Grad school in the rear view: prioritizing career skills, mentorship, and equity in the interdisciplinary environmental PhD

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Abstract

Interdisciplinary Environmental PhD programs show great promise for advancing integrative problem-oriented scholarship, yet graduates of these programs may not always leave with training that best prepares them for the harsh realities of the academic job market or students’ unique career goals beyond academia. This study is the first of its kind to anonymously survey 132 recent participants from programs across the USA who exited their program, either with or without completing a degree, within the past 10 years. Respondents candidly reflected on their experiences with interdisciplinarity, coursework, skills building, mentorship, equity and inclusion, teaching, and preparation for diverse career paths. We found substantial opportunities for improving student satisfaction and career preparedness in the training of interdisciplinary environmental scholars who can provide critical solutions for addressing today’s socioecological challenges while forging long-term paths to professional fulfilment. In the conclusion, we detail recommendations for career planning, pedagogical and skills-based training, and improved equity which can allow these unique doctoral programs to meet the current moment.

Keywords

Doctoral program · Career preparedness · Education · Student experience · Sustainability · Interdisciplinarity

Introduction

Environmental thinkers both within and beyond academia have long argued that the multi-faceted nature of environmental problems is ill-suited to the boundaries of academic disciplines (Brewer 1999; Focht and Abramson 2009). The ongoing socioecological crises faced around the globe require investments in integrative interdisciplinary training (Semerjian et al. 2004), and across university campuses demand for interdisciplinary environmental programs is steadily on the rise (Vincent 2012). While undergraduate programs advancing interdisciplinary environmental training anticipate a wide array of career opportunities for their graduates, doctoral programs face a much more challenging task in preparing their students for their professional pursuits post-graduation. Boundary-crossing research is sorely needed and yet such work is not always legible or rewarded in academic institutions predominantly organized along disciplinary lines. At the same time, prospects for university employment are dwindling, a long-term trend exacerbated by the COVID-19 pandemic (Woolston 2020). The security of academic jobs is also in decline, as only 37% of faculty hold tenured or tenure-track positions (American Association of University Professors 2021). Yet the apprenticeship model of most doctoral programs means that many mentors struggle to prepare their mentees for careers beyond academia (Patterson et al. 2019), careers which many students feel are stigmatized (Shmatko et al. 2020) since the academic path is still regarded as the primary destination for a PhD. Alongside these trends runs the persistent need for environmental education to confront and remedy the field’s history of exclusion and Eurocentrism (Valle 2021), by advancing a more just and inclusive vision of sustainability within the academy and beyond. This begs the question: how can interdisciplinary environmental PhD programs train a diverse array of scholars to advance integrative, inclusive and societally-relevant work while preparing graduates for an unconventional and uncertain professional future?

We offer the following study as empirical ground to stand on while frankly confronting this question. To our knowledge, this survey of recent participants in interdisciplinary environmental PhD programs is unique in providing a forum for former students from across the USA to report on their
training and career preparedness. Existing literature details the insights of doctoral students at a single institution during or immediately following graduate training (Rissman and Barrow 2019; Moslemi et al. 2009; Meyer et al. 2016), providing a powerful but more narrow view due to institutional specificities and a lack of time to link such experiences with a broader career trajectory. Similarly, faculty in environmental programs have documented the results of a student workshop (Gosselin et al. 2020), individual course (Denham et al. 2021; Rashid 2021), focus groups (Knaggård et al. 2018), faculty survey (Bolger 2021), or program design process (Downs et al. 2017) within their own institution to suggest broader implications for interdisciplinary in environmental graduate training. From a theoretical perspective, many thoughtful scholars have published the outcomes of conference workshops on environmental graduate training (Haider et al. 2018; Clark et al. 2011) or put forward agenda-setting pieces detailing the sustainability-specific key competencies needed for future program development (Wiek et al. 2011; Brunson and Baker 2016). Our study compliments these important efforts with a national-level dataset of anonymous responses. This data offers an opportunity to trace trends in the strengths and shortcomings of interdisciplinary environmental PhD programs across institutions from the perspective of those who lived them and moved beyond them.

