

# Disrupt and demystify the unwritten rules of graduate school

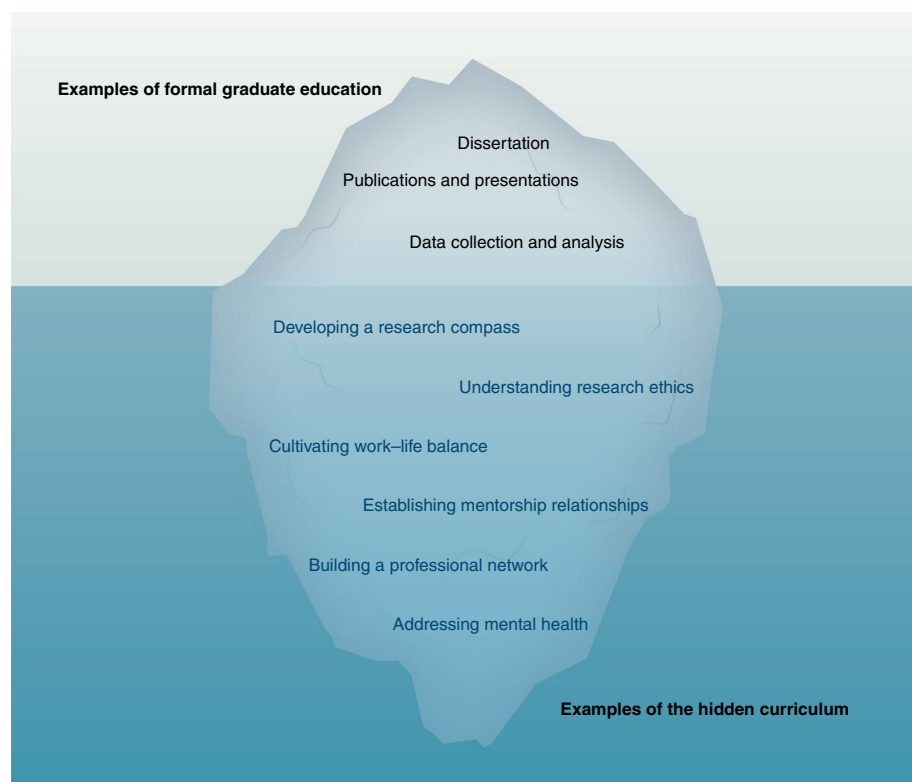
**To the Editor** — A graduate school curriculum can be viewed as an iceberg (Fig. 1), the tip of which is focused on tangible skill development, such as data collection, analysis and publishing. However, beneath the water's surface there lie implicit academic, social and cultural lessons that are currently required to keep an academic career afloat. Informal weekly discussions between early career researchers at the University of California, Santa Cruz identified a number of non-technical skills that are critical to a successful career in geoscience, but which are currently buried in the hidden curriculum.

The hidden curriculum of academia in North America includes social and cultural norms that typically align with those of the white middle class<sup>1</sup>. This means that the hidden curriculum can be even less visible, and ultimately inhospitable, hostile and exclusionary, for those with intersecting and marginalized identities with regard to, for example, race, ethnicity, gender and sexuality. These unwritten rules and expectations contribute to the geosciences being one of the least diverse and inclusive disciplines within science, technology, engineering and mathematics<sup>2</sup>.

Importantly, graduate students should not have to conform to hidden academic norms to succeed. We need to both demystify and disrupt the hidden curriculum; to bring visibility to the skills that graduate students need for a successful career in academia while confronting our community's structural inequities. We believe that everyone has an individual responsibility to become part of the anti-racism movement<sup>3</sup> and to change the existing academic culture and structure at every level. Here we highlight examples of gaps within our formal training and suggest some actions to address key elements of the hidden curriculum.

Students should be trained in the development of an individualized research compass early in graduate school. Identification of interesting, unanswered questions within a scientific field, and positioning oneself to address those gaps, is a foundational element of a research career. Training in research development will help graduate students stay focused as they hone their specific research directions.

Additionally, without a healthy work–life balance, students and academics



**Fig. 1 | Graduate school curriculum viewed as an iceberg.** A number of non-technical skills are vital for a successful academic career, but this hidden curriculum lies beneath the surface of formal graduate training.

will not be in a position to address their research questions. Thus, we argue that the graduate curriculum should provide formal opportunities to discuss, and create, community guidelines on work–life balance practices with faculty and peers. This will not only highlight these challenges, but will also help to change cultural expectations of work in departments and labs. While graduate school is intended to be difficult and time-consuming, finding a balance between personal and professional pursuits can lead to better mental, physical and emotional health.

On a related and often overlooked note, graduate students are more likely to experience depression and anxiety than the general population, with higher rates for underserved identities (for example, as related to race, ethnicity, gender and sexuality)<sup>4,5</sup>. Students therefore need training and support for their mental

health. Support can take many forms, including, but not limited to, material support through subsidized counselling services and fair wages, as well as community support, through peer groups and department curricula on shared challenges in science.

Importantly, training and development don't end after graduate school. In order to navigate the nonlinear nature of research and academic careers, students must be taught how to establish mentoring relationships and professional networks. Explicit and early training in how to map and examine these professional networks can help identify areas for growth and establish the need to continually revisit them as personal and professional needs change.

