Students of color speak on racial equity in environmental sustainability

Tania M. Schusler,a Charlie B. Espedido,a Brittany K. Rivera,a Melissa Hernández,a Amelia M. Howerton,a Kailin Sepp,a Malcolm D. Engel,b Jazlyn Marcos,b V. Bala Chaudharyb

aSchool of Environmental Sustainability
Loyola University Chicago

bDepartment of Environmental Science and Studies
DePaul University

ABSTRACT: Racial and ethnic diversity in environmental sustainability advances social equity and innovation solving social-ecological crises. Yet, Black, Indigenous and people of color (BIPOC) remain underrepresented in sustainability fields despite high environmental concern. Universities provide pathways to sustainability careers and help diversify the field by making programs more equitable and inclusive for racially minoritized students. Toward this end, we interviewed undergraduate BIPOC students in interdisciplinary environmental and sustainability degree programs about their experiences. Their observations reflect a legacy of systemic racism that persists today within environmentalism. Many described motivations connecting ecological and social well-being but lamented limited interdisciplinary and global perspectives in the curriculum. Experiences of discrimination, lack of relatability, and limited discussions of race led to feeling isolated and excluded. Support networks, extracurricular participation, and BIPOC-specific opportunities improved student inclusion and belonging. BIPOC students hold knowledge unapparent to non-marginalized groups that illuminates pathways to racial equity in environmental sustainability.
Global-scale environmental changes driven by human activities are occurring at unprecedented rates, disrupting the Earth’s climate system, exceeding planetary boundaries, threatening biodiversity, and degrading ecosystem services with negative impacts disproportionately affecting the poor and other marginalized populations. Because environmental changes arise from political, economic, and cultural driver transforming political economic systems to advance sustainable development requires cross-sector cooperation characterized by inclusive decision-making that embraces human diversity. Yet in the U.S. and Europe, the environmental movement and related disciplines remain predominantly white despite Black, Indigenous, and people of color (BIPOC) demonstrating high environmental concern and comprising the majority of environmental justice activists.

Bridging this racial/ethnic gap matters for both instrumental and normative reasons. Achieving sustainability requires multi-dimensional thinking suitable to the complexity of socio-ecological systems. Identity diversity contributes to cognitive diversity within groups, and teams with greater cognitive diversity produce more successful outcomes in the context of complex problems. Thus, racial/ethnic diversity advances sustainability. More important than arguments regarding the instrumental value of BIPOC to environmental sustainability, however, is the fact that the environmental field continues to lag behind other scientific fields with respect to racial/ethnic diversity. Environmental employment opportunities are growing. In an equitable society, people of all races and ethnicities would have access to expanding career opportunities. A racially/ethnically diverse environmental workforce also helps advance environmental justice. Environmental injustices, such as the Flint, Michigan water crisis and threats to the Standing Rock Sioux Tribe’s water quality and cultural heritage from the Dakota Access Pipeline, arise in part through BIPOC’s exclusion from environmental decision
Greater racial/ethnic diversity within the environmental field enables BIPOC to influence environmental conditions through management, research, policy, education, and other practices in the wide range of sustainability fields.

Interdisciplinary environmental and sustainability (IES) degree programs offered at colleges and universities are expanding. Yet, despite possessing strong interest in and preparation for environmental careers, BIPOC students tend not to select environmental majors due to programmatic attributes. These attributes include curriculum, which signals to prospective students the program’s values, and compositional diversity, which suggests to BIPOC students the likelihood of a welcoming climate and academic success. Universities can open pathways to environmental careers for BIPOC by increasing IES programs’ racial/ethnic diversity (compositional race and ethnicity demographics of the student body), equity (ensuring BIPOC access to resources, opportunity, and advancement), and inclusion (creating a culture where BIPOC students feel supported, empowered, and represented). Furthermore, diversifying IES programs can improve learning outcomes for all students by preparing them to participate in an increasingly diverse workforce and society, but only when a critical mass of BIPOC are present and IES programs optimize conditions for cross-cultural interactions.

