.124 (0.095)	0.131 (0.100)	0.179 (0.110)	0.221 (0.119)
Major				
HDFS majors	0.916 (0.113)*	0.922 (0.124)*	1.019 (0.139)*	1.084 (0.152)*
Other majors in CC college	0.586 (0.120)*	0.523 (0.132)*	0.397 (0.144)*	0.386 (0.159)*
Psychology majors	1.103 (0.132)*	1.130 (0.140)*	1.022 (0.151)*	0.977 (0.169)*
Majors in the College of Liberal Arts	0.476 (0.113)*	0.495 (0.120)*	0.475 (0.125)*	0.524 (0.136)*
Constant	0.263 (3.147)	0.735 (3.393)	1.374 (3.614)	0.907 (3.926)
N	4,782	4,210	3,627	3,139
Likelihood ratio chi-square	285	238.57	202	187.97
Degrees freedom	11	11	11	11
Pseudo R^2	0.170	0.165	0.163	0.177

Note. Cells display the regression coefficient with its standard error.
*$p < .05$.

other outcome groups. Timing of data collection allowed students who started at the institution 2007–2016 to have had all the outcome measures included in the analysis, but students who started in 2017 only have up to the 5-year graduation (not 6-year graduation).

Therefore, the findings from these kernel density plots indicate that the matching created equivalent distributions in the probability to receive treatment; however, these plots are difficult to interpret in terms of describing matching. Another approach, describing the changes between groups before and after matching using averages and t-tests, was useful to describe how matching changed the control group demographics. This descriptive analysis was completed only for the third fall outcome group (rather than all four groups) because the kernel density plots indicated the similarity between outcome groups. Table 4 shows the proportional representation and the results of a t-test that evaluates whether the representation was equal between groups (CC and control).

Prior to matching there were statistically significant differences in the representation of students by demographic attribute and major, but after matching those differences were negligible. For instance, 28% of CC participants were first generation, compared to only 22% of nonparticipants; after matching, first-generation students comprised 28% of both groups. The differences in academic major were particularly pronounced. Forty percent of CC participants majored in the Human Development and Family Studies (HDFS) department compared to 5% of nonparticipants; after matching, HDFS majors comprised approximately 40% of each group. As in the previous analysis, there were meaningful differences prior to matching, and the

Table 4. Propensity Model Balance Assessment

	Unmatched			Matched		
	CC participants	Nonparticipant	*t*-statistic	CC participants	Nonparticipant	*t*-statistic
Academic preparation index	116.78	115.67	3.04*	116.64	116.73	−0.16
Non-Colorado resident (tuition purposes)	19%	23%	−2.71*	19%	19%	−0.07
Pell recipient	23%	19%	3.60*	23%	23%	−0.18
Female	88%	55%	21.47*	88%	88%	−0.18
First generation	28%	22%	4.00*	28%	28%	−0.14
Racially minoritized	21%	18%	2.66*	21%	22%	−0.16
Human Development and Family Studies majors	40%	5%	50.83*	40%	41%	−0.21
Other majors in College of Health and Human Sciences	13%	16%	−2.71*	13%	13%	0.11
Psychology majors	17%	4%	18.53*	17%	17%	0.02
Majors in the College of Liberal Arts	16%	24%	−5.83*	16%	16%	0.10
Any other major	14%	51%	−23.89*	14%	14%	0.08

Note. Percentages do not total 100 due to rounding.
*$p < .01$.

groups were demographically comparable once matching was completed.

Results

Degree Progress

CC students had higher levels of degree progress at the end of their junior year compared to nonparticipants (Table 5). The adjusted columns display the data after the samples were balanced, and the unadjusted column shows the results prior to utilizing the propensity score. For instance, there were nearly 32,000 nonparticipants prior to using propensity scores to adjust the nonparticipant sample down to 1,031. Not all of the CC participants were included for the ATT. The unadjusted comparisons included 1,038 participants, but only 1,031 appeared in the adjusted comparisons; that is, seven of the CC participants had a probability to participate that was not similar enough (matches could differ by no more than a quarter of a standard deviation) to any nonparticipant, so they were excluded. The success outcomes in the unadjusted column represent a bivariate comparison by CC status, and the adjusted column displays the ATT. This comparison estimates the difference in success after accounting for the demographic and major differences that exist by CC participation.

