

SPOTLIGHT

Creating Pathways for Nontraditional Graduate Students

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As past and present nontraditional students, our group of authors experienced firsthand a range of hurdles in our pursuit of ocean science graduate studies. Some of us attended graduate school while working full time in our fields as a means to advance our careers. Others returned to graduate school to pursue a second career in a new field. Combining our experiences with broader demographic information (Wendler et al., 2010) led us to define nontraditional ocean science graduate students as any of the following: mid-career professionals pursuing graduate degrees for career advancement and those who are embarking on a second career, hold an undergraduate degree outside of STEM, are in their thirties or older, or are balancing school with work and/or family responsibilities. While we highlight these characteristics, we recognize that there are others who self-identify as nontraditional, such as those facing a serious medical condition or disability. We hope that by sharing ways to remove barriers to entry, retention, and advancement for nontraditional students, our field will become more inclusive, equitable, and diverse.

Second-career professionals are assets to our field. Students with backgrounds in computer science, mathematics, and philosophy bring a range of sought-after skills to their ocean science careers. Those who earned undergraduate degrees in disciplines such as English, journalism, communications, and marketing have skills that are vital to translating our science into action and incorporating it in public policy.

WHAT ARE THE BARRIERS AND WHO IS FACING THEM?

To determine whether our experiences were typical of those faced by others, we informally surveyed roughly 70 marine and ocean science programs across the United States, drawing from the list used by Cook et al. (2016, Figure 2). Surveys were sent via SurveyMonkey to program contact emails listed on the websites returned from the Google search. Survey questions and responses are detailed in the online supplementary materials. We also examined approximately 60 ocean science internships to assess their accessibility to nontraditional students. We reviewed each of them for level of education required, whether a student can fulfill the commitment remotely, whether housing is provided, whether meals are covered, the time commitment for the program, whether a stipend is provided, and how much and whether travel to the location covered. The online supplementary materials include a table that shares links to the internship websites and provides an assessment, where possible, of these criteria.

The results of our survey of marine and ocean science programs suggest that the barriers we encountered are likely widespread in our discipline. Two groups stood out as being particularly impacted: working professionals and students new to STEM. Students who must maintain substantial employment outside the university find few options for taking graduate classes in the ocean sciences because most are held during prime working hours. This group of nontraditional students also may not be able to take advantage of the traditional assistantship model because they may have dependents to

support and other financial constraints. A barrier for students coming to ocean sciences from outside a STEM discipline is the lack of pathways that can accommodate this transition.

AN ARRAY OF OPTIONS

Our survey results and personal experiences suggest a number of straightforward ways to provide students with additional pathways (Box 1). Here, we elaborate on four.

- **Offer evening, weekend, and asynchronous online classes.** Our informal survey results show that ocean science graduate courses are largely inaccessible to those engaged in traditional workdays. Nearly all programs (98%) offer courses only on weekdays, and those weekday classes primarily start before 5 p.m. Given that students spend 10 hours or less per week in class in 79% of responding programs, shifting classes to evenings and weekends seems feasible from a time perspective. Additionally, fully online degree programs like that offered by the University of Florida (<https://ffgs.ifas.ufl.edu/academics/online-learning/>) can serve as examples for other programs.
- **Rethink graduate program requirements.** Although 56% of the programs surveyed offer part-time options during all years of their degree programs, 36% of programs decline to offer this flexibility at any point. Only 34% of the programs we surveyed allow students to transfer at least half of their core courses. Based on our experiences, this limitation includes courses taken in the completion of a master's degree that cannot be applied to a doctoral program of the same discipline at another university. In contrast, doctoral programs outside the United States may be purely research based, even to the extent of formally recognizing existing published works. Coupled with the advent of remote and virtual arrangements, this would allow pursuit of an advanced degree while maintaining full-time employment and without the need to relocate.
- **Create part-time internship opportunities.** Internships are one way that students bolster their graduate school preparation. Of the internships surveyed, 95% offered only on-site opportunities, 90% were full-time, and 77% were for a duration of 12 or fewer weeks. As such, they are inaccessible to those who need to maintain employment that will extend beyond their internships. This may be necessary for students to keep health insurance for themselves and dependents or to maintain seniority with an employer in order to take time off work for school.
- **Expand access to STEM resources.** Acquiring a second bachelor's degree is time-consuming and costly. Therefore, many students coming to ocean science from outside STEM may instead take several years of prerequisite undergraduate classes. Roughly 15% of community colleges in the United States offer baccalaureate degree programs (Love and Bragg, 2021; AACCC, 2023). An increase in this number and/or an increase in post-baccalaureate programs—short certificate programs aimed specifically at students seeking to enter into a different field—would help streamline