Towards the aim of identifying ways to make IES programs more racially/ethnically inclusive, we investigated the experiences of undergraduate BIPOC students in IES programs at two private universities in a major metropolitan region of the midwestern U.S. We used grounded theory methodology within an action research approach that involved collaboration among stakeholders experiencing a problematic experience (BIPOC students) and professional researchers (faculty) to collect and analyze data supporting action towards a more just situation. We interviewed 24 students with declared environmental majors who self-identified as BIPOC
about their motivations for studying the environment, positive and negative experiences within their IES program, and recommendations for making it more diverse, equitable, and inclusive. Interview analyses illuminated how racial/ethnic identities influence students’ educational experiences and offer transferable insights, while the action research approach provides a model that IES programs can adapt to generate their own context-specific knowledge and strengthen pathways for BIPOC students to sustainability careers.

**Results**

Interviewees described varying influences that led them to choose an environmental major (Supplementary Table 1), such as encouragement from an influential person like a college professor, high school teacher, friend, or parent; experiences during prior education (e.g., field trip, project, or course) or involvement with an environmental issue in their neighborhood. Two-thirds of participants further expressed that their interest in studying the environment arose from recognizing the interdependence of ecological and human well-being. For some, this realization grew from witnessing environmental injustice: “I have family who live in areas that just feel completely forgotten about. Like trash everywhere, pollution everywhere . . . I could have the tools to at least try to clean up some of those areas and make them nicer for everyone to live in.” Others emphasized an inherent connection between people, nature, and culture: “I’m a backpacker, and it was more than just being fascinated by nature, I realized how . . . I care about my ancestors, I care about where my food comes from, I care about understanding the connection of the world.”

Yet, within their IES degree programs, BIPOC students described observations and experiences that led them to feel isolated and excluded (Figure 1, Supplementary Table 2). Multiple students observed little compositional diversity within classes for their major consisting
of mainly white students and faculty. Some contrasted this with general education courses where
the class composition was more racially/ethnically diverse. Some interviewees also reported that
environmental student clubs and internships lacked diversity. For instance:

I’m usually the only person of color or one of very few people of color in my classes for
my major . . . also that’s reflected in the organizations I’m a part of. I am the only person
of color on [the executive board of the student environmental club] and I was the only
person of color in [that] club, which at one point had 40 members. . . . Sometimes I feel I
have to be the voice of poor people of color because they’re not in my classes or they’re
not in the organizations I go to. Not saying that the people that are there are oblivious
[but] I feel like you don’t think about race as much as someone who is actually affected
by their race.

Predicaments like this left several students feeling frustrated, angry, or out of place. As one said,
“The most I’m going to see a person of color working at [this university] is probably at [the
dining services], and that’s really messed up, that makes me really sad.”

Participants also observed limited interdisciplinary and global perspectives, which
conflicted with their own understanding that social and ecological issues intersect. BIPOC
students described the social implications of science to be understudied in their majors. Although
both universities’ IES curricula include natural science, social science, and humanities courses,
students reported that content about how environmental science affects different racial/ethnic
groups was often limited to elective courses like environmental justice. One reflected: “I feel like
some [professors] wouldn’t even be able to talk to a student of color about race . . . it’s like,
‘This is a science class. We’re gonna talk about hard, empirical facts here’ . . . So if someone
were to bring up racism . . . it’s like ‘I’m gonna hit you with the empirical facts’ and deny the
lived experiences of these people.” Some BIPOC students recounted examples where faculty and
peers purported a “white environmentalism” by offering solutions to environmental problems
that would be incompatible for many BIPOC and portending to fix environmental problems
experienced by BIPOC as a “white-savior” who knows best. Furthermore, some interviewees
expressed dismay that the curriculum emphasized a predominantly white male canon while ignoring contributions by BIPOC to the environmental field. As one said:

> I love Aldo Leopold but if I’m asked to read *A Sand County Almanac* one more time, I’ll be a little mad. We could read so many books about ecology that aren’t written by old dead white men but we almost never do. I know that obviously the field is dominated by older, or dead, white men from America or Europe, but there are so many people working in this field in other places with different problems and solving them in different ways. And we just don’t really talk about it.