Many of the curriculum gaps we've identified for the geosciences will be common across departments

and institutions, but it is far from a comprehensive list of implicit expectations. Specific aspects of the hidden curriculum may be more or less relevant for different disciplines or regions of the world. We therefore urge faculty and staff to examine the hidden curriculum of their own graduate school experiences and to recognize how they may have benefited from knowledge of, or cultural familiarity with, this curriculum.

Once the hidden curriculum is brought to light, it needs critical examination: are the cultural norms arbitrary, unnecessary barriers to participation that can be removed, or are they a crucial aspect of professional development that should be explicitly taught? As the hidden curriculum has a disproportionate effect on marginalized students, failure to address this aspect of graduate education means we will

continue to disadvantage and isolate promising and important students. All faculty and staff must leverage their institutional power to confront traditions that reinforce exclusion in academia<sup>6</sup>. We advocate for robust professional development curricula that educate beyond the tangible and practical to provide an even playing field for all.

Jennifer Pensky<sup>1</sup>✉, Christina Richardson<sup>1</sup>,  
Araceli Serrano<sup>1</sup>, Galen Gorski<sup>2</sup>,  
Adam N. Price<sup>1</sup> and Margaret Zimmer<sup>1</sup>

<sup>1</sup>Department of Earth and Planetary Sciences,  
University of California, Santa Cruz, Santa  
Cruz, CA, USA. <sup>2</sup>Department of Geography,  
University of California, Berkeley, Berkeley,  
CA, USA.

✉e-mail: [jpensky@ucsc.edu](mailto:jpensky@ucsc.edu)

Published online: 19 July 2021  
<https://doi.org/10.1038/s41561-021-00799-w>

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## Acknowledgements

We thank A. Donaldson and C. Murphy, who helped us develop these discussions into a graduate-level discussion-based course that was offered for the first time in the autumn of 2020. The course focused on sharing experiences and developing strategies to navigate several unwritten rules of the hidden curriculum; course materials and metrics can be found at <https://go.nature.com/3xSOCdH>. We also thank L. Scholz, T. Pico and J. Green for helpful feedback on earlier versions of this Correspondence. M.Z. was supported in part by the National Science Foundation (EAR-2046957).

## Competing interests

The authors declare no competing interests.

# First-year graduate courses foster inclusion

**To the Editor** — Recent studies have highlighted the lack of racial and ethnic diversity in geoscience<sup>1</sup> and the failure to increase diversity of students earning geoscience PhDs in the United States for more than 40 years<sup>2</sup>. In response to this crisis, programmes are working to expand diversity through graduate recruitment efforts<sup>3</sup>. However, our discipline will not become more diverse without making our graduate programmes more inclusive and sustainable for those who enter them. As part of our inclusive practices, we, as US professors and mentors of graduate students, have built courses for first-year graduate students that seek to make transparent the tacit knowledge needed to succeed in our discipline<sup>4</sup>, sometimes called the hidden curriculum of graduate school.

Thriving in graduate school and preparing for the next career stage requires skills and strategies that many students have not learned through previous experiences. If underprepared, a bumpy transition to graduate school can derail students and erode their sense of belonging, leading to student attrition (Fig. 1).

The responsibility to guide new students through the adjustment to graduate school defaults to their advisors. In reality, advisor guidance varies widely and advisors are vulnerable to survivorship bias<sup>5</sup>; the assumption that everyone will learn, grow

and succeed in the same way they did may limit advisors' ability to provide needed support for students unlike themselves. Leaving students to work things out on their own promotes further inequity. Many advisors might not have open discussions with their advisees on topics such as the impact of imposter syndrome, authorship expectations, time management, funding plans, conflict management, the norms of the department or institution, mentoring needs and implicit bias. These are among the many topics that we discuss within our first-year graduate courses in order to better equip students to successfully navigate graduate school. By providing the same information to all students, these courses promote equity and inclusion.

Although semester-long orientation programmes are recognized as the most effective approach for introducing students to graduate school and improving retention<sup>6</sup>, fewer than 20% of surveyed US graduate schools offer an orientation programme longer than one day, with over 50% providing just a half-day orientation<sup>7</sup>. We recommend that geoscience programmes include professional development content in their graduate curricula that is specifically tailored to the geosciences and the department culture; an approach that has worked well for our US-based graduate

programmes, which often already have some course requirements.

Geoscience-specific training allows discussion of issues that would not be approached within a general graduate-school orientation. For example, it should include discipline-specific barriers to diversity and inclusion<sup>1</sup>, field safety<sup>8</sup>, research ethics pertaining to sample/data collection and storage<sup>9</sup>, and collaboration with local communities in the regions we study<sup>10</sup>. Another important benefit of departmental courses is that new students explore these issues together and develop a supportive cohort that they can turn to throughout the rest of their time in graduate school. If effective, the cohort-building facilitated by a first-year graduate course encourages students to forge connections across research groups and has the potential to increase retention of historically marginalized people. Students from marginalized groups including, but not limited to, first-generation college students, Black, Indigenous and people of colour, women, disabled people, international students and the LGBTQIA+ community of lesbian, gay, bisexual, transgender, queer, intersex and asexual people are especially vulnerable to attrition due to advisor conflict, misunderstandings about expectations, and/or feelings and experiences of exclusion<sup>11</sup>. Courses for

