Rethinking the undergraduate textbook as a tool to build a diverse community of ecologists

Jeannine H Richards[1,2*], Katherine T Charton[3], Stephanie L McFarlane[2], Abigail F Widell[3], Nick M Haddad[4], Mary B Wyer[5], and Ellen I Damschen[3]

Recruitment and retention of a diverse scientific workforce depends on a more inclusive culture of science. Textbooks introduce prospective scientists to their chosen field and convey its cultural norms. We use ecology textbook data spanning two decades and document little change in representation of scientists during that time. Despite decades of multifaceted efforts to increase diversity in ecology, 91% of founders/innovators and 76% of working scientists introduced in textbooks were white men, poorly matching the demographics of scientists currently publishing in ecology. Textbook images depicted white men working as scientists, while women and people of color were frequently shown as nonscientists. Moreover, textbooks lack discussion of how science and society shape each other. Pathways to increase retention and sense of belonging for individuals from historically excluded groups include updating textbooks to accurately represent the scientists active in the field, contextualizing historical constraints on participation, and revealing how culture shapes scientific investigations.

Front Ecol Environ 2025; 23(3): e2819, doi:10.1002/fee.2819

Persistent lack of diversity continues to plague scientific fields, limiting creative potential (Tannenbaum *et al*. 2019; Hofstra *et al*. 2020; Tilghman *et al*. 2021). Attempts to diversify the science, technology, engineering, and mathematics (STEM) workforce have largely focused on training and opportunities for women and individuals from historically excluded racial and ethnic groups (Estrada *et al*. 2016; Chaudhary and Berhe 2020), based on the rationale that participation is limited by such factors as lack of mentorship, inadequate course preparations, and an absence of research opportunities (Rosser 1990; Armstrong *et al*. 2007; Estrada *et al*. 2016). These individual-centered interventions, however, are proving insufficient, and even dangerously perpetuate an "individual deficit" model (Bilimoria and Liang 2013; Asai 2020), rather than turning a critical eye toward the culture of STEM disciplines as a key part of the problem (Cronin *et al*. 2021; Handelsman *et al*. 2022).

Undergraduate education communicates and reinforces the cultural norms of scientific fields. It is a key time period when students consider their sense of belonging within their chosen career path (Asai 2020; Wood *et al*. 2020; Handelsman *et al*. 2022). Science is typically presented as objective and unbiased; prospective scientists rarely confront the inherent bias and subjectivity in science influenced by human culture and society. Students internalize normative values about what constitute "good" scientific questions, how data are collected and interpreted, and the importance of scientific findings—values that have downstream impacts on who persists in science (Figure 1). Messages about normative scientist identity are also conveyed in the undergraduate classroom via images of which scientists are highlighted (Good *et al*. 2010; Schinske *et al*. 2016).

Here, we investigated how undergraduate textbooks—the most broadly used and frequently updated media to communicate science to students—convey the culture of science in the field of ecology and whether those textbooks change over time to reflect changing demographics and cultural norms. Participation by women in ecology—as compared to other STEM disciplines—has markedly improved, and major ecological associations have prioritized increasing diversity and inclusivity for decades (Bentley *et al*. 1993). Using rare long-term data on textbook content (Damschen *et al*. 2005), we evaluated (1) whether representation of women and scientists of color in textbooks has changed over time to match demographic benchmarks based on publishing records and participation across academic levels, and (2) the degree to which cultural norms and the interplay between science and society are discussed in major ecology textbooks.

Methods

A note on perceptions

Gender, race, and ethnicity are complex, nuanced personal identities. Gender is socially constructed, defining norms, roles, and identities based on biological sex at a societal level but is not necessarily binary nor aligned with biological sex at the level of the individual (Tannenbaum *et al*. 2019).

[1]*Department of Ecology and Environmental Studies, Florida Gulf Coast University, Fort Myers, FL*[*]*(jeanninehrichards@gmail.com);* [2]*Department of Botany, University of Wisconsin–Madison, Madison, WI;* [3]*Department of Integrative Biology, University of Wisconsin–Madison, Madison, WI;* [4]*Kellogg Biological Station and Department of Integrative Biology, Michigan State University, Hickory Corners, MI;* [5]*Department of Psychology, North Carolina State University, Raleigh, NC*