Degree progress differences were reduced by the propensity score adjustment. For instance, CC students earned an average of 89.3 credits by the end of their third spring semester, which is about 3.7 credits higher than nonparticipants who were statistically similar to CC students, but over 5.1 credits higher than all nonparticipants. The 3.7 credit difference more accurately reflects the effect of CC participation because it accounts for differences in demographics. These results indicated that CC participation was associated with students completing approximately one more course by the end of the junior year compared to similar students who did not participate in CC. Similarly, CC participation was associated

Table 5. Overall Unadjusted and Propensity-Score-Adjusted Junior Year Degree Progress, Campus Connections Participants Versus Nonparticipants

	3rd spring GPA		3rd spring completed credits	
	Unadjusted	Adjusted	Unadjusted	Adjusted
CC participants	3.39	3.39	89.3	89.3
Nonparticipants	3.06	3.19	84.1	85.6
GPA/Credit difference[a]	0.33 (.017)*	0.20 (.021)*	5.2 (.389)*	3.7 (.484)*
***N* for nonparticipants / participants**	31,582 / 1,038	1,031 / 1,031	31,582 / 1,038	1,031 / 1,031

[a]Among the adjusted data this is the average treatment effect among the treated, with standard error in parentheses.
*$p < .05$.

Table 6. Underserved Populations' Unadjusted and Propensity-Score-Adjusted Junior Year Degree Progress, Campus Connections Participants Versus Nonparticipants

	3rd spring GPA		3rd spring completed credits	
	Unadjusted	Adjusted	Unadjusted	Adjusted
CC participants	3.25	3.25	87.7	87.8
Nonparticipants	2.90	2.95	82.0	82.1
GPA/Credit difference[a]	0.35 (.039)*	0.30 (.050)*	5.7 (.894)*	5.7 (1.001)*
***N* for nonparticipants / participants**	4,579 / 203	202 / 202	4,579 / 203	202 / 202

[a]Among the adjusted data this is the average treatment effect among the treated, with standard error in parentheses.
*$p < .05$.

with a third-year spring GPA that was about 0.2 of a grade point higher.

This study also sought to understand whether the positive association between CC participation and degree progress was differentially positive for students underserved by higher education institutions. Results showed that CC participation was positively associated with degree progress for students underserved by higher education and, descriptively, the positive association was stronger for these students (Table 6). Among underserved students, CC participation was associated with a GPA that was 0.3 points higher and 5.7 completed credits more than nonparticipants. These ATT results had a larger magnitude than the overall results reviewed in Table 5 (0.2 grade points compared to 0.3 grade points and 3.7 credits compared to 5.8 credits).

Degree Completion

The second set of student success outcomes was degree completion across three time points. Overall, data indicated that CC students graduated at higher rates than nonparticipants (Table 7). Similar to the degree progress metrics, these differences were reduced once demographic attributes and major were accounted for with the matching process. About 81% of CC students graduated within 4 years compared to only 68% of nonparticipants, and about 96% of CC students graduated within 6 years compared to 92% of nonparticipants. These differences were statistically significant and had a substantively important magnitude, represented by the large percentage point differences (12.6 and 4.6). Even at the smallest effect size (4.6), these differences have practical significance to the institution, which shows relatively stable graduation rates.

Table 7. Overall Unadjusted and Propensity-Score-Adjusted Graduation Rate Comparisons, Campus Connections Participants Versus Nonparticipants

	4-year graduation		5-year graduation		6-year graduation	
	Unadjusted	Adjusted	Unadjusted	Adjusted	Unadjusted	Adjusted
CC participants	80.9%	80.9%	95.1%	95.1%	96.1%	96.2%
Nonparticipants	56.8%	68.3%	85.5%	88.7%	90.0%	91.5%
GPA/Credit difference[a]	24.1 (.017)*	12.6 (.020)*	9.6 (.013)*	6.4 (.014)*	6.1 (.012)*	4.7 (.013)*
***N* for nonparticipants / participants**	28,203 / 914	904 / 904	24,870 / 780	772 /772	21,773 / 659	650 / 650

[a]Among the adjusted data this is the average treatment effect among the treated, with standard error in parentheses.
*$p < .05$.

Table 8. Underserved Populations' Unadjusted and Propensity-Score-Adjusted Graduation Rate Comparisons, Campus Connections Participants Versus Nonparticipants

	4-year graduation		5-year graduation		6-year graduation	
	Unadjusted	Adjusted	Unadjusted	Adjusted	Unadjusted	Adjusted
CC participants	72.4%	72.8%	92.6%	92.5%	92.9%	92.7%
Nonparticipants	49.4%	54.3%	79.3%	84.9%	85.1%	87.9%
GPA/Credit difference[a]	23.0 (.039)*	18.5 (.051)*	13.3 (.034)*	7.6 (.037)*	7.8 (.032)*	4.8 (.038)*
***N* for nonparticipants / participants**	4,036 / 174	173 / 173	3,479 / 148	146 / 146	3,012 / 127	124 / 124

[a]Among the adjusted data this is the average treatment effect among the treated, with standard error in parentheses.
*$p < .05$.