**Methods**

We distributed a survey (Appendix A) containing 43 questions addressing motivations for pursuing an interdisciplinary environmental PhD, demographics, coursework, teaching, mentorship, funding, research, experiential learning, diversity, equity, and inclusion, current employment, and opportunities for reimagining the PhD amidst today’s challenges. The survey questions included a variety of forms including multiple choice, multiple select, and free response. The study population consisted of recent participants (those from the last 10 years) in interdisciplinary environmental PhD programs, including both those who graduated and those who left programs without a degree. Recruitment efforts began by compiling a list of 51 US-based interdisciplinary environmental PhD programs (Appendix B), defined as those focusing on environment or sustainability and featuring faculty and coursework in both natural and social science disciplines. While sharing commitments to interdisciplinarity and a topical focus on environmental study, these programs vary widely in their content, structure, and approach, reflecting the diverse and innovative character of the field.

To reach the study population, we contacted PhD programs as well as alumni offices at each institution with a request to distribute the Qualtrics-based online survey to program alumni via email. The survey was also distributed through several listservs commonly used by environmental scholars. When necessary, and when the information was available, we directly contacted alumni of programs. We actively collected responses from March 15, 2021, through June 15, 2021 and received a total of 132 responses. Responses showed a high rate of completion as only 14% of respondents completed less than 90% of the survey. Given the recruitment strategy relied on a third party to circulate the invitation, we cannot calculate a response rate. However, considering that many of these 51 programs only graduate a few students per year and many of them are relatively new, we believe 132 represents a notable fraction of the population of potential respondents.1

Of respondents who chose to describe their race (n = 116), 77% identified as white, 8% as Asian or Pacific Islander, 7% as multiracial, 5% as Black, and 3% as Latinx. Of respondents who chose to provide gender identification (n = 120), 35% identified as male, 62% identified as female, and 3% provided other identifications, meaning that women are somewhat over-represented in our sample compared to the population of people with PhDs. Our results did not yield meaningful trends based on demographic characteristics and we recommend future research use in-depth qualitative methods to understand intersectional experiences.

Our recruitment efforts were limited by the cooperation of PhD programs to conduct outreach to their alumni. To encourage candid responses and the cooperation of program administrators, the survey was anonymous and we did not ask participants to disclose which program they attended. Therefore, we cannot interpret trends within or across specific programs nor can we analyze responses by aspects of program design. Because programs do not publicly release the demographic characteristics of their students, we cannot assess the representativeness of our sample.

Survey respondents were provided the option to skip any question in the survey and the response rates for the multiple choice and multi-select questions ranged between 80 and 90% of total survey respondents. This variation in response rate motivated the inclusion of response counts in addition to percentages in reporting the results. Qualitative data from the survey was analyzed using open-coding to distill common themes among responses.

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1 For example, if each program graduated three PhDs per year and had been in existence for the full 10-year period, this would give a potential respondent pool of around 1500 students; this means that perhaps 9% of the population may have responded. This is different than a response rate since we cannot verify the size of the overall study population or how many members of that population were reached by an invitation from a program coordinator.
Results

Interdisciplinarity

Interdisciplinarity was a key feature for many respondents when selecting to pursue an environmental PhD program. When asked “Why did you choose to pursue an interdisciplinary environmental/sustainability PhD?” most respondents indicated that either their “research topic or approach required interdisciplinarity” or their “topic was problem oriented.” Only a select few (n = 8, 6%) indicated that “interdisciplinarity was not important to me in my program selection.” Interdisciplinary also came up often (n = 47, 36%) when participants were asked about which aspects of their program were most valuable. While respondents may have been primed by the survey’s title, the intentional pursuit of an interdisciplinary education suggested here is an important reminder for those who may dismiss the interdisciplinarity of these programs as incidental to students’ pursuit of a given mentor or area of expertise.

