



Engaging faculty in preparing students for non-academic environmental careers



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As a biology major at New York University, I was introduced to ecology in a course that bused the class out of New York University's Greenwich Village campus every weekend, to investigate biodiversity patterns in nearby forests and wetlands. After a day crossing bogs and walking through forests, I would take the subway home, hip boots in hand, reflecting on how the day's activities connected to my routine city life. Engaging others in understanding the city connections to adjacent habitats became my life's work. As Dean of Arts and Sciences at a public liberal arts university, I encourage faculty and students to engage in connecting classroom knowledge to real-world problem solving, as required in non-academic environmental careers. – *CRC*

After years as a journalist covering science and environment, I abandoned a promising newspaper career for graduate study in ecology and environmental social science. As an academic researcher, my prior work experience has informed my study questions and shaped how I share my findings. I've always sought opportunities to involve stakeholders, especially land managers, in my work. When Schlesinger (2010) editorialized about translational ecology, I embraced this idea and promoted it within the Ecological Society of America (ESA) because it fit perfectly with my views about the role of science in society. But I gained my own translational skills via a highly atypical career trajectory. I was an accidental translational ecologist, but we can no longer afford to rely on happenstance. – *MWB*

Most universities prepare their ecology students primarily for academic careers but less than 20% of PhDs in ecology secure an academic position (Hampton and Labou 2017). It is crucial that ecology coursework incorporates the basic communication, public policy, and stakeholder engagement skills that ecology alumni say are essential for success in today's multifaceted environmental workforce (Lucas *et al.* 2017). Seasoned environmental professionals, graduate students, and early-career ecologists are calling for better career preparation for non-academic environmental careers, starting at the undergraduate level, to help attract a diverse group of talented people to the field of ecology (Lewisohn *et al.* 2015; Hansen *et al.* 2018). Students pursuing careers in academia or research need the innovative training that is being proposed for translational ecologists (Brunson and Baker 2016; <https://bit.ly/36nWciA>). While not all ecologists need to engage stakeholders directly in their research, all students can benefit from a curriculum that teaches them how to communicate research to diverse

audiences and serve as environmental ambassadors to their communities (Brunson and Baker 2016; Schwartz *et al.* 2017).

How can universities move their ecology programs toward a more career-responsive curriculum? This is not simply asking faculty to learn and teach about career opportunities they have never pursued. It is about changing the culture of ecology programs so that students have time to engage in non-academic activities, while also learning the discipline's more traditional skills. This change to career-oriented educational approaches in ecology programs requires university administrative support, faculty buy-in, student leadership development with engaged alumni, direct connection to the universities' mission and strategic planning process, and validation by the main professional societies associated with ecology careers (Schwartz *et al.* 2017).

At the undergraduate level, implementing a community-engaged problem-solving curriculum is essential to achieving the vision of liberal arts colleges today (<https://bit.ly/36rATN1>). With many universities pursuing the Carnegie Community Engagement Classification distinction, faculty are being encouraged to help students forge diverse environmental career pathways, as highlighted in the introduction to this series (<https://doi.org/10.1002/fee.1508>).

Faculty buy-in requires promotion and tenure committees to recognize (and reward) teaching and research that involves community outreach. Such changes in university policy are taking place at large research universities as well as at primarily undergraduate institutions (eg Michigan State University, Utah State University, several institutional members of the Campus Compact environmental initiatives [<https://bit.ly/2PBQnr2>]). However, changes in promotion and tenure *guidelines* are only a first step. Promotion and tenure reviewers (both within and external to candidates' universities) also need to place considerably more weight on community engagement activities. Furthermore, faculty need resources to pursue such activities. Diverse ways of getting financial support for "faculty release time" (from teaching/service duties), curriculum enhancement, or interdisciplinary faculty collaboration projects are also propelling faculty leadership toward an effective 21st-century environmental curriculum – for example, Bates College's (<https://bit.ly/2Fs7Gq7>) or University of Maine's (<https://umaine.edu/mitchellcenter>) sustainability initiatives.

