Vignettes

Leveraging a Service Experience into a Course-Based Undergraduate Research Experience in an Introductory Geology Classroom

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Whatcom Community College is a small, suburban public college situated near a large agricultural region. A local, nonprofit, organic farm (Growing Veterans n.d.) sought to partner with the institution in a service opportunity examining its soil health. The outcome was a course-based undergraduate research experience (CURE) for students in an introductory environmental geology course for nonmajors.

During a field trip to the farm early in the quarter, the farmers shared their current seasonal growing challenges. The farmers, who were experimenting with different kinds of cover crops, weeding methods, and plant rotations, wished to determine how these practices affected soil health. Student research compared the results of simple soil tests by field or over time. For example, groups of students examined the relationship among elements such as nitrate, pH, earthworm concentration, soil infiltration, and soil bulk density as they compared different types of cover crops to noncovered areas. This partnership has operated since 2014, and data have accrued to support the farm's practice decisions such as employing specific cover crops to maintain soil health. Each year, students enter the raw data results from their research projects into a Google spreadsheet. This allows students to compare their results to those from previous years. As part of the CURE, students present their findings in a formal, academic-style poster session, to which the farmers, faculty, and staff are invited to attend. This poster session is in lieu of a final exam as a celebration of learning. The research posters and raw data are available for the farmers to reference throughout the year, which are used to make planting decisions.

Students completed a survey as part of their experience (Kortz and van der Hoeven Kraft 2016) in which they were asked three open-ended questions about how they benefited, how the project matched what they expected, and how their ideas about science changed. The responses captured similarities to the benefits and challenges described by Kortz and van der Hoeven Kraft (2016) such as an increased appreciation of science and scientists as well as more confidence in themselves. As one student wrote, "[I] gained confidence and experience in working with a team. And confidence in my science skills." In addition, as this CURE was performing a service for a local organic farm, students also described the benefit of feeling like their work contributed to something greater beyond their own college experience. For example, as one student noted, "This was a different type of project w[h]ere you get to visit a place and try to help fix problems. It helps you get more involved and is more fun." Students benefited from this learning experience, and the farm receives ongoing consultation that informs its practices.

References

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Kortz, Karen M., and Kaatje J. van der Hoeven Kraft. 2016. "Geoscience Education Research Project: Student Benefits and Effective Design of a Course-Based Undergraduate Research Experience." *Journal of Geoscience Education* 64(1): 24–36. doi: 10.5408/15-11.1

Community College Ceramics and Student Research: Cooperative Work Experience Projects in the Arts

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Allan Hancock College is a California public community college located in northern Santa Barbara County, serving 11,500 students per semester. For the past three semesters in the Fine Arts Program, student researchers have been sampling, researching, and firing natural clay deposits found in the campus region. Students research local clays by firing them at various temperatures and adding variable fluxes to experiment with eutectic melting points. In 2020, a collaboration began with the California Department of Conservation. The Mineral Resources Program will provide resources for students to research the geological lifecycle of kaolins, gain an understanding of how clays are mined, and learn about other historical contexts of the region (brick-making factories, etc.). Amiko Matsuo, a faculty member in the college's 3D Fine Arts Program, worked with engineering geologist Greg Marquis to pilot a cooperative work experience (CWE) project to develop a model outreach/interdisciplinary curricular guide for the Minerals Resources Program.

This student research emerges from an effort to develop cross-disciplinary student research opportunities through the structure of internships. Matsuo worked with the

CWE internship under the Career Center to develop community partners. Students sign up for one unit and work with a faculty mentor and community partners such as La Purísima Mission, Adamson House, Santa Barbara Food Bank Empty Bowls, and Santa Maria Open Streets to develop individual research goals. All CWE research projects in 3D Fine Arts are designed to culminate in signature events such as pop-up exhibits and peer-to-peer learning workshops. Additionally, all CWE projects stress elements of service learning.