Among underserved populations, graduation rates were higher for CC participants compared to nonparticipants (Table 8). Again, this association tended to be stronger in magnitude among the underserved population of students except for the 6-year graduation rate. At the 6-year graduation point the CC students graduated at a rate of 93%, which was 4.8 percentage points higher than underserved nonparticipants; however, in contrast to the difference in the overall population, this difference was not statistically significant.

Discussion and Implications

The goal of this study was to determine whether participation in the CC service-learning course was positively associated with student success, particularly for students with structurally underserved identities (i.e., first-generation students, racially minoritized students, and Pell grant recipients). Results indicated that participation in CC was positively correlated to student success. Compared to undergraduate students who did not participate in CC, CC students had significantly higher GPAs, more credits completed by their junior year, and higher rates of graduation at 4, 5, and 6 years. These positive associations were even stronger for students from structurally underserved populations (i.e., students with two or more of the following attributes: first generation, racially minoritized, or Pell grant recipients). These findings align with prior research on the value of service-learning for student outcomes (Do et al., 2024; Haddock et al., 2013; Hufnagle et al., 2023; Kuh, 2008; Mungo, 2017; Song et al., 2017). Critically, results provide evidence that CC could be one way to bridge the gap in positive outcomes seen between underserved populations and other student populations.

When students take longer to complete their degree, they incur direct costs (e.g., tuition) as well as opportunity costs (e.g., lost income). Student progression-to-degree is influenced by institutional policies and practices (Scott-Clayton, 2015; Shapiro et al., 2016), and these factors may be particularly important during the early part of students' higher education trajectories (Do et al., 2024). It takes time to familiarize oneself with resources available on campus and to establish a sense of connection to the institution. Thus, intervening early with practices that increase students' access to resources may be one way to support students both during this transition and toward timely degree completion. The majority of CC students participate before their junior year; thus, the timing of CC may partially account for its effect on degree progress. It may be important that service-learning courses are publicized to first-year students and that these students are encouraged to participate.

In addition to quantifying the association between specific service-learning opportunities, like CC, and academic outcomes, it will be important for universities to understand the optimal duration of involvement in such opportunities for students. Although only undergraduates who took the CC course for one semester were included in this study, it is possible that continued involvement would amplify positive associations with attainment outcomes. Indeed, students who took the CC course frequently reported finding meaning and purpose in the experience of mentoring and expressed a desire to stay involved with CC after the semester-long course ended. To address this demand for continued involvement, a "leadership track" was developed to allow students to enroll in additional course credits and stay involved in a variety of leadership roles, including serving as a Mentor Coach to a small group of first-time mentors, a lead Mentor Coach, which is an assistant to the course instructor, and/or join the CC research team. This leadership track has been so popular that, beginning in 2021, students now can earn a Certificate in Campus Connections Youth Mentoring (9 credits) to recognize this leadership and deep involvement. Future studies examining the cumulative effects of extended involvement will provide pragmatic insights for universities wishing to implement CC regarding optimal program structure and "dosage."

Notably, the effect of CC on educational attainment is more pronounced for students from underserved groups. Prior research has found similar differential effects of service-learning on sense of belonging, based on student income level. Specifically, students with low income who participated in service-learning experiences reported greater increases in sense of belonging, relative to higher income students (Soria et al., 2019). Our results align with these findings and provide further evidence that sociodemographic characteristics may moderate the effect of service-learning on academic outcomes. One possible explanation for this pattern of findings is that CC increases students' sense of belonging. Sense of belonging on college campuses plays a central role in persistence, engagement, motivation, and well-being (Azmitia et al., 2018; Gillen-O'Neel, 2021; Pratt et al., 2019). However, university students who hold underserved identities report lower sense of belonging (Gopalan & Brady, 2020). Service-learning opportunities such as CC may promote underserved students' educational success through allowing them to connect with diverse communities and address societal issues that matter to them (Song et al., 2017). Further, such opportunities may afford these students, who may enter college feeling a lack of belonging, a critical opportunity for connecting with peers and faculty (Hurst, 2010; Soria & Johnson, 2017).