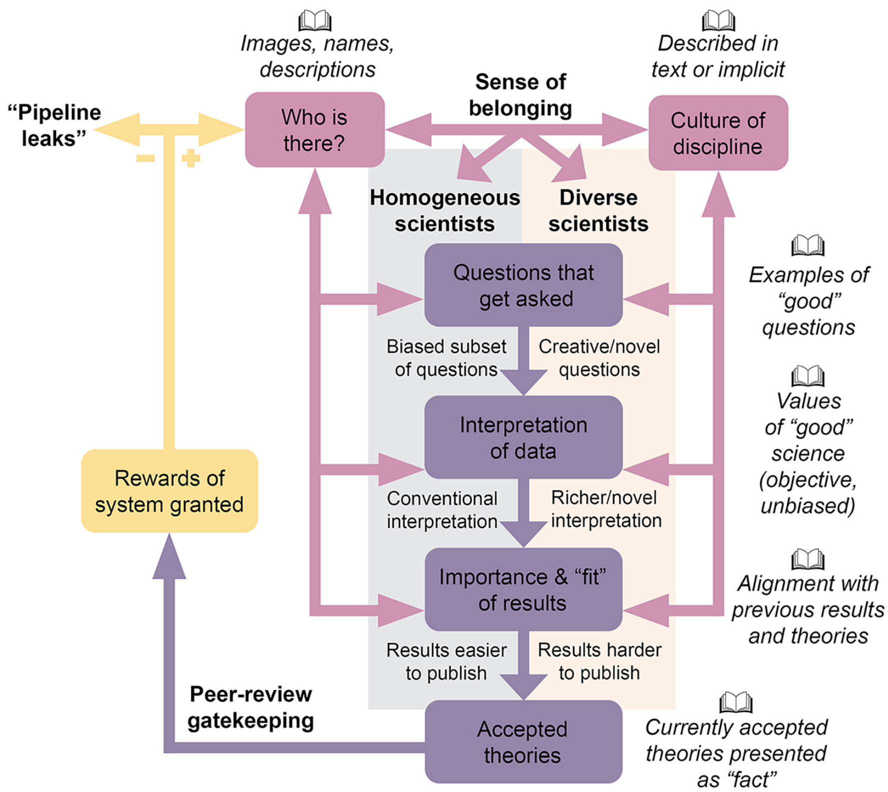

Figure 1. Conceptual model of how textbooks convey and influence the culture of science. Boxes connected by arrows represent directional relationships. The content of textbooks (book icons) shapes student perceptions of working ecologists and the discipline's culture (pink boxes). These influence how the scientific process is conducted (purple boxes), who chooses to stay in science, and which work is deemed valuable (gold box and arrows). Scientists from diverse backgrounds are more likely to employ a diverse array of epistemologies and methods in their science. Two alternative pathways present the impacts of homogeneous (left) versus diverse (right) perspectives.

Gender identity (how one self-identifies) may or may not match perceived gender (how others perceive the person). Likewise, race is not biologically defined but is socially constructed based partially, but not exclusively, on skin tone and other physical traits (Jablonski 2021). Like gender, racial identity is complex, individual, and sometimes kept private, whereas visual cues are frequently used in race perception by others. Social constructions of gender and race play important social and historical roles in structuring access to opportunities.

Students must rely on their own perceptions when interpreting names and images of scientists presented in textbooks, and students' own backgrounds paired with cultural norms subconsciously inform that interpretation. We used perceptions of gender, race, and ethnicity in this paper, which are likewise shaped by our own positionality, to mimic how students may interpret explicit and implicit gender and race/ethnicity information. We recognize that simplistic binary categories erase the existence of nonbinary and transgender community members and members of diverse racial and ethnic groups who have contributed to the development and growth of ecology as a field. The field of ecology has been further enhanced by a wealth of other diverse identities that we do not attempt to address in this paper.

Statement of author positionality

The authors identify as six cis-gender white women and one cis-gender white man. All are US citizens from birth. We include one undergraduate student, one graduate student, one postdoctoral researcher, one assistant professor, two full professors, and one professor emerita. One of us identifies as a first-generation college student. Five of us have teaching experience in ecology courses and/or using one or more of the textbooks examined in this study in teaching. Three of us have expertise or substantial experience in the social sciences and/or humanities. We acknowledge that we represent a small fraction of the diversity we hope to bolster in STEM; however, we have all engaged in various ways with diversity, equity, inclusion, and justice initiatives in STEM in our service, teaching, research, and volunteer work at our current and former institutions. We acknowledge that these identities and others not listed have unavoidably informed our perceptions, particularly regarding the qualitative data collection and interpretation of results in this study.