Interdisciplinary mentorship came in a variety of forms, with the vast majority (n = 106, 92%) reporting that their dissertation committee was composed of faculty from multiple disciplines. Of those, half (n = 53) indicated that an interdisciplinary committee was a requirement of their program. The most common form of this requirement was the inclusion of at least one committee member from a different department or discipline, with some programs specifying the need for disciplinary expertise. For example, a requirement that the student’s committee have at least one social scientist and at least one natural scientist or that at least two of the three pillars of sustainability (i.e., social, economic, and environmental) be represented. In a few select cases, programs required that at least one committee member be a non-academic or a practitioner working off campus. This requirement, however, was not always matched with incentives for faculty to participate in committees beyond their department, leaving some students struggling to recruit mentors. For those with an abundance of faculty from a variety of disciplines within their department, such requirements were more easily fulfilled. The level of engagement across committee members, however, could be highly variable. As in one student’s case, the full committee was only required to be present for the final dissertation defense with no requirements for interaction or meaningful cross-disciplinary considerations throughout the course of their study. It is worth noting that respondents who reported having an interdisciplinary committee also took longer to earn their degree (5.4 years compared to 4.7 years on average), although it is unclear if the cause is due to the interdisciplinary committee or the more complex nature of interdisciplinary research. Overall, most respondents indicated that they were either very satisfied or somewhat satisfied (n = 83, 72%) with their program’s overall approach to interdisciplinarity, with relatively few (n = 15, 13%) indicating that they were either somewhat dissatisfied or very dissatisfied. The remaining respondents (n = 17, 15%) were neutral. The respondents indicating that their committee was not interdisciplinary were more likely to be dissatisfied with how interdisciplinarity was approached by their program, suggesting that students enrolled in interdisciplinary environmental PhD programs do in fact want their committee to be interdisciplinary.

Despite overall satisfaction, respondents also commented about several short-comings related to interdisciplinarity, committee composition, or mentorship. One complaint was that despite the emphasis placed on the importance of interdisciplinarity, it was not meaningfully incorporated into the actual coursework or curriculum. Another issue reported was programs offering very few courses devoted to interdisciplinarity and that those offered were heavily weighted towards theory rather than practice. It was suggested that more interdisciplinary coursework be offered, and that there be more opportunities for applied work where one could learn how to implement interdisciplinary projects, scholarship, and research. Participants also pointed to the potential for misalignment between program expectations and career goals of enrolled students, as they struggled to find the appropriate balance between the disciplinary expertise emphasized in academic jobs and the interdisciplinary expectations of the PhD program.

Coursework and skills building

Respondents were asked to describe the type of coursework that best supported their PhD progress; which courses were most directly beneficial from the perspective of their current position; and if they would have changed anything about the amount or type of coursework taken. Their responses underscored the value of skills-based courses—such as statistics, programming, research design and research methods—which most participants wished they had taken more of in retrospect.

Research design courses were fundamental, as in the words of one respondent such courses provide “a framework for understanding the type of work ANY scientist does” as well as provide the foundation for interdisciplinarity. Similarly, courses that helped hone professional skills in time management or analytical skills were highly regarded. Participants clearly valued the topical expertise provided by courses highly relevant to their desired career path, such as fisheries management or wildlife ecology. A smaller portion of students highlighted the importance of inspiring or eye-opening courses which offered different worldviews. In
particular, they remarked on the reflexivity fostered by environmental justice or environmental history courses which allowed them to understand how disciplines developed and what their biases or blind spots might be. The majority of top-rated courses, however, represented quantitative, natural science, or methods courses, rather than social theory or humanities topics. This may reflect the way in which technical skills are more widely recognized as transferable when eyeing multiple career pathways. Alternately, it may signal how theoretical courses shape one’s approach to research more than its execution and thus are less easily identified as missing in retrospect. For those anticipating a career in teaching, courses on pedagogy were notably lacking. Overall, students valued flexibility and independence as some found coursework requirements excessive or irrelevant.