graduate school preparation for career-changing students. Access to academic advising and mentorship by STEM faculty would give necessary support to these second-career students.

LEARNING FROM ANOTHER FIELD

Disciplines including nursing, business, law, and education are successfully expanding capacity through the approaches we describe. For instance, our colleagues in the University of Hawai'i at Mānoa's College of Education (COE) have provided pathways for non-traditional graduate students for many years. Typically, these students are full-time teachers when they enroll in graduate studies to sharpen their craft, continue modeling "lifelong learning" for their students, and increase their salaries. Because the majority of COE students cannot attend class during the school day, graduate courses are held in the evenings or on weekends. Furthermore, to increase accessibility to these professionals, many programs have created a tailored educational experience where students are enrolled part time for five straight semesters, including summer, rather than the typical four semesters of full-time enrollment. In an effort to increase access for those coming to education from another field, the COE has also created an 18-month, Post-Baccalaureate Certificate in Secondary Education (PBCTE; <https://coe.hawaii.edu/secondary/programs/pbcte/>) licensure program that caters to nontraditional students.

A large aspect of teacher preparation resides in "fieldwork," which traditionally entails several semesters observing and participating in classrooms. However, these unpaid roles are often not possible for nontraditional students. Therefore, PBCTE students may instead be employed as "On the Job Training" teachers contracted as emergency hires for the Hawai'i Department of Education or an accredited private school. Similar approaches could be designed for ocean science graduate students working in their discipline.

WE CAN'T AFFORD TO WAIT

There is a real and growing need for ocean scientists. By 2030, the global ocean economy is expected to be twice the size it was in 2010 (OECD, 2016). Expertise and innovation in the ocean sciences is essential in ensuring this growth is environmentally sustainable. Yet, a recent estimate suggests that the United States is only producing about the half the students needed to fill this demand (*The Economist*, 2022). Additionally, our field fails to reflect our society's diversity. By offering additional pathways through ocean science education, we can expand both the number of ocean scientists and their diversity.

SUPPLEMENTARY MATERIALS

The supplementary materials are available online at <https://doi.org/10.5670/oceanog.2024.105>.

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BOX 1. OPTIONS FOR REMOVING BARRIERS FACED BY NONTRADITIONAL OCEAN SCIENCE GRADUATE STUDENTS

- Offer courses in the evenings, on weekends, and/or online.
- Allow students to transfer in a greater proportion of core courses.
- Allow students to be part-time for the duration of their degree programs.
- Rethink arbitrary length-of-program requirements.
- Grant credit for ocean science work students do outside academia (e.g., sharing science with stakeholders, mentoring others, authoring white papers, project management of ocean science projects), either formally or towards fulfilling graduation requirements.
- Consider removing teaching requirements from degree programs and/or revising the requirements to recognize work done in ocean science sectors beyond academia (e.g., private industry, government).
- Create research-only graduate programs, as is common outside the United States.
- Raise graduate assistant salaries such that they allow recipients to support themselves and at least one dependent without qualifying for public housing (<https://www.huduser.gov/portal/datasets/il.html>) and/or supplemental nutrition assistance (<https://www.fns.usda.gov/snap/students>).
- Expand post-baccalaureate programs in order to streamline preparation for graduate school for those new to STEM.
- Create part-time and/or remote internships for aspiring students.
- Allow prospective students access to STEM advisors and mentors.
- Grant community college students (and other residents) access to state university library services, in states that don't already do so.
- Remove arbitrary age restrictions from scholarships and/or funding opportunities.
- Remove requirements for holding a bachelor's degree in a STEM field from scholarships and/or funding opportunities.

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