CC is uniquely designed to facilitate increased sense of belonging through activities that promote relationship building, sense of community, and self-affiliation with the college campus (e.g., touring campus with mentees; utilizing campus recreation fields). Additionally, CC provides the participating college students with a network of support systems both in and out of the classroom. Alternatively, service-learning has also been shown to operate through increasing academic engagement and self-efficacy (Kendrick, 1996; Schmidt et al., 2004). More work is needed to understand the mechanisms of the effects of service-learning on academic outcomes. Future research should directly investigate sense of belonging and other psychological processes as potential mediators of the effects of service-learning on academic outcomes.

Service-learning also emphasizes the value of alternative forms of knowledge, skills that are different from those traditionally

highlighted in the classroom, but which may be aligned with the lived experiences of students from underserved backgrounds. First-generation students, who are disproportionately low-income and students of color, often report finding little connection between classroom curricula and their own lives, which can lead these students to question whether they belong in higher education (Jehangir, 2010). This belonging uncertainty presents a barrier to persistence. Service-learning, which centers students' lived experiences and utilizes nontraditional models of learning and assessment, may foster a more inclusive academic environment where first-generation students' cultural wealth and knowledge can be integrated, thus allaying some of the belonging uncertainty these students may experience (Bueno et al., 2022; Jehangir, 2010). Additionally, mentors from minoritized communities may make meaning (Kuh, 2008) that is highly personal by giving back to mentees from similar communities. Future work should incorporate robust qualitative data collection and analysis to investigate which features of the service-learning course were most meaningful for students, and whether these perceptions varied by sociodemographic characteristics. Additionally, the fact that service-learning courses benefit underrepresented students can also call into question why they do not benefit privileged students in the same way. We speculate there could be numerous reasons for this discrepancy, one of which may be power dynamics. Students from privileged backgrounds may be entering into service-learning courses with a vision of helping others rather than engaging in a mutually beneficial learning experience. Future research should continue to explore these differences. Furthermore, service-learning and other HIP courses may benefit from introducing more reflective approaches to challenge students to think about social inequalities, privilege, and power dynamics. For example, incorporating these topics into the curriculum could ensure that all students engage more meaningfully with and gain deeper insights into their experiences.

Disparities across college campuses in terms of retention and graduation rates, especially among minoritized students, are a cause for concern. As universities commit to implementing strategies to increase diversity, access, and inclusion of all students, supporting programs that can demonstrate fostering success for underserved students is critical. Yet, there is a dearth of systematic evaluations of specific evidence-demonstrated courses and programs. Through examining the association between participation in CC and key indicators of academic achievement, this study demonstrates the value of a service-learning course for undergraduate students, particularly those traditionally underserved in higher education. Our results suggest service-learning opportunities like CC as one avenue universities may pursue to close attainment gaps and contribute to a more just higher education system. Finally, as mentioned, CC was designed to eliminate some of the traditional burdens associated with service-learning courses by arranging for the course to occur on the college campus, count as an upper division elective, and occur exclusively during the semester weeks. Systemic changes such as encouraging more widespread adoption of flexible service-learning models, integrating service-learning with work-study programs, or increasing funding or scholarships for students participating in service-learning could address the potential costs for underrepresented students. Researchers should continue working to understand specific barriers faced by students in these contexts and to develop best practices for reducing these burdens across different types of institutions and programs.

Limitations and Future Directions

Several limitations must be considered in the interpretation of these results. First, the intent of the analysis is to describe the multivariate association between CC and student success; therefore, determination of causality was threatened by external validity. Alternative matching processes, beyond nearest neighbor, could have been utilized, particularly with the incorporation of additional variables collected from the institution. Second, this study was conducted at one institution. In order to truly examine the implications of a service-learning experience like CC on student success, especially among students from structurally underserved populations, it is imperative that studies like this one are replicated at other universities and colleges. Third, because CC is housed in the Department of HDFS, CC participants were disproportionately likely to be HDFS majors. Additionally, timing of CC completion could be associated with the correlations between completion and student success. Most students, but not all,

take the course their second year in school. However, this analysis does not account for timing: Students were included in the treatment if they took the course during Years 1 through 3. Future research should examine the impact of CC and similar programs on students across majors as well as the timing of course completion. The experience might have differential impacts based on student major as well as course timing.

