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Bridging sustainability and diversity, equity, and inclusion (DEI) through transformative sustainability pedagogy

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Abstract

Purpose – This paper aims to examine how sustainability education can support diversity, equity, and inclusion (DEI) outcomes in higher education. The authors found that transformative sustainability pedagogy (TSP) provides a powerful framework through which students can develop the experiences, systems thinking and affective skills needed to connect sustainability with DEI.

Design/methodology/approach – Four focus groups with 33 total participants were conducted with undergraduate students at a mid-sized American university. The focus groups consisted of a series of questions and a concept mapping exercise. Data were analyzed thematically using three dimensions of TSP as an explanatory framework: experiential/participatory learning, systems thinking and affective/emotional engagement.

Findings – Results show that while many students initially defined sustainability in narrow environmental terms, those with broader educational experiences held more nuanced views. Student responses demonstrated evidence of participatory learning (co-constructing broader definitions of sustainability through concept mapping), systems thinking (linking sustainability to diversity issues as well as global inequities) and affective engagement (emphasizing inclusion through empathy and care).

Research limitations/implications – While this study draws on data from a single institution and a small, self-selecting sample (which limits generalizability), it points to the potential for TSP to enhance DEI outcomes within sustainability education. These results also indicate opportunities to inform curriculum development and shape instructional practices.

Practical implications – The findings indicate that to align sustainability education with TSP, it is important to adopt pedagogical strategies that emphasize experiential and affective learning, incorporate critical frameworks and draw on interdisciplinary perspectives. In addition, supporting co-curricular initiatives strengthens the integration of sustainability with DEI.

Originality/value – This paper provides empirical support that TSP can serve as a pedagogical bridge between sustainability and DEI, offering hopeful evidence that TSP-led sustainability education can foster understanding of DEI through qualities embedded within the learning experience. By examining how student learning aligns with the three dimensions of TSP, the study contributes both theoretical and practical insights into the ways in which sustainability education may advance DEI goals in higher education.

Keywords Collaborative learning, Sustainability in higher education, Societal impact, Transformative learning theory, Transformative pedagogies, Engagement and empowerment

Paper type Research paper

Introduction

Over the past several decades many higher educational institutions (HEIs) have undertaken institutional reforms to adopt and enact core values of diversity, equity, and inclusion (DEI). Shaped by scholar Kimberlé Crenshaw's theory of intersectionality, the concepts comprising DEI have separate definitions: diversity often refers to characteristics of personal identity/

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difference, equity as fairness, and inclusion as the implementation of the principles of diversity and equity (Abrams, 2022; Collins and Bilge, 2020). Considerations of DEI have shaped policies and priorities within HEIs in countries including Canada (Michalski *et al.*, 2017; Tamtik and Guenter, 2019), South Africa (Jappie, 2019; Mdepa and Tshiwula, 2012), the UK (Eggins, 2014; Gallagher, 2018) and the USA (Barnett, 2020: Copeland and Tarver, 2020). Beyond a need to reckon with histories of colonialism and patterns of racial and ethnic discrimination within education, these reforms also respond to the rapidly diversifying demographics within HEIs (Copeland and Tarver, 2020; Jappie, 2019).

Across higher education, DEI efforts and sustainability education are often treated separately but there has been increasing interest to explore links between the two. Hatch-Tocaimaza *et al.* (2025, p. 2) argue that "(DEI) work in higher education is indivisible from sustainability efforts and that both can be understood as complementary principles of justice." Others argue that DEI and sustainability are complementary and that sustainability education must grapple with DEI to have relevance (Chattopadhyay, 2019; Fregosi, 2020; LeVasseur, 2021). Research suggests that attention to DEI principles can enrich pedagogical approaches to teaching sustainability (Burns, 2015; Kagawa, 2007). However, some studies have found that students primarily conceptualize sustainability as related to environmentalism and may not see sustainability education as connected to intersecting issues such as social justice (Alexander *et al.*, 2022; Gal and Gan, 2020; García-González *et al.*, 2020; Kruger *et al.*, 2020; Owens and Legere, 2015). Despite growing scholarly consensus on the value of integrating DEI and sustainability, there remains limited empirical understanding of how students themselves may view this relationship.

