Engaging Environmental Science students through project-based service learning in the community

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INTRODUCTION
Community engagement pedagogies, often called service learning, are ones that combine learning goals and community service in ways that can enhance both student growth and the common good (Bandy 2018). Connecting community-based service with academic course material has been shown to enhance the development of personal and cognitive skills (Vogelgesang and Astin 2000). Other benefits may include improving students’ ability to apply what they have learned in the ‘real world’, greater ability to work well with others, and improved social responsibility and citizenship skills, but some studies report mixed results (Eyler 2002). The problem-based project conducted during Fall 2017 in the Environmental Science (ENVS 250) course also fits with the mission of Capital University to inspire individuals to be civically engaged. Students in ENVS 250 Environmental Science (taken by both science and non-science majors) conducted a data-driven environmental research project focused on sustainability and waste issues on campus and in the local community during Fall 2017. Students were required to conduct a literature review, design a research project, collect, graph, and interpret data, write a scientific research paper, give an in-class presentation, submit an action plan with reflection, and complete a final course evaluation survey. Assessments were made through a variety of methods to investigate the impact of the project on student learning, personal, and social outcomes.

METHODS
Research projects were conducted on a range of topics, including recycling (Fig. 1), food waste and composting (Fig. 2), styrofoam use in the main dining room (Fig. 3). Assessment was collected using:

- Progress learning outcomes from the IDEA student ratings of instruction from the lab portion of the course using a Likert scale (see Fig. 4).
- An anonymous final course evaluation survey that required students to self-report progress in learning outcomes using a Likert scale (see Fig. 4).
- Student self-reporting ratings on whether the research project was a valuable part of the course using a Likert scale.
- Anonymous student written feedback and reflection on the research project and paper.
- A written action plan provided by students addressing the environmental issue at the individual, local, state, and national levels, and their own reflection as a citizen-scientist.

RESULTS
Survey results showed that out of 17 students, 82% and 76% agreed or strongly agreed that they made substantial progress on gaining a broader understanding and appreciation of science, and developing a sense of community responsibility, respectively (Fig. 4). Only 59% agreed or strongly that they made substantial progress on acquiring skills in working with others in the lab portion of the course (Fig. 4). Only 41% of students agreed or strongly agreed that the project and research paper were valuable, and 53% agreed or strongly agreed that the project and paper allowed them to make substantial progress in their knowledge and appreciation of environmental issues, as well as developing a connection between research and personal behavior/values.

DISCUSSION
Progress on student learning, personal, and social outcomes were lower than expected. Some students reported that they found the project useful and informative, and appreciated the time to work on it in class. Others asked for more deadlines throughout the semester, to integrate it more into the course, and to allow students to form larger groups. In order to improve this experiential course-based research experience, I plan to further analyze comments and data from the action plans and reflections from Fall 2017, rewrite the guidelines to be more transparent (Winkelmes et al. 2015), show examples of exemplar products (now that they are available from Fall 2017), and introduce additional journaling and reflection. Eyler (2002) suggests that what matters most in high quality service learning is the amount and type of reflection. Specifically, effective reflection could occur before, during, and after the project, and can happen alone, with classmates, and with community partners. Moving forward, this work provides baseline data for integrating a community-based service learning problem-based project in ENVS 250 at Capital University, while also assisting with the recently adopted City of Bexley Zero Waste Plan.

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REFERENCES