At the graduate level, interdisciplinary programs in conservation biology and environmental public policy have emerged



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Figure 1. Mark Brunson engaging Native American students on water-quality issues affecting the Navajo reservation and cities near Utah State University campuses.

at the University of Georgia (<https://www.ecology.uga.edu/degree/masters-cesd>), Utah State University (<https://climateadaptation.usu.edu>), the University of California–Davis (<http://conservationmanagement.ucdavis.edu>), and other prominent institutions. These programs include practical skills in decision making, communication, and planning as well as a basic foundation in ecology and environmental science.

Universities are developing research traineeship programs (<https://bit.ly/347qe8P>) and are also funding Community Scholars/Fellows programs for graduate student and faculty professional advancement (Day *et al.* 2012). These graduate programs emphasize interdisciplinary research and focus on producing STEM professionals prepared for research-related careers within and outside of academia, with mentoring by alumni and local professionals.

Graduate science education for non-academic career employability requires university support for centers that can facilitate community-engaged research projects, improving community well-being as well as training students across disciplines (Case 2014). This is hard to do for researchers who spend much of their fieldwork life far away from the universities in which they have faculty positions. As a result, graduate students and postdocs have taken the lead in collaborating with the community and developing the internship experiences with local industry and agencies needed for enhancing graduate student career preparation (Washington University Balsa group; <https://fuse.wustl.edu/balsa-group-washu>).

Given these new directions in graduate education, faculty mentors should deliberately structure their students' graduate study to allow time to pursue these non-academic interests, rather than advising students solely to learn about the latest analytical tools or theoretical debates. This also means faculty with community engagement experience must be willing to teach the needed courses. At Utah State University, one of us (MWB) first offered a graduate translational ecology seminar in 2011, and has done so in most years since. It has attracted

not only ecology students, but also others from environmental social science, geography, technical communication, and art, creating cross-disciplinary collaboration experience that can benefit students pursuing academic as well as non-academic careers. The seminar includes review of pertinent literature; skill-building activities; and class-designed translational activities outside the university. The opportunity to engage with students and community to accomplish scholarly goals in a non-research setting has provided new insights into topics to study (Figure 1) (and it has been fun to teach).

For faculty who may feel unprepared to teach about such an emerging field, help is available. The Leopold Leadership program at Stanford Woods Institute for the Environment has worked for 20 years to develop academic leaders for global sustainability (<https://leopoldleadership.stanford.edu>). Innovative transdisciplinary synthesis organizations such as the National Socio-Environmental Synthesis Center (SESYNC) and National Center for Ecological Analysis and Synthesis (NCEAS) are leading the way in training programs for a translational ecology workforce (<https://bit.ly/2LI49rf>; <https://bit.ly/2qEKfG5>).

Professional societies for ecologists are also leading the charge to make career readiness a priority in ecology education. In 2016, the ESA Student Section organized an effort to identify challenges and opportunities for 21st-century ecologists as well as concrete steps to address them. One recommended step was to hire translational ecologists in every department and offer formal training in translational ecology (Hansen *et al.* 2018). The ESA's recent societal endorsement of a four-dimensional ecology education (4DEE) curricular framework elevates the importance of the human dimension in the discussion of traditional ecology topics, while emphasizing fieldwork, communication skills, and interdisciplinary connections. The 4DEE framework can guide ecology education at all levels to meet the diverse needs of today's environmental workforce, while validating the quality of pedagogy of ecologists everywhere (<https://doi.org/10.1002/fee.2013>).

It is time for all stakeholders to use existing resources and models to move ecology programs forward to a more career-responsive education. Designing and implementing ecology curricula that promote the employability of all students, by teaching them how to recognize the career skills they are gaining, and to articulate their value to potential employers, is essential for enhancing employability of the next generation of environmental professionals (<https://bit.ly/2PbaFsx>).

Supporting Information

Author bios and references may be found in the online version of this article at <http://onlinelibrary.wiley.com/doi/10.1002/fee.2158/supinfo>

This article is the final installment of the “Exploring Ecological Careers” series. We hope that the series has been helpful and inspiring for readers (particularly students and early-career ecologists) who are considering career paths outside of academia.