Experiential learning also provided key training opportunities. Eighty percent of participants who responded to this question \((n = 87)\) indicated that they had opportunities to “learn by doing” through nontraditional activities beyond their research project or coursework during their PhD. Most of those respondents described these opportunities as invaluable to their PhD experience. The most common opportunities mentioned were the following: grant writing and/or submitting applications for funding; involvement in research projects beyond their dissertation work; applied research featuring community engagement; internships, fellowships, or study abroad opportunities; volunteer or service-related experiences; teaching or teaching assistantships; and opportunities to co-author research papers with faculty. In several cases, respondents emphasized that these experiences were more valuable than formal or required course work for their education and eventual employment. A recent paper by graduate students of interdisciplinary PhD programs also underscored the important of leadership skills training which could be supported through skill-based certificate programs, funding to attend external training programs, and encouragement to take part in science communication or policy fellowships (Sykora-Bodie et al. 2021).

Diversity, equity, and inclusion

When asked how well their department addressed diversity, equity and inclusion (DEI), 37% of \((n = 108)\) participants reviewed their department positively, 30% reported a neutral stance, and 33% characterized their department’s performance negatively. We also asked about how well the department addressed DEI with regard to coursework, research, teaching, and departmental culture, and these assessments remained fairly consistent about DEI across these domains, though coursework and departmental culture tended slightly more negative. Qualitative responses reflected an overwhelming tendency for DEI to go unaddressed, mentioning DEI initiatives and topics as “non-existent” or “rarely talked about.” Several participants expressed that the absence of DEI efforts constitutes a major programmatic flaw.

Representation held a prominent place in participants’ evaluation of their program’s ability to address DEI. Respondents reported that faculty were overwhelmingly white and pointed out that while many programs successfully recruited international students and faculty, people of color from within the US were far more rare. Some expressed concern that in diversifying via internationalization, skin color was being mistaken for lived experiences of marginalization. Participants noted a lack of economic diversity, explaining that the burden of student fees and meager stipends were more easily endured by those from more affluent backgrounds. The gender balance among faculty received mixed reports, with some frustrated by the persistence of all-male departments while others appreciated the strong presence of female faculty. In cases of successful recruitment of both diverse faculty and students, however, many noted significant attrition by female faculty and students of color, indicating a failure to provide equitable support.

In terms of programmatic content, many participants made sharp critiques of their program’s poor performance regarding DEI across coursework, research, and institutional support. Many respondents noted the absence of environmental justice scholarship and the persistence of a largely white, male, and Eurocentric canon in core courses. Others called out the failure to address links between early ecological thought and discriminatory ideologies such as eugenics and colonialism, as well as a need to address the historic relations of academic institutions or disciplines to racism. One student pursuing research related to inequalities reflected that such topics were deemed “less scientific” by faculty. Another described that even when faculty were encouraging of such scholarship, they were unable to provide appropriate guidance. Most participants reported existing DEI efforts to be student-driven and lacking in substantive faculty or institutional commitments.

Several participants reported successes and suggestions for improving the culture of DEI in environmental PhD programs. Many appreciated the recent formalization of commitments through statements, committees, and policies as a step in the right direction. Students called for formal guidelines addressing ongoing departmental actions to address DEI and standard procedures for accommodating disability, mental health, and parental leave. Without formal structures, individual arrangements may be more prone to bias or strain graduate students’ advising relationships. One respondent enthusiastically endorsed the recent addition of a paid internship advancing DEI efforts, acknowledging that such labor when uncompensated adds an additional burden to marginalized students. Finally, participants requested dedicated training on implementing DEI efforts in their teaching and research practices.
Teaching

Respondents expressed a need for more formal training in teaching. In terms of teaching preparation, respondents emphasized training in the skill of course development. While some respondents found TAships valuable, others noted that these often involved grading papers rather than classroom experience. Most valued was the ability to teach independently and design one’s own courses. They also expressed a need for training in inclusive teaching, including identifying biases and working with learning and language differences.

