ABSTRACT
Service-learning can help students connect with peers at a college and influence academic success and retention. Between 2017 and 2019, about 700 WSU students annually enrolled into a freshman-level biology course, with 50% of students assigned to the control group and the other 50% to the experimental group. Students assigned to the experimental group who completed service-learning experiences were compared to a control group who completed their courses using traditional lab exercises. The Center for Civic Engagement (CCE) partnered with Biology 102 to AY18 and AY19, with half of the lab sections incorporating service-learning experiences – structured community-based projects organized by the CCE, including orientations and reflections – while the other half proceeded with the traditional curriculum. Statistical analysis comparing overall grade earned in BIO 102, overall GPA, and retention to the subsequent academic year between the randomly assigned control and CCE groups showed that single-service-learning experiences improved both grades and retention. Comparisons were performed separately for each of four cohorts: Fall 2017 (N = 105), Spring 2018 (n = 148), Fall 2018 (N = 703), Spring 2019 (n = 446). Service-learning students had significantly higher grades for BIO 102 and through the first-year SL compliers to the control group. Among all first-year students, 93% of SL students were enrolled at the beginning of the Fall 2019 semester, compared to 81% of students assigned to the control group.

BACKGROUND
Success in college requires substantial commitments of emotion, time, and money. That higher education can do better in encouraging both emotional and intellectual efforts is evidenced by the growing 5-year graduation rates for first-time, full-time students both nationally (60%) and at WSU (62%). At least in part, this stems from failure to retain first-year students, resulting in a lower high school graduation rates by the sophomore year (Stevenson, 2010; Aellow, 2011). Approximately eight out of every 10 first-year students will stay on to become sophomores. We clearly need to implement additional, evidence-based strategies to enhance rates of both retention and graduation.

Engagement in diverse areas of college life can increase the likelihood that first-year students are retained (Khoshaba, 2006), and service-learning (SL) is one form of engagement (Bringle et al., 2010). SL aims to connect students to their academic interests, and provide opportunities to connect with peers and the community at large. In our study, both WSU-specific and the Falcon more generally, together with structured reflection, SL also aims to provide opportunities for students to further develop organizational and interpersonal skills (Bosma, 2010). National data show that civic engagement can enhance retention rates, as well as increase resilience and social agency (Grissom, 2012). Here we provide the first evidence that a single SL experience can enhance academic performance and first-year retention rates for WSU students, especially those belonging to the vulnerable sub-populations of first Gen and students of color.

METHODS
Design
We conducted a semi-randomized blind controlled study of the impact of SL on retention rates of a diverse population of first-year students, enrolled in BIOLOGY 102, a large 100% BIOC 200B class offered both Fall and Spring semesters. Students were tracked in four cohorts based on the same semester (i.e., Fall 2017, N = 703; Cohort 1 = Fall 2017; N = 999; Cohort 2 = Spring 2018; N = 148); Cohort 3 = Fall 2018 (N = 703), and Cohort 4 = Spring 2019 (N = 446). Students in each cohort were assigned to one of two treatment groups based on their lab section. Neither control nor experimental students were informed that they were participating in a research study on academic performance and retention. Students in the control group completed a standard set of lab exercises. In the experimental group, one lab was replaced by a SL experience coordinated by the Center for Civic Engagement (CCE). Students were free to choose their own SL projects, few of which were connected to the subject content of the class. A typical project involved a commitment of about 3 hours, and involved interactions with peers and other community members.

Analyses
Data were extracted from class records, and databases maintained by the CCE and Institutional Research. Analyses were conducted first for each of the four SL cohorts and then repeated by including only first-year students. In each case (full sample, first-year students only), we also report analyses by restricting the sample to include only those experimental groups who completed the SL component (i.e., “compliers”). Students assigned to the experimental groups who did not complete the SL component (i.e., “non-compliers”) were excluded in these analyses. All analyses are reported separately for each of the four cohorts. We used tests of independent sample means to compare within semester academic performance outcomes. Logistic regression models were used to test retention outcomes.

RESULTS
Academic Performance
Students who completed SL earned significantly higher end-of-semester grade class grades in three of the four cohorts (Table 1; p < 0.05). In addition, students earned significantly higher end-of-semester GPA in three of the four cohorts (Table 2; p < 0.05).

LITERATURE CITED

Within-Academic Year Retention
Within-year retention from Fall to Spring semester was examined for Fall 2017 and Fall 2018 cohorts. There were no statistically significant differences in within-year retention between the experimental and control groups, regardless of sample used (full sample, first-year students only, and compliers only).

Between-Academic Year Retention
First-year SL students who completed the SL component in Fall 2018 among the SL compliers compared to the control group (85% vs. 79%, respectively, p < 0.05). As shown in Fig 1, this difference was even more pronounced when comparing students of color to white students. The retention rate among students of color assigned to the control group was 67%, in contrast, the retention rate among students of color in the SL compliers group was 87%, the same rate as white students. Although of smaller magnitude and not statistically significant, there was a similar pattern for Cohort 1 (Fall 2018), in which 81% of SL compliers were enrolled at the beginning of the Fall 2019 semester, compared to 72% of students assigned to the control group.

FIGURE 1: Retention rates for control students and SL compliers from Fall 2017 to Fall 2018. As reported in the text, retention was significantly higher in SL compliers than in students in the control group for students of color (p < 0.05).

DISCUSSION
Our study supports the value of providing first-year students with even just one SL experience. Relative to controls, students who completed SL achieved higher academic performance, with 60% of semester class grades 5.9% higher and a 9.9% boost in end-of semester GPAs. In addition, fall-to-fall retention was 9.9% higher for SL than for control students.

Some sub-populations of first-year students may be more vulnerable to attrition, especially if their families/communities have little or no history/tradition of college attendance (e.g., Petty, 2014). We partitioned our total data set in order to compare control and experimental students who identified as students of color, largely Latinos. We note that many of these students are also First-Gen students (Fall 2017). Students of color in the SL group showed first-to-second year retention rates that were 15% above those of peer students of color in the control group.

We find this to be a remarkably strong effect for such a small and simple intervention, and it provides strong support for the inclusion of SL opportunities into existing First-Year Programs, or as components of early- and near-university classes such as ENGLISH 101 and HIST 101. Doing so will require allocation of resources to support the infrastructure required for offering SL on a larger scale. Nevertheless, our data indicate that such investment can benefit the academic performance and retention of all first-year students, including students of color who are among the most vulnerable to attrition.

ACKNOWLEDGMENTS
Approval for our study was granted by WSUs Institutional Review Board, and funding was provided via the Provost’s Student Success Program, the NPEC, CCE, and Institutional Research for sharing our data, and our BIO 102 Teaching Assistants for keeping track of student participation. And of course, we thank our BS102 students.