Textbook data collection

We reviewed six content-based focal chapters across six ecology textbooks published between 2014 and 2021 (hereafter, "2020 dataset"; Table 1). Of these, two were later editions of a textbook reviewed in Damschen *et al.* (2005) (Molles and Sher 2018; Relyea 2021). In three cases, we used a new title from the same author(s) (Stiling 2014; Krohne 2017; Begon and Townsend 2021). Finally, two of the textbooks used previously had gone out of print and had not been replaced by the publisher; therefore, we added one new textbook (Bowman and Hacker 2020)—by a major academic publisher—that we confirmed is used in teaching introductory ecology by looking at a sampling of course syllabi posted online. Taken together, these textbooks represent much of the scope of textbook content being presented to undergraduate students in US introductory ecology courses.

Content analysis methods followed those of Damschen *et al.* (2005) for ecology textbooks published between 2000 and 2005 (hereafter, "2000 dataset"). Data were recorded by three individuals assigned to the same focal chapters across textbooks to minimize observer bias. For the focal chapters in each textbook, we recorded each scientist mentioned by name within the main text, sidebars, figure captions, chapter summaries, and recommended readings. We classified each scientist as either a "founder/innovator" (scientist whose new theory or

Table 1. Discussion of scientists by name differed among textbooks

Textbook	Female	Male	Last name only	First initials only
(1) Begon M and Townsend CR. 2021. Ecology: from individuals to ecosystems (5th edn). New York, NY: Wiley.	2 (1%)	18 (13%)	123 (86%)	0
(2) Bowman WD and Hacker SD. 2020. Ecology (5th edn). New York, NY: Sinauer Associates.	2 (1%)	52 (39%)	77 (57%)	4 (3%)
(3) Krohne DT. 2017. Ecology: evolution, applications, and integration (2nd edn). Oxford, UK: Oxford University Press.	1 (1%)	19 (20%)	72 (78%)	1 (1%)
(4) Molles Jr MC and Sher A. 2018. Ecology: concepts and applications (8th edn). New York, NY: McGraw Hill.	31 (13%)	123 (51%)	72 (30%)	17 (7%)
(5) Relyea R. 2021. The economy of nature (9th edn). London, UK: Macmillan.	2 (5%)	36 (88%)	0	3 (7%)
(6) Stiling P. 2014. Ecology: global insights and investigations (2nd edn). New York, NY: McGraw Hill.	15 (16%)	76 (79%)	1 (1%)	4 (4%)

Notes: some texts (eg [4], [6]) included full names and/or pronouns of scientists, allowing readers to perceive gender based on naming and grammatical conventions, whereas other texts tended to refer to scientists by last name or last name with first initials (eg [1], [3]) or to structure the text so that only contributions were highlighted and names were rarely included at all (eg [5]).

innovation guides new work by others) or a "working scientist" (scientist whose work upholds and extends current theories) based on the language used to describe their contributions, and we recorded associated gender pronouns. We observed no instances where nonbinary pronouns described a scientist.

We counted the number of drawings and photographs in the entirety of each textbook, tallied by chapter. All image analysis was completed by one individual to reduce observer bias. For images containing people, we recorded perceived binary gender (woman/man/unknown) and binary race (person of color/white/unknown) based on our perceptions of how the image content matched cultural norms for gender presentation, skin tone, and other physical features culturally associated with "gender" and "race" (see "A note on perceptions" section, above). Using information from the image and caption, we defined the role of each person as: "founder/innovator", "working scientist", "nonscientist", or "person for scale or context". In addition, we classified the activity the person was performing in the image within one of eight categories (Appendix S1: Figure S1) based on open coding methodology. For comparisons to the 2000 dataset, only images from focal chapters were used.

In each focal chapter, we recorded instances where the social and cultural context of science was discussed. Each instance was classified into one of seven categories using an open coding approach (Appendix S1: Table S1) developed by the lead author. Three individuals then each coded two focal chapters across all textbooks, recording the section of the chapter and the number of lines of text dedicated to cultural context in each instance. We revisited and refined our coding definitions in consultation with each other throughout the process and recoded sections as necessary to align with changes. We then determined the percentage of cultural context by counting the total lines of text in each chapter section.

Gender and race/ethnicity designations

We extracted first names for all scientists mentioned in the textbooks and used a three-stage approach in designating gender. First, we used the *gender* package in R (Mullen 2021) to assign gender with the method "ssa", which uses the US Social Security Administration baby names database from 1932 to 2012 to determine the likelihood of the binary gender associated with names based on sex assigned at birth. For names not matched, we repeated the process with "napp" (census data for Nordic countries from 1801 to 1910). For each matched name, we considered the name "female" when the probability it was assigned to females was >0.65, "male" when the probability it was assigned to males was >0.65, or "neutral" if neither were true. For remaining unmatched names, we used the *rvest* R package (Wickham 2021) to search the www.names.org website, which lists names as "female", "male", or "neutral" for over 225,000 names, based on social security, census records, and other data sources. To assign race/ethnicity based on names to our list of authors, we used the *predictrace* package in R (Kaplan 2021) followed by the R package *rethnicity* (Xie 2022) to predict race/ethnicity from names based on US census data. We accepted the results if both methods agreed and the probability for the predicted race/ethnicity was >0.75.