Some participants described *experiencing discrimination*, more often from peers than faculty or staff. They reported moments where others ignored or dismissed their experiences in class discussions, thereby invalidating their racial/ethnic reality. One reflected, “I feel like the small microaggressions are more of like, ‘Really, you’ve gone through that?’ . . . Kinda not believing.” Others described sensing an “us versus them” mentality in the tone of professors or peers who used vague language to refer to groups of people: “It’s like you can tell how someone owns the word. People can say ‘they’ or ‘black people’ and it feels and sounds totally different.”

One student described feeling tokenized:

> I’m [an] intern and there was an instance where my supervisor referred to me as an African-American student . . . in an email sent to multiple people. And did not recognize me by name or mention that I am [an] intern, a position I worked very hard for. He just said I was an African American student in [this department]. And I feel like that’s a disservice to the hard work that I put in. And it’s very disrespectful, it’s very tokenizing.

These direct observations — little compositional diversity; limited interdisciplinary and global perspectives in the curricula; and/or personally experiencing discrimination — led BIPOC students to feel excluded and isolated (Figure 2). Some participants reported that peers or faculty seemed unable to empathize with their lived experiences. This *lack of relatability* left BIPOC students feeling disconnected from their IES programs. As one said, “You’re not gonna understand my struggle because you don’t live it, you don’t see it.” Another explained, “Some people will never know what it’s like to live in a food desert, what it feels like to live in a
neighborhood where there are more liquor stores than there are grocery stores. So there is this disconnect when [peers] talk about some stuff.” A few encountered difficulty making friends. One reflected, “I wouldn’t say I’ve ever felt like I’ve been treated differently because of my race or ethnicity, but I definitely think it’s harder to create friendships.”

This lack of relatability left some interviewees feeling frustrated or disheartened to participate in class discussions. They described feeling bewildered by white peers’ interpretations of events or issues; yet, many felt uncomfortable sharing their own perspectives. These BIPOC students observed that white faculty and peers rarely raised questions about race as it related to course content. One shared, “For a while I just didn’t ask questions . . . I was just like, ‘I’m gonna just sit here and let it go.’ But definitely my junior and senior year that was when I really was like, ‘I’m just sick of sitting in these classes and no one questions anything,’ or they might have questions but they’re not the type of questions that I wanna ask.” A handful of interviewees described themselves as outspoken; however, most discussed feeling reluctant to raise questions or offer comments in class related to race, social justice, or personal experiences. Several expressed worries about being judged or upsetting others. As one said, “I sometimes don’t say anything on purpose because I don’t want to make some people uncomfortable.” These students felt more open discussing race in some contexts than others. One reflected, “Sometimes if I’m in a class . . . which is predominantly white . . . I wait like two or three classes and see, ‘Am I actually going to speak in this class? Or is this a class where I’m just on my laptop, where I’m quiet?’” Another said, “‘Am I gonna be judged?’ That question always arises in my head. And, sometimes I'm more comfortable than others, but I feel like to be truly comfortable, that shouldn't really be a thought.” This limited discussion of racial/ethnic identities arose from the lack of compositional diversity in the classroom as well as white students’ and professors’
limited ability and/or willingness to discuss race.

Several participants suggested that little compositional diversity, limited interdisciplinary and global perspectives, and lack of discussions about race within their IES degree programs led to limited social consciousness for all students (Figure 2). One reported, “I feel like [white peers] don’t want to speak [about environmental racism] because there’s minorities in the room, so they stay silent and they have no opinions.” Another reflected, “. . . it’s not so much [that white peers] give ideas . . . that I feel are inherently racist but the fact that there are [not] any ideas that are outside of their race . . .” A lack of racial/ethnic diversity restricts learning for all students; yet, the complexity of achieving sustainability requires learning across diverse cultures. One student explained, “I went to this conference and I was like one of three brown people in a room full of like one hundred. So that’s constantly repeated, and . . . I don’t think you can talk about sustainability if you’re not getting the issue from all perspectives.”

