Student Perceptions of Diversity, Equity, and Inclusion in Conservation: Assessing an Undergraduate Course

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Abstract

Few undergraduate courses in science, technology, engineering, and math (STEM) majors provide meaningful focus on Diversity, Equity, Inclusion, and Justice (DEIJ) or addressing biases in science. Embracing DEIJ during this stage is essential for equipping students to participate constructively in solutions to these longstanding challenges, especially as the career landscape continues to evolve. This study focuses on a course designed to address this gap by providing students with the opportunity to critically reflect on the founding principles of conservation, to understand the long term impacts that colonialism, racism, and sexism have had on the field, and to introduce students to diverse perspectives (i.e. other ways of knowing; indigenous perspectives), thus providing a more holistic understanding of the structures and influences on modern conservation. Overall, we found that students responded very positively to the course and showed strong interest in these topics, including how addressing DEIJ could impact and improve the conservation field. Our experience suggests a broad desire among students for more DEIJ content that gives them a more holistic understanding of the conservation field and provides inclusive practices that address the long-standing issues in our field.

Keywords: diversity, ecology, curriculum, inclusion

The social movement to address systemic racism in the US, reaching a recent tipping point from the murder of George Floyd in 2020, has had ripples across academic and educational disciplines and contexts. In ecology and the conservation sciences, there has been growing recognition of the pervasive influence that white supremacy, classism, and misogyny had in the founding of the US conservation movement, and calls to critically assess how these legacies continue to shape the field today.

Diversity, equity, inclusion, and justice (DEIJ) are concepts that institutions and organizations have engaged with prior to 2020, but the focus has largely been on workplace issues and the recruitment and retention of diverse professionals (Bailey et al., 2020). Less attention has been on integrating these concepts into undergraduate coursework, which would engage students with these important topics while they are building the foundations for their professional careers (Chaudhury & Colla, 2020). Few courses in science, technology, engineering, and math (STEM) majors provide any meaningful focus on DEIJ or addressing biases in science (Moreau et al., 2022). This is a deficiency, as embracing DEIJ during this stage is essential for equipping students to participate constructively in solutions to these longstanding challenges, especially as the career landscape continues to evolve.

This study focuses on a course that was developed as an elective for juniors and seniors in a large land grant university's wildlife ecology program. The course was intended to address a gap that the instructors identified in the current ecology undergraduate program. The course was designed to provide students the opportunity to critically reflect on the founding principles of conservation (critiquing both the principles themselves and the context in which they were constructed), to understand the long term impacts that colonialism, racism, and sexism have had on the field, and to introduce students to diverse perspectives (i.e. other ways of knowing; indigenous perspectives), thus providing a more holistic understanding of the structures and influences on modern conservation. Both instructors come from marginalized communities and had expertise in DEIJ research. This is significant, as Lin (2018) found that having minority instructors benefitted students from underrepresented backgrounds, as these instructors provided role models and representations of minorities in leadership positions.

The course consisted of nine modules spread over the fifteen-week semester (Table 1). The pedagogical approach focused on content delivery and readings followed by student discussion. Each module included an online discussion prompt to encourage thoughtful reflection. Instructors chose this approach to encourage a cohesive and inclusive learning community in which students interact with each other, learn content cooperatively, and have opportunities to reflect on course content. Studies have shown that traditional lecture-heavy practices with high stakes exams disproportionately impact students from marginalized communities while courses that offer more interaction are associated with benefits for these students (Cronin et al., 2021). Discussions and reflections were designed as reflective questioning opportunities, which have also been shown to foster DEIJ in the classroom while promoting deeper learning and awareness (Super et al., 2020). On the whole, these empathetic and inclusive teaching approaches are especially effective and beneficial for students who may experience social, cultural, and political barriers (Arif et al., 2021).

In this study, we seek to understand the impacts this course had on the students. Namely,

1) Did perceptions of the conservation field and/or the students' major change in response to the DEIJ concepts and topics covered in the course?

2) Did student perceptions of their own positionality and perceptions of their role in conservation change in response to the DEIJ concepts and topics covered in the course?