For 559 scientists named in the focal chapter text or textbook indices, we conducted web searches using full names and the term "ecology". We used photographs and information from personal websites, Wikipedia entries, ResearchGate, LinkedIn, or news articles to assign a perceived gender and race/ethnicity (Appendix S1: Figure S2). We recorded perceived binary gender (woman/man/unknown) and race/ethnicity (Asian, Black, Hispanic/Latino, Native American, White, or unknown) based on photographs, pronouns, and any explicitly stated identities. These perceptions were then compared to the designations from the software packages. Results from the gender software matched our perceptions in 97.8% of cases and the results for Asian, Hispanic/Latino, and White designations from the race/ethnicity software matched in 97.5% of cases. However, all scientists identified as "Black" by the software ($n = 3$) were perceived by us to be white.

Benchmarks

We used benchmark data published in the US National Science Foundation's biannual report on *Women, Minorities, and Persons with Disabilities in Science and Engineering* for comparisons between 2000 and 2020. Gender data from 2000 were published in 2004 (NCSES 2004) for undergraduate and doctoral degrees, postdoctoral fellows, and academic faculty levels. The 2021 report, which we used as the benchmark for "2020", contained data for undergraduate and doctoral degrees and postdoctoral fellows from 2018, and faculty levels from 2019 (NCSES 2021).

To capture contributions to the ecology literature over time, we selected scientific journals that specialize in ecology and have a history of at least 20 years of publication: namely, *The American Naturalist*, *Ecography*, *Ecological Monographs*, *Ecological Research*, *Ecology*, *Oecologia*, and *Oikos*. For each journal, we used the *rvest* package in R (Wickham 2021) to capture publication year, volume number, issue number, article title, digital object identifier (DOI), author names and order, and number of citations for all articles published from 1970 (or date of the first issue) to 2020 from the publishers' websites. We excluded non-research-based formats. In total, 48,570 articles and 141,231 author entries were included in our analyses. Using the software-based methods described above, binary gender was assigned for 109,610 authors and race/ethnicity for 15,983 authors.

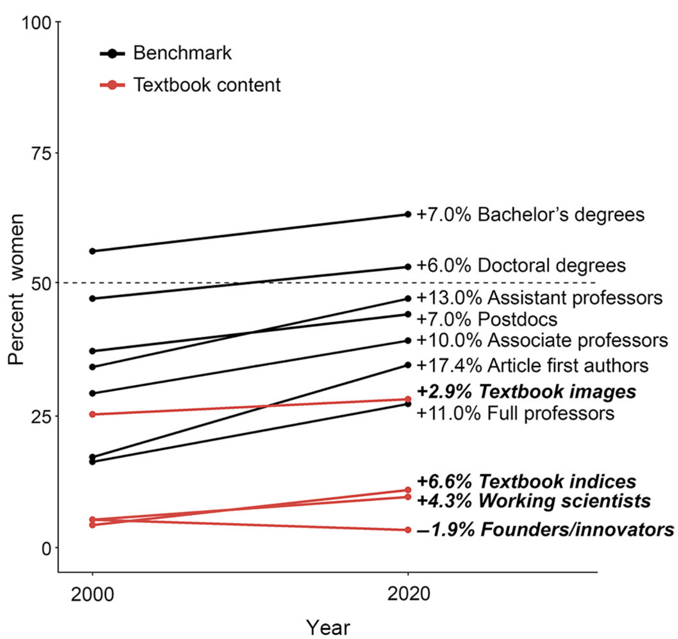

Figure 2. Representation of women has changed little in textbook content over the past two decades despite increased contributions to the field. Representation of women in textbook content (red lines) is shown as the percentage of women in various components of college-level ecology textbooks in 2000 (published 2000–2005) and 2020 (published 2014–2021). Benchmarks for representation of women in the field (black lines) are shown as the percentage of women as first authors of peer-reviewed publications and the percentage of women in various life science career levels in 2000 (NCSES 2004) and 2020 (NCSES 2021).