This is not unique to interdisciplinary environmental programs, and universities have, by and large, dealt with the lack of teaching preparation through offering workshops through their teaching centers rather than including it in PhD programs. These workshops were described as valuable for some, but voluntary workshops with university teaching centers are not necessarily filling the bill. A formalized process and dedicated courses for credit or practicums would better support pedagogical skill development, as would direct observation and feedback from faculty. One respondent noted that “these optional trainings demanded a lot of effort to get in and only provided cosmetic improvements.” Another commented that after working as a TA or co-instructor for 11 classes during graduate school, they found “the practical challenges of delivering equitable, interdisciplinary education to be almost wholly unrelated to feel-good teaching seminars” offered by the university. This resonates with prior studies indicating short trainings may have limited effectiveness in changing teaching practices and effective training programs can take a semester or more (Shortlidge and Eddy 2018). In retrospect, many respondents wished that they had had “foundational” or “teaching 101” courses that covered both pedagogical theory and practice. The few respondents who had completed such courses as part of their program gave positive reports.

Careers within and beyond academia

The vast majority (69%, n = 74) of respondents are currently employed in a position requiring a PhD, with an additional 10% (n = 11) in positions preferring a PhD. Academic appointments dominated career outcomes (69%, n = 75) with 38% (n = 41) of all respondents in tenure-track positions, 11% (n = 12) not in the tenure-track with security of employment, 4% (n = 4) in adjunct lecturer roles, and 17% (n = 18) in post-doctoral positions. Employment beyond academia was largely in non-governmental and non-profit work (11%, n = 12) or government agencies (10%, n = 11), with a very small portion working in the private sector (3%, n = 3).

To conclude, the survey respondents were asked two open-ended questions: “Given the changing landscape of work and academic employment opportunities, how might an environmental PhD program adapt to these conditions?” and “What more imaginative, innovative or creative approaches to a PhD would you like to see?” Overwhelmingly, respondents discussed the need to prepare students for and expose them to careers beyond academia. They advised several strategies for doing so, including emphasizing problem-based learning, offering more technical coursework, facilitating networking opportunities, creating opportunities to learn from practitioners, offering formal career counseling, and coordinating internships. As one respondent explained, undergraduates are offered such services and yet “there’s an assumption that graduate students don’t need those chances to explore their options, which is crazy in light of the academic job market.” Another recommendation was to make PhD programs as a whole more problem-based and applied, while intentionally building transferable skills. Of the five respondents who gave reasons for leaving their PhDs early, three of them mentioned shifting career skills are also REALLY valuable to a number of sectors and I wish I had learned them during my PhD rather than assembling them piecemeal after the fact.” Internships and networking offer opportunities to integrate non-academic experiences and explore a wide range of options. One respondent advised programs “Encourage students to network outside of academia with potential employers EARLY. Encourage them to attend conferences even if they are not ready to present to get a sense of who is working where and what types of work they do. Bring in guest speakers from outside of academia doing fantastic work. Give students a chance to talk to them.” Fostering collaborative projects among students might also provide teamwork skills valued in a variety of workplaces. Overall, respondents underscored the need to not only prepare students for non-academic career possibilities, but moreover to ensure such paths are culturally accepted and valued within PhD programs.

Respondents also wrestled with the notion of the over-production of PhDs, with some citing a need to adapt admissions to job availability while others cautioned against an exclusive focus on employment. “There’s no point in admitting 120 PhD students when only 50 will find jobs that require PhDs. Being more honest about that could save a lot of students time and money.” By contrast, one respondent cautioned, “It would be a mistake to align the PhD only with corporate ideas of employment readiness. It is important to continue to train environmental thinkers, academics, philosophers.” Another respondent rejected the idea of adapting to the changing employment landscape: “Don’t adapt. Fight back. Few people are more equipped to fight against the neoliberalization of universities and the increasingly extortionate academic labor market than highly educated...
researchers.” These considerations are important to keep in mind when thinking about how to create or redesign programs to prepare students for a variety of careers.

**Recommendations**

The stakes are high when it comes to interdisciplinary environmental PhD education because our worsening socio-ecological crises require expertise that transcends disciplines. Are the programs that exist meeting the moment? It seems that in a few respects, such as offering experiential learning opportunities, existing programs are meeting the challenge—but generally speaking, there is much more that needs to be done. Reflecting on both the closed and open-ended answers from respondents, we have six specific recommendations.