3) How did students respond to the inclusive teaching practices used in this course?

Table 1

Course modules

Module	Topic
1	Worldview, Values, and Attitudes in Conservation
2	History of Conservation in the US
3	Colonialism and International Conservation
4	Diversity, Equity, and Inclusion in the Outdoors
5	Environmental Racism & Environmental Justice
6	Who is Trusted in Science?
7	Traditional Ecological Knowledge (TEK) & Indigenous Issues in Conservation
8	Engaging with Diverse Stakeholders for Conservation Management
9	Addressing Diversity, Equity, and Inclusion in the Academic to Career Pipeline

Methods

For this project, we conducted a qualitative analysis of student reflections from selected prompts over two different semesters of the course. A total of twenty-nine students consented to participate in this research with thirteen from the 2021 semester and sixteen from the 2022 semester. There were a total of 28 students enrolled in 2021 and 26 students enrolled in 2022. Students were approached after the semesters had concluded to prevent potential issues with coercion during the course. They completed a short online questionnaire asking for demographic information as well as whether or not they had taken any other courses with DEIJ content prior to this class. We used an open coding approach with no a priori codes/categories to assess 6 reflection prompts (Table 2). Both researchers coded responses separately then combined codes to ensure inter-rater reliability. A final round of coding was done that incorporated and consolidated both researchers' codes, resulting in the final codes. We also analyzed all entries from student course evaluations (eighteen from 2021 and nine from 2022). Course evaluations are completely anonymous and provided through the institution's evaluation system. Human subjects research was approved and this study was designated as exempt by the Institutional Review Board (IRB); all students consented to participation.

Table 2

Student reflection prompts with total number of responses

Topic	Prompt	Number of Responses
Caste (based on Wilkerson 2020)	Think about our discussion this past week about caste. In two to three paragraphs, reflect on what you and your classmates said about their experiences of living in different castes and write about how a person's caste might impact how they see the world and interact with others.	30
Worldviews and conservation	Reflect on what we covered in class with respect to U.S. conservation history and worldviews. In two to three paragraphs, how do you think your own educational experiences in our department reflect the dominant US conservation perspective? Are there courses where incorporating other worldviews would be (would have been) useful? How do you think the field of ecology and conservation might change if broader worldviews were acknowledged (or incorporated)?	30
Mid-semester check-in	We're halfway through the semester! In two to three paragraphs, please share one or more of things that has/have been most helpful to you about this course so far. What is something surprising or unexpected that you've learned? What have you found most challenging about the content we've covered?	30
Religion and conservation	Reflect on last week's guest lecture. What were some parts you felt were particularly interesting? Was there anything the presenter talked about that you had never heard about before? In your own opinion, how do you think religion impacts how people engage (or don't engage) in conservation or how they see their roles/responsibilities towards nature?	15*
Who is trusted in science?	Reflect on what you learned from last week's guest lecture. in two to three paragraphs, give one or more examples of how disproportionate rates of publishing (and/or lack of global representation among journal editors) can affect conservation science and /or practice.	15*
Traditional Ecological Knowledge	In two to three paragraphs, how do you think traditional ecological knowledge (TEK) and science should interact and be used in natural resource management efforts, especially when they conflict with each other?	30

**prompt only asked in 2022*

Results

Of the respondents, the majority were female (N=23) with three males and one non-binary student. The gender of respondents generally reflected the overall course makeup as 87% of students in the course were female-identifying. Seventeen respondents identified as White, one as Asian, six as Hispanic/Latino (any race), and two as mixed-race. This also reflects the racial/ethnic makeup of the course overall as 78% identified as White, 18% as Hispanic/Latino, 1% as Asian, 1% as mixed race, and 2% not self-identifying. Most of the students were ecology majors (N=18), five were biology related (i.e. animal sciences, marine sciences), and three in the humanities (anthropology, journalism, business). Only one respondent indicated that they had taken another undergraduate course with a DEIJ focus, while seven had taken courses that included at least one DEIJ-related module.