Results and conclusions

Representation of scientists is stagnant and lacks diversity

Over the past two decades, there has been little change in how ecology textbooks portray scientists (Damschen *et al.* 2005). In current textbooks, scientists are predominantly portrayed as white men (Figures 2 and 3), including 90.7% of those presented as "founder/innovators" (n = 108) and 76% of "working scientists" (n = 184). Textbook images overrepresent white men as actively engaged scientists while women and individuals of color are overrepresented in passive, nonscientific roles (Figure 3; Appendix S1: Figure S1). Textbooks frequently fail to reveal the time period of contributions cited or discuss the historical context of exclusion (Wood *et al.* 2020), leading students to likely perceive that ecology remains a field dominated by white men.

The diversity of ecologists represented in textbooks falls far short of those actively contributing to the field. First authorship by women in ecological scientific journals has increased steadily since 1970 to ~35% in recent years (Appendix S1: Figure S3a), yet only 10.5% of working scientists named in textbooks were identified as women (Figure 2). Likewise, scientists from historically excluded racial and ethnic groups were nearly absent (Appendix S1: Figure S2), despite that by 2021, authors with European (non-Hispanic) family names or surnames (hereafter, "last names") made up only 44% of authorship in ecology journal articles, as compared with 45% last names of Asian origin, and 9% last names of Hispanic origin (Appendix S1: Figure S3b). Among 559 scientists referenced in the text, our methods identified only 3.6% as Asian, 2.7% as Hispanic, and a single Black scientist (Appendix S1: Figure S2). Fewer than 2% were identified as women of color and no Native American scientists were identified.

Textbooks frequently omitted identity information for scientists, making science appear separate from the people who conduct it. Some texts mainly referenced scientists by last names or used only first initials, while others avoided mentioning scientists by name (Table 1). While possibly well-intentioned, when identity is not specified, students tend to assume the scientist represents the dominant cultural norm (Rosser 1990; Smyth and Nosek 2015; Schinske *et al.* 2016). Textbook images reinforce the assumption that science operates within a vacuum devoid of people, values, or cultural influence; only 4% of textbook images (n = 2629) contained people at all (Figure 3c).

Continued silence about interactions between culture and science

Ecology textbooks address the role of humans in science and natural systems much more than they did two decades ago (3% versus 12% of total content; Figure 4a). Ecology has become increasingly relevant to contend with human-caused impacts on species and ecosystems (eg human-caused climate change, invasive species). Yet much of this content is relegated to sidebars rather than being featured in the main text (Figure 4a).

What continues to be missing is how cultural norms and values shape the practice of science (0.1% of all textbook content; Figure 4b). Not a single textbook discussed how scientists themselves inherently add bias and subjectivity to the scientific process, nor acknowledged the influence of societal norms on scientific questions, funding, or research methodology. This dearth of coverage exists despite increasingly available examples of how cultural norms have directed or overturned foundational ideas in ecology and evolution. For example, hypotheses about sexual selection in animals were overturned when gender norms were reframed (Hrdy 1986; Tang-Martínez 2020).

What prevents change?

The change we documented in textbooks is exceedingly slow relative to changing demographics in the field of ecology and the increasing priority given to diversity and inclusivity for decades (Bentley *et al.* 1993). The external motivations to change textbooks are seemingly few. New editions are often incremental revisions of previous editions to update scientific content. The cost for labor by authors and editors required for comprehensive changes, if properly compensated, could be passed on to students, making already expensive textbooks more prohibitive. Finally, there may be pressure against including anything that could be construed as "political" in textbooks so that they will not be excluded from some markets.

Much of the discussion of the social context of science has historically been the purview of fields like feminist science studies rather than being closely integrated within scientific fields (Hrdy 1986; Rosser 1990). For instructors, developing new content not supported by the course textbook is daunting and time prohibitive. Instructors may also fear retribution for including topics perceived as politically charged or simply outside the boundaries of what is typically considered "science". Textbook consumers (professors/instructors and students) ultimately determine the value of the product and can be selective agents of change. We invite instructors to use the textbook-specific data presented here (Table 1; Appendix S1: Figure S4) and evaluate new textbook editions with a similar lens when selecting textbooks for their courses.