La Purísima Concepción De María Santísima was founded in 1787 and was the 11th of 21 Franciscan Missions in California. One artifact in its collection was broken in an earthquake, and a California State Parks employee contacted the college seeking an interested student to re-create the object. CWE student Margaret Barker was paired with La Purísima with oversight from the instructor. Barker was prepared for the historical reproduction project because of her work in the Ceramics Workshop class. During the previous semester, Barker had taken soil samples from her grandfather's vineyard to create a refined slip as a coating on her relatively large-scale ceramic objects. For the Purísima project, Barker worked to reproduce the historical form, which was approximately 12 inches in diameter at the base, 12 inches in diameter at the throat, 30 inches at the circumference at the fullest point, and 18 inches in height, which were measurements of the historical vessel provided by California State Parks. Based on observations of photographs and sherds, Barker researched hand-building processes necessary for the re-creation of the object. She combined a coil-building and paddling process, carefully following a template of the profile as she built the clay from the base upward. The template was prepared, taking into consideration the shrinkage rate of the clay body in the drying and firing process. According to her self-determined objectives, Barker completed a slideshow documentation of her process, wrote a reflection on her research experiences, and created a historical reproduction using hand-building techniques and terra-sigillata specific to the region. Her piece is now part of the La Purísima Mission exhibit.

Undergraduate research at the college has been solely student/faculty driven. In particular, the Fine Arts Program reframes objectives inherent to creative problem-solving. High-impact practices and student-centered pedagogy develop critical thinking skills and a research mind-set. Aspects of this project have been presented in the form of signature class events that a faculty member featured in a professional development lecture for the college.

Such collaborative projects demonstrate how the arts can be supported by deliberate and intentional local partnerships while strengthening ties with the community.

Spreading Undergraduate Research Experiences across a Community College

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Undergraduate research, although common at the university level, has been a slowly growing endeavor at community and technical colleges around the nation. Reasons for this situation include the mission of community and technical colleges, cost, and faculty workload. However, the proposed and realized impacts of authentic undergraduate research experiences on student success make these worthwhile activities for students at two-year institutions (Adedokun et al. 2014; Balster et al. 2010; Corwin, Graham, and Dolan 2015; Fechheimer, Webber, and Kleiber 2011; Kelly et al. 2007; Nadelson, Walters, and Waterman 2010). This vignette discusses the impacts of undergraduate research experiences on the students of Northeast Wisconsin Technical College (NWTC) through models for course and summer undergraduate research experiences (CURE and SURE, respectively; Kolokithas and Calderón 2018).

For the CURE, instructors at NWTC have joined the Tiny Earth Initiative (Tiny Earth n.d.), a network of students and instructors that focuses on student sourcing of antibiotics from soil. The World Health Organization has declared that an era is coming in which once simple infections treatable by antibiotics will be deadly again (Nisnevitch 2016). Although some institutions participate with a course section or two, it was decided that all sections of the Microbiology course at NWTC would join in the search for antibiotics. The Tiny Earth initiative shares curriculum, resources, and training for interested partners, which makes the transition into this model relatively simple to adopt. The labs involve collecting soil, isolating bacteria, screening for antibiotic producers, and identifying genotypes and phenotypes. Further isolation of antimicrobial substances and eukaryotic testing also can be done.

At NWTC, the Tiny Earth initiative curriculum has been in place for the past three years, and the results have been quite positive. Students were surveyed before and after completion of their course. Students were asked a range of questions, including applicability of the subject to their daily lives. Before the adoption of the Tiny Earth curriculum at NWTC, the perception of students that microbiology was applicable or very applicable to their daily lives, not just their program, increased from 23 percent of students in the presurvey to 50 percent of students in the postsurvey (n = 75). However, when the Tiny Earth curriculum was adopted, students seemed to have a better appreciation of the applicability of microbiology to their daily lives, as the data collected showed an increase from