Research question 1: Did perceptions of the conservation field and/or the students' major change in response to the DEIJ concepts and topics covered in the course?

Within the "worldviews and conservation" prompt responses, students were asked to reflect on DEIJ content in their major. The greatest number of mentions for this prompt were related to how DEIJ content in undergraduate wildlife courses could improve both the major and the conservation profession as a whole (Table 3). One student describe specifically how including broad perspectives could positively influence the field of conservation:

"I think the field of ecology and conservation would be astronomically improved by including broader worldviews! As a whole, we become better people and better professionals by having an understanding of our own situations as well as the situations of others we may come into contact with. It is also extremely important to be considerate of the people that may be impacted by management decisions. Adding more worldviews can also expand the range of possible solutions for ecology and conservation problems. More eyes and brains on a problem is always beneficial" (Respondent #1).

Table 3

Top 5 mentioned codes for "Worldviews in Conservation"

Most Mentioned Codes	Number of Mentions
Would improve the profession/major	33
Few/no class offerings with these topics	20
Eurocentric worldview promoted	10
Need to deal with the past	8
This content should also be in other courses	7

Table 4

Top 5 mentioned codes for "Mid-Semester Check In"

Most Mentioned Codes	Number of Mentions
New knowledge/understanding	21
Teaching methods	18
Gap in education about topic	11
Inclusive environment	11
Personal change	4

The second most mentioned code related to the lack of DEIJ content in coursework within the major. Several students expressed surprise at having almost completed their undergraduate degree in conservation, yet never having a class that addressed the problematic aspects of conservation history or the importance of including diverse perspectives in the practice of conservation. As one student put it:

"This being my last semester in the WEC department, I have taken all the courses required for the major and I find it a bit embarrassing that I am only now learning about how many minority groups were essential in the protection of our land" (Respondent #8).

Students also reflected on the dominant worldviews that are highlighted in their coursework. One student spoke of the lens through which most of their classes were taught:

"Every wildlife class I have taken here is taught through the lens of white privilege and fails to include how poor people, black and brown people, native Americans, and other marginalized communities interact with the environment" (Respondent #22).

Another student noted that courses mostly included discussions from a dominant perspective:

"Specifically in this department, conservation history is typically taught the same way and I feel that it is very reflective of the ideas that dominate conservation discussions in the United States" (Respondent #20).

For the "Mid-semester Check In", students highlighted the impacts the course, so far, had on their understanding of DEIJ issues in conservation and reflected on the teaching methods that resonated most with them (Table 4).

Students reiterated that there was a gap in their knowledge about these issues due to the lack of other courses that contained similar content and explained the impact of their new knowledge and awareness. For example:

"Taking this course has opened my eyes to the fact that I was missing the obvious lack of diversity right in front of my face and that I was missing a huge amount of knowledge" (Respondent #1).

Another reflected on the course and how their new knowledge might impact their future career:

"I had never really thought about how important different perspectives are in the context of conservation and the way we utilize and perceive nature. This is something that I believe will help me in my future career and help me become a better humanitarian and advocate for wildlife and the conservation of natural resources. Many parts of this course have been surprising and have challenged my view of what conservation means" (Respondent #7).

While some prompts were aimed at broadly reflecting on DEIJ in conservation, several prompts were related to specific course topics. Even within these prompts, students expounded upon how these topics impacted their understanding of conservation. For example, when asked to reflect on Traditional Ecological Knowledge (TEK), students wrote about the similarities and differences of TEK to western science and how TEK broadened their understanding of what science is and how knowledge is gained. Upon reflection, one student noted how the western scientific process of understanding the world has similarities to indigenous frameworks:

"Science is a process that gives people a way to understand their surroundings. TEK is another way people make sense of their surrounding and is made up of observations and experiences just like science" (Respondent #29).

Importantly, some students also recognized the fundamental differences in worldview that encompass western science and TEK. For example, one student mentioned the integral and place-based nature of TEK:

"I think the most important thing is to allow Indigenous groups to speak for themselves. It is important that we remember that TEK and the land is a part of their culture. It is not just a separate aspect of their life, like science can be to us" (Respondent #6).