BIPOC students also reported positive experiences within their environmental majors that fostered some sense of inclusion and belonging (Figure 1, Supplementary Table 3). Several received support from faculty, staff, or peers who listened to and acknowledged their experiences or assisted them towards achieving their goals. One shared, “I’ve grown as a student, in ways that I’m very happy with, and a lot of that has to do with the help that [professors] offered me, and just the fact that they’ve been respectful of me as a student.” While many interviewees felt supported by faculty or staff, some reported that they had to seek out that support. Others noted that faculty/staff support mainly focused on academics or career development. Participants often felt more comfortable discussing issues related to race with friends. Roughly half described deriving support from friendships with peers. A BIPOC student shared, “One of [my friends] I have three classes with him and he’s one of my other supports. He’s white, but he’s a white
immigrant . . . And, he is a minority, too . . . because he’s gay . . . And he understands . . . his privilege, too, and he reflects upon them and he kinda has my back.” Some interviewees simply described neutral relationships: “I wouldn’t say that my peers necessarily want me to fail but I wouldn’t say they have overtly cheered me on either.”

Extracurricular participation in student organizations, internships, or faculty research within their IES program or, slightly more often, the university at large helped participants to connect with others and feel comfortable being themselves. One reflected:

I often talk about the lack of diversity and inclusion within the environmental field, and I’m actually trying to start a campaign to increase the number of environmentalists [of color] on [this] campus, and people in the [student] environmental organizations have been very supportive with that and helping me get that started, but also just listening to the issues that I see when I’m mentioning it and being receptive to it instead of reactive.

Students’ involvement beyond the IES program often, but not always, occurred through cultural organizations. One shared, “I'm [in] a Filipino student organization. And so, when I'm there, I can speak freely about my experiences.” Yet, not all interviewees felt comfortable or had the opportunity to join clubs, as we describe below.

Several participants benefited from targeted opportunities for BIPOC students, such as scholarships, grants, internships, research positions, or organizational membership. Some had not directly benefited but nonetheless valued the existence of such opportunities. One said:

... a lot of those internships I’ve applied for had a lot of those disclaimers like, ‘We encourage minorities, and women, and people of color.’ I actually really enjoy those . . . it shows to me that they wanna increase diversity amongst their staff and get those opportunities out there. Not necessarily like . . . you’re gonna get the job, because you have to be qualified of course. But, a lot of the [university] sponsored internships that I’ve looked for have had that disclaimer and I enjoy them a lot.

Stories about feeling supported, engaging in extracurricular activities, and recognizing targeted opportunities implied some degree of belonging (Figure 2). Unlike others who described discomfort discussing experiences related to their racial/ethnic identities, some BIPOC students
felt *comfortable discussing race* in the classroom or with peers. One reflected, “The people that I’ve had classes with . . . try to be as respectful as possible when bringing [race] up, and then are very much willing to listen, and some teachers will actually directly acknowledge and say, ‘I’m white and middle class, so I may not know the whole situation.’” Notably, students felt comfortable speaking about their racial/ethnic identities most often in courses like environmental sociology, environmental ethics, or environmental justice.

Despite these positive aspects of some participants’ experiences as environmental majors, others identified *barriers to participation* (Supplementary Table 2) that prevented them from realizing support, networks, and opportunities. Being a commuter student, working to meet financial needs, or fulfilling family responsibilities made it difficult for some BIPOC students to participate as much as they would like: “I’m busy, I have a lot of work and I have responsibilities, I take care of my sisters . . .” A few identified lacking a career-related social network as an obstacle: “I didn’t know about any [opportunities] because you have to know people in the environmental community to do it and if you don’t know anybody it’s hard.” The discomfort of being BIPOC in a majority white setting, as reported earlier, also prevented some from participating in clubs, internships, or related opportunities. Along with reducing these barriers, interviewees offered several recommendations for making their IES program more inclusive of BIPOC students (Table 1, Supplementary Table 4).
Table 1. Black, Indigenous, and people of color (BIPOC) students identify ways to make IES degree programs more inclusive of people from all races.