1. **Programs should enhance support for career preparedness throughout the PhD, including providing and rewarding targeted skills-based training.**

   Students overwhelmingly recommended that interdisciplinary environmental PhD programs take concrete steps to support career preparedness throughout their academic journey and emerging evidence indicates these practices can improve student success (St. Clair et al. 2017). One form this might take would be to approach PhD students more like postdoctoral scholars where mentors and advisees craft a professional development plan revisited at regular intervals. Rather than assuming research and coursework alone will advance a students’ career, this plan would chart progress on specific skill development, networking, collaborative research, and exposure to potential career opportunities within and beyond academia. This echoes the recommendations of others who have proposed intake interviews to tailor student training (Rissman and Barrow 2019). Another approach is to offer targeted skills-based training in ways that are clearly demonstrable. Whether in data science, pedagogy, or specific research methods, programs can ensure opportunities are available that give students the level of depth and applied experience necessary to come away able to demonstrate their expertise not only in their topic of study but in a set of specific transferable skills. Certificates, prizes, digital badges, or other forms of recognition may help make these skills legible to a wide array of audiences.

2. **Programs should do more to incorporate equity and justice into coursework and to prioritize recruitment and retention of underrepresented scholars.**

   Significant work remains to ensure interdisciplinary environmental PhD programs serve students equitably and prepare them to integrate justice in their approach to sustainability. Questions of equity can be threaded through coursework or explored in depth through focused seminars. Coursework across topics can contextualize the Eurocentric legacy of environmental study while broadening the representation of environmental thought to include non-Western ideologies and the works of scholars of color. Programs and institutions can prioritize the recruitment and importantly, retention, of students and scholars under-represented in the field. Importantly, international recruitment should not substitute for recruiting and retaining students and scholars who have experienced the unique circumstances of life as a Black, Indigenous, or Latinx person in the United States. Exit interviews with scholars leaving the department might provide key insights into areas of improvement.

3. **Programs should support pedagogical training for students pursuing teaching positions, rather than relying only on campus units and the initiative of students to fill this gap.**

   Rather than assuming that TA-ships provide sufficient training for those pursuing teaching positions, a professional development plan could chart progress on pedagogical training, course development, independent instruction, and student evaluations. Students should not be pigeon-holed into a specific track, but rather have the flexibility to pursue what they deem beneficial, as there may not always be tradeoffs. For example, investing time learning about evidence-based teaching does not necessarily reduce students’ sense of being well-trained for a research career, nor does it reduce their number of publications (Shortlidge and Eddy 2018). Over time students may choose to alter their career trajectory, but the importance of a professional development plan lies in talking about career preparedness candidly, early, and often, while normalizing and supporting careers beyond academia.

4. **Programs should articulate clear expectations and evaluations of interdisciplinarity in the program, including in program assessments.**

   Students are drawn to interdisciplinary environmental programs because they understand the imperative for integrative thinking when confronting complex sustainability challenges. However, operationalizing interdisciplinarity can be challenging for students faced with unclear expectations, limited faculty experience with such work, or institutional structures that constrain mentorship opportunities. Students pursuing academic careers might also be guided to intentionally cultivate a disciplinary identity alongside their more interdisciplinary engagements to ensure they are legible on the academic job market.
Mentorship could be improved by hiring faculty with a demonstrated track record of interdisciplinary work or training, as well as incentivizing mentorship from those outside the department and even outside the academy. Program assessment can also help. Clear expectations and evaluations of interdisciplinarity in the program (Meyer et al. 2016), including for coursework, student projects, and faculty activities, can provide data to drive improvements over time.