Discussion of religion and conservation also appeared to be another important gap in exposure, as several students mentioned that they had never considered the importance of religion in conservation and that other courses had not touched on the role of beliefs in conservation behavior (Table 5).

Table 5

Top 3 mentioned codes for "Religion in conservation"

Most Mentioned Codes	Number of Mentions
Had not considered religion before	9
Important to consider/incorporate local beliefs	9
Important to understand different values	9

As with TEK, respondents recognized the importance of supporting or incorporating local belief systems in conservation (Table 5). As one student pointed out:

"If one can intertwine conservation with the fundamentals of people's core values such as religion, it can be a great way to connect those people to nature and have them shepherd the things they care about" (Respondent #29).

For the "Caste" prompt, "ties to conservation" was the second most mentioned code (Table 6). Here, students discussed how the idea of a racial caste system impacted the conservation field.

Students reflected on the overrepresentation of the dominant caste on the origins of western conservation. For example, one student said:

"I found our discussion on castes and how they formulate our perspectives on wilderness and conservation very important and believe it is a topic highly under-discussed in the field. Just as in many other disciplines, the framework of all original research and practices were from the lens of white upper-class men taken for granted as representing the entire population" (Respondent #16).

Table 6

Top 5 mentioned codes and subcodes for the "Caste" reflection prompt

Most Mentioned Codes (with subcodes)	Number of Mentions
Lived experience	23
Privilege	7
Mixed-Race	6
Sheltered	4
Ties to conservation	6
Privilege	5
Caste system in practice	4
Outside learning experiences	4

Another student reflected on their realization that other cultures have perceptions of nature or worldviews that differ from western views:

"Before this discussion, I had never thought about how other groups might perceive nature differently than my westernized view of it. I realized that other cultures may have new and unique ideas about conservation and I think these voices need to be heard in the discussions about wildlife conservation" (Respondent #17).

Research question 2: Did student perceptions of their own positionality and perceptions of their role in conservation change in response to the DEIJ concepts and topics covered in the course?

For the "Caste" prompt, students reflected on their lived experiences; their experiences of privilege or of racism and systemic inequality. The majority of mentions for the "Caste" prompt revolved around students discussing their lived experiences (Table 6). Students reflected on their own privilege or challenges related to where they fit in the caste system as proposed by Wilkerson (2021). For several students, their recognition of caste did not come until they were older. For example, one student discusses the challenges of grappling with a mixed-race identity:

"It wasn't until I was much older did I realize that I had always been seen as different whether it was because I had a father that was brown skinned or my father had a daughter that was white skinned. That experience kept me from immersing myself in my family's culture and or seeing where I fit. It is difficult to control where we fall in the caste or even move through it" Respondent #9

Another student reflected on the subtleties of systemic racism and how it impacts experiences that people of different races have:

"I think the fact that I really didn't realize how much subtle and overt racism there was all around me until I was in high school is a testament to just how much caste can either shield you from or expose you to racism" Respondent #5

Some students reflected on their privilege. Three students described growing up in fairly homogenous communities and how that shielded them from the impacts of systemic racism. One student mentioned how, during the class discussion about identity, their group (consisting of all white students) did not include race as a core part of their identity and suggested it was evidence of privilege that race was not a defining feature.

Other students mentioned privilege in a more general sense and how the system functions in practice. For example, one student mentioned that people who are at the top of the caste system lack awareness that there are racial divisions that affect groups differently and how that can prop up divisions, not out of overt discrimination, but because of a lack of understanding. Another reflected on how implicit biases can contribute to continued inequality. Lastly, there were 4 mentions of "outside learning experiences" where students reflected on how contact with diverse groups through their lifetimes have contributed to a greater awareness of social hierarchies and on the importance of exposure to communities that are different from their own.

Research question 3: How did students respond to the inclusive teaching practices used in this course?