<table>
<thead>
<tr>
<th>Recommendations</th>
<th>Illustrative quotes</th>
</tr>
</thead>
</table>
| **Integrate BIPOC voices into the curriculum** (For example: incorporate literature by BIPOC, include Indigenous perspectives, invite BIPOC as guest speakers, address social justice within courses, partner with local communities in course projects) | “one goal is to increase environmental literacy, so if [faculty] were to include minority environmental writers and put it into the lesson plan and curriculum that would be awesome”  
“with environmental science, you talk about environmental justice and you talk about the injustice being done to people of color, and when professors talk about that it seems like they’re just reading off the slides. It doesn’t seem like they’re really going into it. . . I feel like [the program] needs to go deeper into those types of issues” |
| **Train faculty/staff in diversity, equity and inclusion** | “It’d also be great if professors all had some sort of diversity training. . . I feel like a lot of people don’t recognize . . . the ways in which people of color have to navigate the world versus someone who is white.” |
| **Hire racially/ethnically diverse faculty/staff** | “I definitely wish that there were more professors of color, who understand the need to talk about these issues from a different perspective.”  
“it’s encouraging, too, to see people you can more closely identify with in leadership roles” |
| **Recruit BIPOC students** (For example: invite BIPOC students currently in the major to speak at high schools or campus orientation) | “I feel like there’s just a need to get more students in there that are minorities.” |
| **Create resources to support BIPOC students** (For example: financial scholarships, research opportunities, student groups) | “I would love to see a student group that are students of color interested in environmentalism . . . focused on supporting each other and career development and leadership development . . . and maybe . . . have workshops or teach-ins about environmental justice issues and have guest speakers come in . . . so it would be a way that they’re supporting each other but then they’re also teaching the [university] community about these issues as well.” |
Implications for IES degree programs. Our results align with prevailing research on BIPOC students’ sense of belonging in scientific, technology, engineering, and mathematics (STEM) fields. Belonging, which refers to “the experience of mattering or feeling cared about, accepted, respected, valued by, and important to the campus community,” can affect students’ academic satisfaction, grades, and retention. In STEM, white men are more likely to feel that they belong, while women and BIPOC students are more likely to find scientific fields unfriendly, unsupportive, or hostile. In the present study, limited racial/ethnic compositional diversity among students and faculty combined with white dominated curricula left many interviewed BIPOC students feeling excluded and isolated. Their observations and experiences reflect a legacy of systemic racism that persists today within environmentalism.

Participants offered recommendations to address this racism (Table 1). Among these, hiring faculty of color will require IES programs at predominantly white institutions to reconsider every step of the hiring process from crafting the job description through candidate selection to actively reject biases towards whiteness. Increasing compositional diversity of faculty, staff, and students without changing aspects of organizational culture and structure that reinforce white dominance can harm BIPOC. IES programs also must attend to historical, organizational, psychological, and behavioral dimensions that influence the learning environment. Toward this end, BIPOC students recommended providing equity and inclusion training for all faculty and staff; integrating the curriculum to acknowledge BIPOC, the worldviews of marginalized groups, and the social implications of science; and dedicating resources to specifically support BIPOC students. Faculty, staff, and administrators implementing such changes can draw upon research literature on promoting racial equity in STEM education and should be prepared to persist through resistance.
This study catalyzed practical steps to increase racial diversity, equity, and inclusion at both study sites, including forming dedicated committees to facilitate change, faculty/staff training, pedagogical revisions, review of hiring practices, and financial and other supports (e.g., peer mentoring) for BIPOC students. Participants’ recommendations might apply differently in other contexts; however, the action research approach transfers across settings. Standpoint theory emphasizes that marginalized groups, in this case BIPOC students, hold knowledge based on their social positions that is inapparent to non-marginalized groups; thus, research on racial/ethnic diversity within IES degree programs should start with the perspectives of BIPOC students. Other IES programs can engage in action research that involves BIPOC students and faculty as co-researchers to learn about the experiences of BIPOC in their own institutions and then tailor programmatic changes to improve the learning environment accordingly.