Rethinking textbook content

The lowest-hanging fruit for improving representation in textbooks is to overhaul photographs and images to match the diversity of working scientists and explicitly include people doing science. Identity interpreted from photographs may be more readily internalized by students than a name in the text (Good *et al.* 2010; Schinske *et al.* 2016). Including full names and biographical information for working scientists and using preferred gender pronouns where known

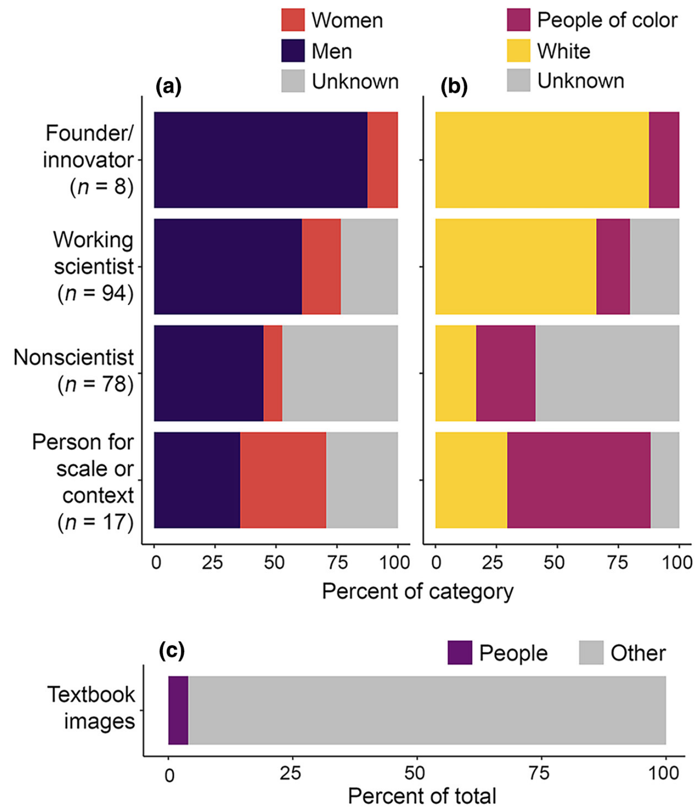

Figure 3. Textbooks depict scientists as white men and ecology as largely absent of people. Using binary gender and race perceptions of the authors, textbooks depict (a and b) scientists as mainly white men, while women and people of color are more likely to be included as nonscientists or for scale or context. (c) The science of ecology is depicted as being devoid of people, with only 4% of textbook images containing humans.

can help to illuminate the diversity of scientists who contribute to ecology today. Highlighting important research and contributions to the field by women, gender-diverse scientists, and scientists of color is becoming easier both because these contributions are becoming more numerous and because historically underrecognized contributions are being revealed. Including Traditional Ecological Knowledge in textbooks could further amplify underrepresented Native American voices and begin to address the interplay between science and culture. There is ample opportunity for textbook authors to implement changes to textbooks as new editions have been published on average every 3.25 years since the early 2000s (± 1.2 years). We wish to acknowledge the work that Sher and Molles (2022) have done in making some of these changes, including updated photographs showing a diversity of people conducting scientific research and a particular effort to reference research by women of color, in the most recent edition of their textbook (published after completion of our study). For instructors, with or without the support of modified textbooks, abundant resources exist to highlight diverse scientists (eg Diversify EEB, www.diversifyEEB.com; Project Biodiversify, www.projectbiodiversify.org; Underrepresentation Curriculum Project,