In the "Mid-semester Check In" prompt, two of the top five most mentioned codes dealt with the teaching methods employed during the course and the inclusive environment fostered in the classroom (Table 4). Students largely enjoyed the focus on discussion as opposed to lecturing and lauded the holistic approach to the course. Related to teaching methods, eleven mentions were made about the inclusive environment fostered during the class. Students talked about psychological safety, namely the openness of their peers to discuss difficult topics, and the instructors' efforts to offer a variety of ways to engage with the content (guest speakers, group and class wide discussions, individual writing, etc.).

"I feel like this is the first course I've taken where everyone is truly open to expressing their experiences and learning from those of others. What I have found most helpful to me about this course so far is everyone's willingness to share during discussions" (Respondent #5).

Another student mentioned the inclusion of both positive and negative aspects of conservation and how the instructors did not seek to denigrate the history of conservation, but highlight the problematic aspects as well as the accomplishments:

"I like that we are learning about these issues in a holistic way and that we can take a topic like the national parks and discuss the negative impacts they had, but not write off the whole national park system as a bad system, which I feel like could happen in a different class. I like that this class is all about understanding the causes of the problems and ways to help fix it, not just focusing on the negatives" (Respondent #17).

The student evaluations of this course were overwhelmingly positive. The course rates are higher than the department mean for overall value, creating a positive learning environment, and on instructor-related questions (Table 7).

Table 7

Student evaluations from 2021 and 2022

	2021		2022	
	Mean	**Dept Mean**	**Mean**	**Dept Mean**
Overall, this course was a valuable educational experience.	4.89	4.29	5.00	4.21
The instructor fostered a positive learning environment that engaged students.	5.00	4.29	5.00	4.37
The instructor was instrumental to my learning in the course.	5.00	4.51	5.00	4.15
The instructor was enthusiastic about the course.	5.00	4.34	4.89	4.45
The course fostered regular interaction between student and instructor.	4.90	3.71	5.00	3.83

In the free response section, students were able to identify instructor strengths that contributed to learning outcomes in the course. Of the twenty-three comments left for both years, eighteen mentioned specific teaching techniques or instructor attributes such as providing a comfortable environment for discussion, using a variety of interactive activities, creating a positive and engaging learning environment, flexible teaching style, compassion, and kindness.

"[Instructor] is well spoken, understanding, and extremely educated and passionate about this course. She did a great job of recognizing all preexisting misconceptions students may have and informing students about relevant issues without pushing specific opinions or agendas. She also facilitated conversation and discussion of tough topics that other courses in the department wholly ignore" (2022 respondent).

"I really enjoyed this course, not something that is typically talked about in the wildlife field but it is definitely a much needed discussion. I liked the documentaries and breakout groups to talk to other students, students were more willing to talk in breakout groups than in whole class discussions" (2021 respondent).

Discussion

Many disciplines have been recently grappling with ways to address systemic inequities in their fields. In scientific disciplines like conservation, these conversations have been mostly focused on how to recruit more diverse populations but have largely ignored the legacies of colonialism, racism, xenophobia, and sexism (Chaudhury & Colla, 2020). It is in large part these underlying factors, however, that have led to the present lack of representation in many spaces, and which continue to drive inequities today. In order to understand the contemporary context of this discipline, it is important to critically examine the full history of the field. As Bouie (2018) states, "failure to do so and hold ourselves accountable shields us from our own implicit assumptions that perpetuate modes of inequity currently plaguing the sciences."

The creators of this course assume, as Gould et al. (2017) states that engaging with history to understand diverse experiences and relationships can help address historical traumas, and that these holistic approaches are critical to engaging more diverse communities in conservation. In addition to addressing the challenging history of the conservation field, we sought to encourage students to think more broadly about how communities interact with and manage natural resources by introducing them to diverse perspectives about nature and conservation. Diversifying perspectives through which students learn can help instructors more effectively engage with students, particularly those from marginalized backgrounds (Arif et al., 2021).