It is important to keep in mind a limitation of our study: grouping students of distinct racial/ethnic identities under the umbrella of BIPOC overlooks the unique experiences of different racial/ethnic groups and nuances of students’ intersectional experiences. Pathways to belonging within higher education differ among students’ unique, multifaceted identities; thus, this is an important area for further research. Nonetheless, this study offers a transferable process for investigating the experiences of BIPOC students in IES programs and documents their insights and recommendations for shifting the environmental field from a narrow “white environmentalism” to one that embraces the diverse perspectives and approaches required for solving complex social-ecological crises.

Methods

We followed an action research approach employing grounded theory methodology. Action research involves a democratic process by which stakeholders experiencing a problematic
situation and professional researchers collaborate to collect and analyze data that supports action leading to a more just situation. Together, the professional researchers and stakeholders define the research questions and cogenerate knowledge about them for the express purpose of taking action to promote social change. The study began when Espedido and Rivera, both BIPOC and IES students, raised concerns with faculty (Schusler and Chaudhary) about the lack of racial/ethnic diversity within their degree programs. The two initially sought to recruit more BIPOC students to the programs but quickly realized through conversations with admissions personnel that recruitment alone would not guarantee prospective students’ ability to attend the university nor their retention once enrolled. At this point, Chaudhary, Espedido, Rivera, and Schusler decided that investigating the experiences of currently enrolled BIPOC students could usefully inform actions towards increasing racial/ethnic diversity, equity, and inclusion within IES programs. These 4 designed the research and 5 other BIPOC students (Engel, Hernández, Howerton, Marcos, Sepp) subsequently joined the research team and contributed to data collection, analysis, and/or reporting. Thus, the 9-member research team included 2 professional researchers and 7 BIPOC students, with the latter holding dual roles as participants and researchers.

We selected grounded theory methodology to prioritize BIPOC experiences rather than preconceived conceptions about their experiences. Grounded theory involves “developing theories from research grounded in data rather than deducing testable hypotheses from existing theories” (italics in original). We followed a constructivist approach to grounded theory through which we aimed to elucidate the research problem of increasing racial/ethnic diversity, equity, and inclusion in undergraduate IES degree programs through our interactions with participants and their perspectives. Our resulting explanations offer interpretive depictions of the
phenomenon studied -- students’ of color experiences as undergraduate environmental majors -- not exact representations, although we sought to develop as robust an interpretation of the data as possible. Semi-structured interviews comprised the data collection method. The research was approved by two university research ethics boards, one at each study site.

The use of action research with BIPOC students holding dual roles as researchers and participants strengthened the study. Sharing racial/ethnic identities, or even sharing experiences across different racial/ethnic identities, can foster coherence among participants and researchers that enhances the rigor of research findings. Each student on the research team who conducted interviews was an experienced facilitator in conversations about race and ethnicity. That they also identified as BIPOC in environmental majors positioned them with a high degree of relatability to both the interviewees and the social contexts of the study sites. Sharing these aspects of identity with participants improved rapport and reduced the likelihood of researcher reactivity. One can logically expect that BIPOC students would respond more openly and frankly to questions posed by a BIPOC peer than faculty (even BIPOC faculty), given the more equitable power relationship between peers.