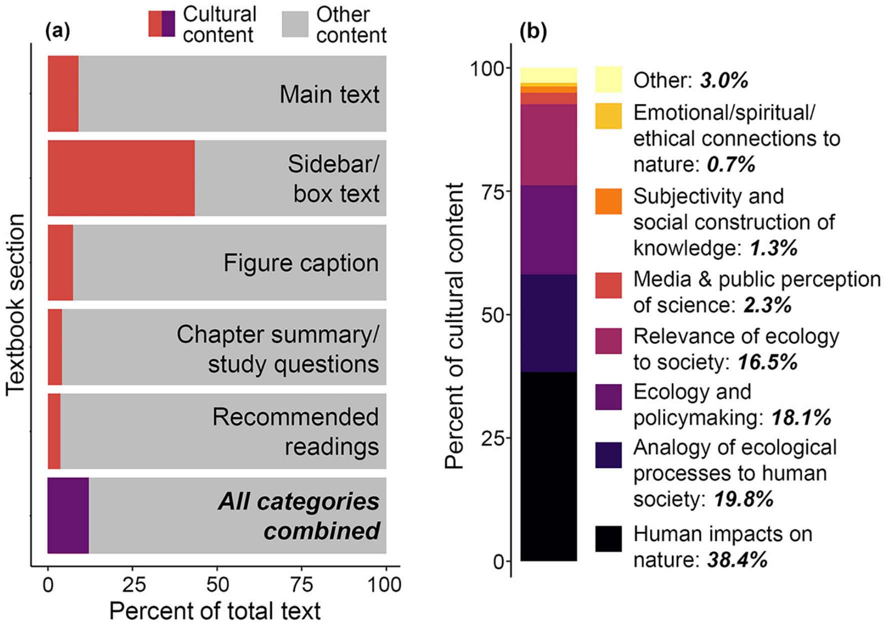

Figure 4. The cultural context of science is largely overlooked in current textbooks. (a) When cultural context is covered, it is largely included as a sidebar to the main text. Cultural context in textbook content is shown as the percentage of lines of text in each chapter section (orange) that acknowledges or discusses human impacts on science and vice versa (12% of total content; purple). (b) Textbooks rarely discuss how culture shapes science and the types of questions being asked. Of all textbook cultural content, only 1.3% (or about 0.1% of the total text) explicitly discusses subjectivity and the social construction of knowledge in science.

www.underrep.com; Indigenous STEAM Collaborative, www.indigenoussteam.org).

The lack of cultural context we identified, particularly in relation to how science is conducted and what work is valued, is more complex to address. However, we see many possible paths by which textbook authors can contribute to changing culture. Explicitly discussing the history of exclusion in science (eg barriers to participation for women and minoritized groups) and how the scientific process is influenced by cultural norms (eg Linnaeus's classification of human races, see Graves [2015b]; biological determinism, see Graves [2015a]) will help students contextualize the scientists and types of science presented. Highlighting cases where dominant hypotheses were overturned because different perspectives introduced novel ways of interpreting observations (eg female choice and sexual selection; Hrdy 1986; Tang-Martínez 2020; Ah-King 2022) underscores the importance of conducting science with scientists from diverse backgrounds and who have different ways of thinking, simultaneously promoting a culture of belonging.

Why make change?

Presenting science as a social process encourages scrutiny of latent biases surrounding the culture of science and who participates. In the college classroom, perceptions of who is a scientist can affect course performance for students from historically excluded groups by increasing feelings of exclusion, imposter syndrome, and stereotype threat (Good *et al.* 2010; Schinske *et al.* 2016). In later career stages, cultural norms influence what types of research get proposed, funded, and published (Figure 1). As scientists from the dominant group are rewarded and persist in science, many perpetuate the same culture (Armstrong *et al.* 2007; Sheltzer and Smith 2014). Including and encouraging diverse perspectives supports recruiting new investigators, increases creativity, and leads to better scientific outcomes needed to address the challenges of the present moment.

Acknowledgements

Thanks to members of the Damschen Lab for discussions and comments on the manuscript; to K Kostelnik, D Murphy-Medley, and T Wentworth for generating the long-term data and ideas; and to S Ahler, who helped with data collection for current textbooks. This work was supported by US National Science Foundation DEB-1754764 (EID) and DBI-2010942 (JHR). *Author contributions*: authorship was determined by the first–last author emphasis model. Idea generation and study design were led by EID and JHR, with contributions from all authors; JHR, KTC, SLM, and AFW collected the data; JHR conducted analyses; JHR and EID led the preparation of the manuscript. All authors contributed to review and revision.

Data Availability Statement

Data, code, and extended methods are available in the Open Science Framework (OSF) repository at https://doi.org/10.17605/OSF.IO/RUFN4.

References

Ah-King M. 2022. The history of sexual selection research provides insights as to why females are still understudied. *Nat Commun* **13**: 6976.

Armstrong MJ, Berkowitz AR, Dyer LA, and Taylor J. 2007. Understanding why underrepresented students pursue ecology careers: a preliminary case study. *Front Ecol Environ* **5**: 415–20.

Asai DJ. 2020. Race matters. *Cell* **181**: 754–57.

Begon M and Townsend CR. 2021. Ecology: from individuals to ecosystems (5th edn). New York, NY: Wiley.

Bentley B, Berkowitz A, Cid C, *et al.* 1993. Mechanisms to increase recruitment and retention of women and under-represented groups in ecology. Washington, DC: Ecological Society of America.

Bilimoria D and Liang X. 2013. State of knowledge about the workforce participation, equity, and inclusion of women in academic science and engineering. In: Wyer M, Barbercheck M, Cookmeyer D, *et al.* (Eds). Women, science and technology: a reader in feminist science studies. New York, NY: Routledge.

Bowman WD and Hacker SD. 2020. Ecology (5th edn). New York, NY: Sinauer Associates.

Chaudhary VB and Berhe AA. 2020. Ten simple rules for building an antiracist lab. *PLoS Comput Biol* **16**: e1008210.