Student reflections revealed that their perceptions of conservation changed in response to the topics covered in this course. Further, one important theme that emerged was the students' recognition of the overall lack of conversation about these topics in the rest of their program curriculum. Many students observed that their education focused heavily on western worldviews and "mainstream" perspectives about conservation and natural resources management, and lacked consideration of other ways of knowing or the negative aspects of western conservation history. These findings echo the results of Schusler et al. (2021) whose interviews of Black, Indigenous, and People of Color (BIPoC) students in environmental majors identified that their educational experience lacked global perspectives, ignored contributions of BiPoC individuals, and focused on a "predominantly white male canon" that offered limited content about how environmental science affects marginalized communities.

Additionally, our respondents reflected on the ways in which incorporating diverse perspectives could improve the conservation discipline. Reese (2020) found that purposefully discussing DEIJ topics could position students to become agents of change and to improve the future of scientific disciplines. Students in this study expressed that these topics are important in their fields of study but that they had not previously thought about them. They reflected on how broadening their own perspective could help them better engage with diverse communities in their future professional lives. Examining their own identities, they also acknowledged areas of privileged and blind spots when it comes to DEIJ. Some students from marginalized identities also reflected on the ways in which their identities impacted how they navigated their personal and professional lives.

Lastly, we explored how inclusive teaching practices impacted student learning and engagement in the course. Students reacted positively to the teaching methods and expressed that the instructors created a welcoming environment for them to navigate these challenging topics. Intentionally focusing on discussion, reflection, and creating a supportive environment to address challenging topics has been found to positively impact learning outcomes in courses that address these topics, and generally improves outcomes specifically for students from marginalized backgrounds (Super et al., 2020; Naiknavare & Maisel 2022; Moreau et al., 2022). The confidence that people have to express their true feelings, or psychological safety, has been shown to enhance inclusion in workplaces (Romansky et al., 2021). In addition to the benefits of these teaching approaches, the course instructors coming from minority backgrounds themselves likely also contributed to the success of the course. While we did not measure this factor directly, research has shown that representation matters, and that the presence of minority faculty can improve student learning and wellbeing on multiple fronts (Jones et al., 2002; Lin, 2018).

Overall, we found that students responded very positively to the course and showed strong interest in these topics, including how addressing DEIJ could impact and improve the conservation field. Our experience suggests a broad desire among students for more DEIJ content that gives them a more holistic understanding of the conservation field and provides inclusive practices that address the long-standing issues in our field. In one study of high school students, 40% reported actively pursuing information about DEIJ on campuses they were interested in attending and 76% of respondents indicated that they would rank colleges "much more appealing" because of DEIJ initiatives (Jaschik, 2021). While many higher education institutions generally support DEIJ, there has been slow progress toward DEIJ goals. In a survey of 118 colleges, three-quarters mentioned they had at minimum a DEIJ mission statement but only half said their colleges were making expected progress toward their DEIJ goals (Kelderman, 2023). Less than half of those respondents mentioned having culturally relevant programs or centers and less than one quarter of colleges reported doing any sort of systematic review of their curriculum to identify DEIJ issues. This slow progress has also been recently hindered by the surge in anti-DEIJ legislation at the state level that restricts colleges from having DEIJ offices or staff, prohibits DEIJ statements for hiring and promotion, and restricts educational content. As of 2023, anti-DEIJ legislation has been proposed or implemented in 13 states across the United States.

Conclusion

In this study, we explored the impacts of a DEIJ-based conservation course on undergraduate students' perceptions of their major and the broader ecology/natural resource discipline. We also sought to understand how inclusive teaching practices were received in a course that covered often sensitive and polarized topics. This study was exploratory in nature and we recognize several limitations. For one, this course is an elective, so potential exists for self-selection bias as students who registered for this course may have already had an interest in the content. Additionally, those who had positive experiences with the class may have been more likely to consent to participate in this study. While it is important to keep these limitations in mind, this study provides valuable insights into how relevant DEIJ themes can be covered in conservation curricula and suggests that DEIJ courses that incorporate inclusive teaching practices offer numerous benefits to undergraduate students in the ecological and natural resource sciences.

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