It was important, however, that BIPOC students on the research team did not allow their own experiences to bias their interpretations of the data. Responding themselves to the interview questions in an interview conducted by another member of the research team allowed each student researcher to gain awareness of their own perceptual lenses and thereby minimize the undue influence of these as they conducted the research. That BIPOC students led data collection and analysis, along with the research team’s prolonged engagement in the study settings and use of peer debriefing during analysis, assured the results’ credibility. An audit trail documenting the research team’s intentions, instrument development, raw data, reduced data,
data synthesis, and process notes about methodological and analytic decisions provided dependability and confirmability of results.47

**Study Sites.** The study took place at two private universities in a major metropolitan region of the midwestern U.S., each enrolling over 10,000 undergraduates at the time of data collection (2017-2018). Both were majority white institutions with 38.7% BIPOC among the entire student body at site 1 and 39.0% at site 2. Site 1 enrolled 291 undergraduates in six majors related to environmental sustainability; 29.4% of these majors identified as BIPOC. Site 2 enrolled 166 undergraduates as environmental science or studies majors, of whom 20.5% were BIPOC. Both programs feature multi-disciplinary curricula that stress environmental and social sciences and humanities, Earth and ecological systems sciences, and undergraduate research experiences.

**Participants.** Using purposeful sampling,44 we invited students with declared environmental majors at each school who self-identified as BIPOC to participate in an interview. On 2 to 3 occasions, the academic dean or department chair at each site e-mailed the study’s recruitment message to all undergraduate environmental majors. The e-mail invited those identifying as a racial/ethnic minority in the U.S. to contact the researchers if they would like to take part in an interview. Twenty-four students of varied racial/ethnic backgrounds participated (Table 2), including the 7 BIPOC students on the research team (5 at Site 1 and 2 at Site 2). The racial/ethnic composition of interviewees’ home communities as well as the primary or secondary education schools they attended also varied. Some grew up in predominantly communities of color, others in largely white communities, and only a few in areas with a mix of racial/ethnic diversity. All interviewees provided documented informed consent before participating in data collection.
We concluded data collection upon identifying several theoretically and practically important emergent themes; however, we do not claim to have reached theoretical saturation in sampling. A study limitation relates to analyzing the experiences of BIPOC students as one group when participants possessed widely diverse racial/ethnic identities. To ensure confidentiality, we could not differentiate results by participants’ specific racial/ethnic identities, as some may be the only student with that precise racial/ethnic identity in their major. Our results do not take into account differences in experiences across distinct racial/ethnic groups nor students’ intersectional experiences. Yet, what might be meaningful for a male African-American student might not apply in the same way, or at all, to a female Mexican-American student, for example. In future studies, it would be fruitful to illuminate such intersectional nuances of BIPOC students’ experiences.

Table 2. Racial/ethnic identities of students interviewed. All resided in the United States.

<table>
<thead>
<tr>
<th></th>
<th>Site 1</th>
<th>Site 2</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>African-American</td>
<td>3</td>
<td>0</td>
<td>3</td>
</tr>
<tr>
<td>Asian-American (including Burmese, Chinese, Filipino, Vietnamese)</td>
<td>5</td>
<td>2</td>
<td>7</td>
</tr>
<tr>
<td>Latinx (including Ecuadorian, Mexican)</td>
<td>2</td>
<td>4</td>
<td>6</td>
</tr>
<tr>
<td>Mixed races/ethnicities (including Arabic-White, Asian-White, Black-White, Chinese-Vietnamese, Japanese-Puerto Rican, Mexican-Filipina, Puerto Rican-Mexican-White)</td>
<td>5</td>
<td>3</td>
<td>8</td>
</tr>
<tr>
<td>Total</td>
<td>15</td>
<td>9</td>
<td>24</td>
</tr>
</tbody>
</table>
Data collection. We conducted in-depth, semi-structured interviews with participants individually or, more often, in small groups of 2-3 students from May, 2017 to June, 2018. Taking place on participants’ respective campuses, the interviews lasted from 30 to 90 minutes. The interview guide (see Supplementary Information) began with questions about the student’s decision to attend that specific university and select an environmental major, prior educational experiences, and extra-curricular involvement. We then inquired about students’ perceptions of how their racial/ethnic identities influenced their experiences within the environmental major. We asked them to discuss their experiences in the major both in and out of the classroom, including their comfort speaking with peers and professors about race, instances of overt or covert racism, opportunities available to them as BIPOC students, and whether they felt supported by faculty, staff, and peers. Finally, we invited interviewees to recommend actions that could make their IES degree program more racially/ethnically equitable and inclusive. Because the interviews had the potential to raise negative experiences, such as recalling racial discrimination, we provided participants with a list of mental health providers, racial/ethnic identity affinity groups, and other resources available to students on campus and in the local community at the interview’s conclusion. Each interview was audio recorded with participants’ permission. The recordings began after participants’ introductions so that identifying information was not recorded and confidentiality was ensured. The recordings were transcribed and the transcripts imported into NVivo 1248 to manage the data for analysis.