5. Programs and faculty should integrate interdisciplinarity through increased project-based learning.

Project-based learning is another way to improve interdisciplinary training. Respondents indicated that the structure of many programs (i.e., depending upon existing courses from across the university with one or two courses that are meant to be integrative) do not allow sufficient opportunity to intentionally integrate curriculum across disciplines. In addition, students want more opportunities to actually implement interdisciplinary projects. These issues may be remedied by taking a scaffolding approach to project-based learning, where an applied group project is divided into manageable components and embedded in courses throughout the program, with more direct support from instructors early on and more independent work later in the process (see Stentoft 2017; MacLeod and van der Veen 2019).

6. Appropriate funding packages will make it easier to implement these recommendations.

Not surprisingly, tailored career preparedness, pedagogical training, targeted skills-based training, interdisciplinary committees, and other program requirements may increase the time needed to earn an interdisciplinary environmental PhD as compared to more disciplinary or focused programs (as our respondents indicated). This underscores the importance of appropriate funding packages for students that enroll in these programs, making sure that enough funding is available to support them for the time necessary to realistically complete all program requirements.

Who can take up these recommendations? One of the implementation challenges is that programs and departments are not exclusively responsible for progress on these fronts and are often limited by the resources or priorities of their institution. We write knowing that fellow faculty and graduate students are most likely to read an article like this and we may feel disempowered by the larger structures we work within. However, we can organize and work with administrators and research funders to further the broader conditions for progress within programs and departments. Professional societies, undergraduates and masters students who are contemplating PhDs, and employers can all be allies in articulating the case for these changes. In a sense, there has never been a better time to revisit the structure and goals of the interdisciplinary environmental PhD, because with the varying crises in higher education—from enrollment and engagement to employment to diversity, equity, inclusion and justice—even those who may be slow to change recognize that things cannot stay the same. The six recommendations above are rather modest, and some have happily become common-sense suggestions echoed in classrooms and conference rooms. The work now is to create space to implement them.

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Declarations

Conflict of interest The authors declare no competing interests.

References

- American Association of University Professors (2021) “The Annual Report on the Economic Status of the Profession, 2020–2.” The Annual Report on the Economic Status of the Profession
- Bolger P (2021) A study of faculty perceptions and engagement with interdisciplinary research in university sustainability institutes. J Environ Stud Sci 11(1):115–129. https://doi.org/10.1007/s13412-020-00616-7
- Brewer GD (1999) The challenges of interdisciplinarity. Policy Sciences, the Theory and Practice of Interdisciplinary Work 32(4):327–337
- Brunson MW, Baker MA (2016) Translational training for tomorrow’s environmental scientists. J Environ Stud Sci 6(2):295–299. https://doi.org/10.1007/s13412-015-0333-x
- Clark SG, Steen-Adams MM, Pfirman S, Wallace RL (2011) Professional development of interdisciplinary environmental scholars. J Environ Stud Sci 1(2):99–113. https://doi.org/10.1007/s13412-011-0018-z
- Denham D, Rozance MA, Malone M, Goodling E (2021) Sustaining future environmental educators: building critical interdisciplinary teaching capacity among graduate students. J Environ Stud Sci 11(1):101–114. https://doi.org/10.1007/s13412-020-00611-y
- Downs TJ, Carr ER, Goble R (2017) Re-imagineing environmental science and policy graduate education for the twenty-first century using an integrative frame. J Environ Stud Sci 7(2):177–188. https://doi.org/10.1007/s13412-017-0423-z
- Focht W, Abramson CI (2009) The case for interdisciplinary environmental education and research. Am J Environ Sci 5(2):124–129. https://doi.org/10.3844/ajessp.2009.124.129
- Gosselin DC, Thompson K, Pennington D, Vincent S (2020) Learning to be an interdisciplinary researcher: incorporating training about dispositional and epistemological differences into graduate student environmental science teams. J Environ Stud Sci 10(3):310–326. https://doi.org/10.1007/s13412-020-00605-w
- Haider LJ, Hentati-Sundberg J, Giusti M, Goodness J, Hamann M, Masterson VA, Meacham M et al (2018) The undisciplinary journey: early-career perspectives in sustainability science. Sustain Sci 13(1):191–204. https://doi.org/10.1007/s11625-017-0445-1