Cronin MR, Alonzo SH, Adamczak SK, *et al.* 2021. Anti-racist interventions to transform ecology, evolution and conservation biology departments. *Nat Ecol Evol* **5**: 1213–23.

Damschen EI, Rosenfeld KM, Wyer M, *et al.* 2005. Visibility matters: increasing knowledge of women's contributions to ecology. *Front Ecol Environ* **3**: 212–19.

Estrada M, Burnett M, Campbell AG, *et al.* 2016. Improving underrepresented minority student persistence in STEM. *CBE-Life Sci Edu* **15**: es5.

Good JJ, Woodzicka JA, and Wingfield LC. 2010. The effects of gender stereotypic and counter-stereotypic textbook images on science performance. *J Soc Psychol* **150**: 132–47.

Graves JL. 2015a. Great is their sin: biological determinism in the age of genomics. *Ann Am Acad Polit SS* **661**: 24–50.

Graves JL. 2015b. Why the nonexistence of biological races does not mean the nonexistence of racism. *Am Behav Sci* **59**: 1474–95.

Handelsman J, Elgin S, Estrada M, *et al.* 2022. Achieving STEM diversity: fix the classrooms. *Science* **376**: 1057–59.

Hofstra B, Kulkarni VV, Munoz-Najar Galvez S, *et al.* 2020. The diversity–innovation paradox in science. *P Natl Acad Sci USA* **117**: 9284–91.

Hrdy SB. 1986. Empathy, polyandry, and the myth of the coy female. In: Bleier R (Ed). Feminist approaches to science. New York, NY: Teachers College Press.

Jablonski NG. 2021. Skin color and race. *Am J Phys Anthropol* **175**: 437–47.

Kaplan J. 2021. predictrace: predict the race and gender of a given name using census and Social Security Administration data. Vienna, Austria: The R Foundation for Statistical Computing.

Krohne DT. 2017. Ecology: evolution, applications, and integration (2nd edn). Oxford, UK: Oxford University Press.

Molles Jr MC and Sher A. 2018. Ecology: concepts and applications (8th edn). New York, NY: McGraw Hill.

Mullen L. 2021. gender: predict gender from names using historical data. Vienna, Austria: The R Foundation for Statistical Computing.

NCSES (National Center for Science and Engineering Statistics). 2004. Women, minorities, and persons with disabilities in science and engineering. Alexandria, VA: NCSES.

NCSES (National Center for Science and Engineering Statistics). 2021. Women, minorities, and persons with disabilities in science and engineering. Alexandria, VA: NCSES.

Relyea R. 2021. The economy of nature (9th edn). London, UK: Macmillan.

Rosser SV. 1990. Female-friendly science: applying women's studies methods and theories to attract students. New York, NY: Teachers College Press.

Schinske JN, Perkins H, Snyder A, and Wyer M. 2016. Scientist spotlight homework assignments shift students' stereotypes of scientists and enhance science identity in a diverse introductory science class. *CBE-Life Sci Edu* **15**: ar47.

Sheltzer JM and Smith JC. 2014. Elite male faculty in the life sciences employ fewer women. *P Natl Acad Sci USA* **111**: 10107–12.

Sher A and Molles Jr MC. 2022. Ecology: concepts and applications. New York, NY: McGraw Hill.

Smyth FL and Nosek BA. 2015. On the gender–science stereotypes held by scientists: explicit accord with gender-ratios, implicit accord with scientific identity. *Front Psychol* **6**: 415.

Stiling P. 2014. Ecology: global insights and investigations (2nd edn). New York, NY: McGraw Hill.

Tang-Martínez Z. 2020. The history and impact of women in animal behaviour and the ABS: a North American perspective. *Anim Behav* **164**: 251–60.

Tannenbaum C, Ellis RP, Eyssel F, *et al.* 2019. Sex and gender analysis improves science and engineering. *Nature* **575**: 137–46.

Tilghman S, Alberts B, Colón-Ramos D, *et al.* 2021. Concrete steps to diversify the scientific workforce. *Science* **372**: 133–35.

Wickham H. 2021. rvest: easily harvest (scrape) web pages. Vienna, Austria: The R Foundation for Statistical Computing.

Wood S, Henning JA, Chen L, *et al.* 2020. A scientist like me: demographic analysis of biology textbooks reveals both progress and long-term lags. *P Roy Soc B-Biol Sci* **287**: 20200877.

Xie F. 2022. rethnicity: predicting ethnic group from names. Vienna, Austria: The R Foundation for Statistical Computing.

Supporting Information

Additional material can be found online at http://onlinelibrary.wiley.com/doi/10.1002/fee.2819/suppinfo