Data analysis. Using grounded theory, we examined inductively participants’ words describing their experiences as BIPOC students in environmental majors. Grounded theory employs an iterative process of initial coding, constant comparison, focused coding, and memo-writing to identify converging and diverging patterns in the data and arrive at emergent themes.27
To the best of our ability, we set aside preconceptions and constructed our interpretations through extensive interaction with the data to develop the most acute elucidation of its meaning. Initial coding involved carefully reviewing each meaningful segment of data and creating a descriptive label capturing its essence. Each code was also ascribed properties describing the nature of data it encapsulated. While coding a transcript, the analyst systematically compared how each new segment of data related to or deviated from prior codes. This allowed for revising, adding, or creating sub-codes to more robustly depict the data. Through this iterative process and in communication with one another, each analyst created new codes and applied codes developed by others to produce collectively a preliminary set of analytic categories. When we began analysis, we managed data from the two sites separately; however, because no conflicting codes arose between the data from the two sites during initial coding, we merged the datasets to proceed with focused coding.

Two rounds of focused coding involved continuing comparative analysis of the preliminary category system with the data within and across transcripts to discern which categories held the most explanatory power pertinent to the research question. During focused coding, the analysts substantiated some categories and re-configured others by separating, combining, or otherwise synthesizing codes to most saliently reflect the data and illuminate overarching ideas about the data that became the key themes reported in the results above. Writing analytic memos throughout this iterative process helped the analysts refine their interpretations by elaborating on the meaning of codes, documenting recurring patterns or unique perspectives, identifying budding connections between codes, and exploring potential relationships within and across categories. Ongoing conversations between the analysts and, periodically, with the full research team helped to reach consensus on data interpretation. Rich
description provided through the inclusion of multiple, illustrative quotes for each thematic
category in Supplementary Information (Supplementary Tables 1-4) enable readers to discern the
transferability of results to their own contexts. For ease of reading, we removed from excerpted
quotes utterances common in conversation, such as repeated words, “you know,” and “like.”

References


44. Patton, M. Q. *Qualitative Research and Evaluation Methods*. (Sage Publications, 2002).


Figure 1. Key themes and illustrative quotes that emerged from interviews with BIPOC students reflecting on their experiences as undergraduates in interdisciplinary environmental and sustainability degree programs.
Figure 2. BIPOC students’ observations and experiences in interdisciplinary environmental and sustainability degree programs often contrast their motivations for studying the environment and lead to exclusion and isolation, although some supportive experiences contribute to feeling included and a sense of belonging.
Acknowledgements

We are grateful to Paul Metzler for assisting in the creation of Figure 1. This work is supported financially by a National Science Foundation Grant (award DEB-1844531) to VBC.

Contributions

C.E., B.R., T.S. and V.B.C. conceived the study. C.E., B.R., M.E. and J.M. conducted focus group interviews and provided editorial comments. J.M., M.H., A.H. and K.S. conducted analyses. T.S. wrote the paper. All authors provided editorial comments on the manuscript.

Competing interests

Authors declare no competing interests.

Additional information

Interview Guide

Supplementary Tables 1-4