Learning through research: the undergraduate research experience in a community college.

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Abstract
The typical hands-on experience in science coursework is often limited to predetermined laboratory activities involving little exploration. Undergraduate research departures from this paradigm and instead allows students to experience first-hand what is entailed in making an intellectual contribution to their discipline. At Laramie County Community College, we offer the opportunity for students to initially experience the nature of science, and then engage with and conduct novel research through course work and through independent study. This program has far reaching successes with the use of federal funding to further engage and prepare our students for their future education and careers.

Background
Undergraduate research in the community college is slowly overcoming the traditional paradigm that suggests 1) research is separate from teaching, and 2) community colleges are places of distribution, not the creation of new knowledge. This shift is the result of the recognition that students, including those at community colleges, are capable of and benefit from research experiences in a variety of ways [1, 2], and to exclude them from these opportunities is a disservice to them and our society. For example, students that engage in scientific research have increased skills, greater persistence in STEM degree programs and careers, and are often interested in pursuing more advanced degrees than originally intended. Students also gain in less easily measurable ways, such as increased confidence in their abilities as scientists and expansion in the use of critical thinking. Further, in the last 10 years, various professional groups of scientists and educators have increasingly recommended that the teaching of science move to a depth versus breadth format, and include more ‘practice’ of actual science [3]. This has ultimately translated into recommendations that colleges should provide research opportunities for students in their first 2 years [4], hence, while at LCCC. This coupled with the fact that community colleges serve 46% of all college undergraduates underscores the need for these experiences to be available for our students to remain competitive. Locally, the student population at LCCC is about 4,000 individuals; 46% are first generation, 43% are Pell eligible and 18% identify as minorities. Despite our relatively rural location, we are in driving distance of 3 research universities and are uniquely poised to directly impact the pipeline of students going into science. Regionally, there is a push to increase participation in the sciences as seen through the 500+ students participating in an annual Undergraduate Research Day at the University of Wyoming. Ultimately, implementation of research across the curriculum at LCCC would ideally produce a showcase day and/or an undergraduate journal made up of communications from a wide swath of our own students.

Mission and Vision
Our mission is to provide access to an authentic research experience for any interested and motivated undergraduate student wanting to enhance their academic experience.
Our vision is to accomplish this through:
- Providing research opportunities through classes and independent study in both lab and field-based projects using contemporary and applicable instrumentation.
- Active recruitment and retention of student scientists.
- Support for involvement of other CC and UW faculty.
- Development and maintenance of relationships with community agencies and surrounding institutions.

Figure 1. Variety of mechanisms for research experience currently used at LCCC in the Natural Sciences program.

Opportunites
- Students practice what they learn
  - Develop and practice skills in problem solving, information literacy, communication, and collaboration

Challenges
- Time to participate (both students and faculty)
- Research credits finding a place in a transfer program
- Sustained funding
- Administrative and cultural support at the community college level varies
- Recruitment of students to participate
- It can be a big jump in responsibility on the students for their own learning
- How and where to implement the research experiences (Figure 1)

References