Finally, with regard to examining the association of CC and student success for underserved students, this was an exploratory study. Future work should explore, through in-depth qualitative interviews, the nuanced experience of participating in CC for students of varying intersecting identities and the differences between them (e.g., students who are White and low income compared to students who are Black and low income). Such work may help clarify the influence of the systemic racist structures within higher education (Harris & Patton, 2019). Moreover, the CC service-learning course is now licensed and offered at other universities. Future studies can examine whether similar results for minoritized students are replicated on other campuses. This study serves as an initial step in understanding the effects of curricular and programming choices universities make, and how those choices may support them in upholding their commitment to diversity, equity, and inclusion.

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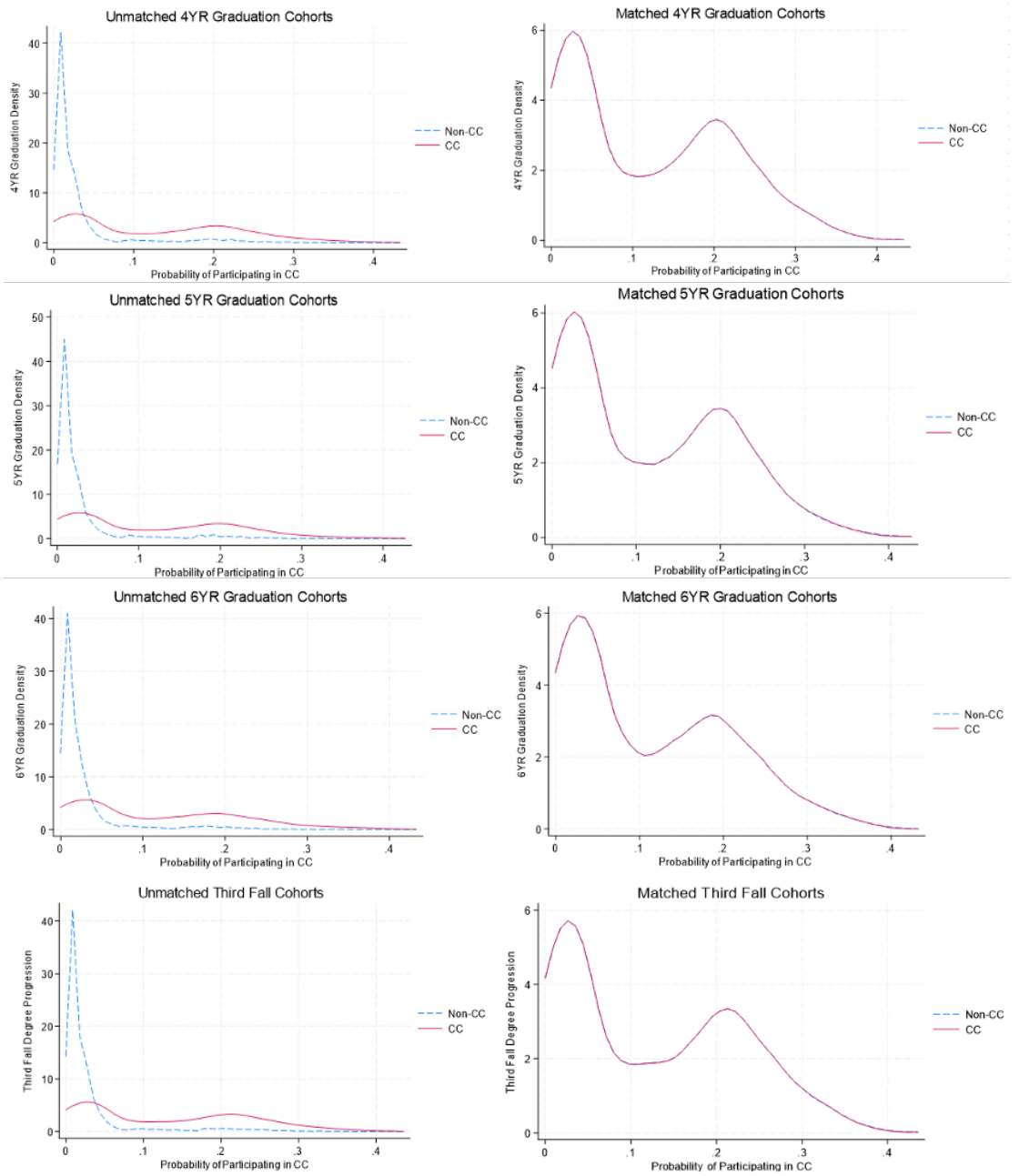
Appendix A: Kernel Density Plot for Treatment Probability by Treatment Status Among Full Population Samples



Appendix B: Kernel Density Plot for Treatment Probability by Treatment Status Among Structurally Underserved Samples