Burns's (2015) transformative sustainability pedagogy (TSP) offers a potential framework for integration of DEI and sustainability. At the heart of TSP is the belief that students must understand sustainability through "living systems," tracing links between environmental harms and social injustice (Burns, p. 261). Previous TSP research has explored teacher empowerment through participatory action research (Bedford, 2022), curriculum which incorporates embodied learning activities (Leite *et al.*, 2022; O'Neil, 2018), institutional redesigns (Lotz-Sisitka *et al.*, 2015) and colleges which promote alternative living arrangements (Blake *et al.*, 2013). Several scholars have developed TSP-guided conceptual models that incorporate emotions into learning, including the "head, hands, heart" framework for teaching sustainability (Sipos *et al.*, 2008). Related research on transformative sustainability education (TSE) has demonstrated that experiential and collaborative learning can foster systems thinking and increase awareness of the social dimensions of sustainability among graduate students (Gal and Gan, 2020). Yet despite the potential of TSP to cultivate critical consciousness in learners, there remains a lack of research exploring how transformative educational experiences may contribute to students' understanding of DEI, or examining TSP from the students' perspective. Addressing this gap is crucial for understanding how sustainability education can more fully support institutional priorities like DEI.

To fill this gap in the literature, this study uses student focus groups to provide empirical evidence of TSP in practice, arguing that it can serve as a pedagogical bridge to connect sustainability and DEI. This paper shows that students engaged in TSE demonstrate systems-level thinking and emotional growth, describing rich learning experiences that shaped their perspectives on DEI. The findings also suggest that experiential and informal learning, critical frameworks, and interdisciplinary collaborations support DEI. So although previous research indicates that students often do not recognize the connection between social justice and sustainability (Kruger *et al.*, 2020), this study identifies the TSP framework as a potential solution. This work also demonstrates practical ways in which (for instance, by using TSP) the vitally important core concepts and values of DEI can remain integrated in curriculum in a politically charged educational environment. In this way, the paper contributes to the

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evolving conversation about the future of DEI in higher education, offering sustainability education as a possible path forward.

Literature review

Students have a positive view of sustainability and high interest in learning about sustainability (Hyytinen *et al.*, 2023; Kagawa, 2007; Null and Asirvatham, 2023). Research indicates students believe sustainability requires "collective and radical social change" and that values like diversity and inclusion are core strengths which they must draw on to achieve societal transformation (Kagawa, 2007). In addition, studies have demonstrated that students believe social inequities must be addressed to facilitate environmental change and that they must learn from diverse cultures to live sustainably (Gal and Gan, 2020; Kagawa, 2007). These findings suggest some students already value sustainability curriculum and recognize the links between sustainability and the principles of DEI within their own educational experiences.

Despite acknowledging mutually enriching connections between sustainability and DEI, there are barriers to using sustainability education to expand understanding of these concepts. For example, faculty and students have differing definitions of sustainability and most students conceptualize sustainability primarily through a lens of environmentalism (Alexander *et al.*, 2022; García-González *et al.*, 2020; Kruger *et al.*, 2020; Owens and Legere, 2015). While there are key gaps in student understanding of social dimensions of sustainability, there are also differences in how sustainability is viewed across demographics, such as gender (Décamps *et al.*, 2017; Kruger *et al.*, 2020). Yet, research promisingly suggests students who have completed sustainability training are more likely to account for social or economic dimensions of sustainable development (Gal and Gan, 2020; Lourdel *et al.*, 2007).

Since achieving sustainability requires attention to environmental, economic and social factors, there is consensus that incorporating it into the educational experience calls for an interdisciplinary (Howlett *et al.*, 2016) and transdisciplinary (Anapey, 2024; Tejedor *et al.*, 2018) approach. Though there are nuances, in general, "interdisciplinary" refers to collaborations between academic disciplines whereas "transdisciplinary" happens beyond the classroom (Horn *et al.*, 2023). Given the information gaps discussed above, scholars suggest operationalizing core DEI-linked competencies around sustainability (Brundiers *et al.*, 2021). Sustainability education researchers have also suggested non-traditional student assessments like cognitive mapping to draw connections between competencies (Burns, 2015; Howlett *et al.*, 2016; Lourdel *et al.*, 2007; Tejedor *et al.*, 2018). Informal learning opportunities – such as participation in campus clubs – also deepen student understanding of the DEI dimensions of sustainability (Gramatakos and Lavau, 2019). Therefore, robust formal and informal educational experiences appear crucial.

Scholars have argued for the potential of DEI-related, critical theoretical frameworks such as environmental justice or ecofeminism to deepen student understanding of sustainability (Kruger *et al.*, 2020). Building on postcolonial scholarship and critical theory, environmental justice and Indigenous scholars point out that groups least responsible for climate change in the Global South stand to face the greatest disruptions from the climate crisis (McGregor, 2020), whereas ecofeminism argues that the capitalist model of economic growth is predicated on the oppression of women (Gaard, 2017; Puleo, 2017; Shiva and Mies, 2014). In a related way, some have critiqued sustainability discourse itself as heavily Western-focused, arguing the need for Indigenous and place-based approaches (Ajaps, 2023; Breidlid, 2012; Maison, 2022). Studies in Africa and Asia have demonstrated that culturally sensitive education buoys sustainability, while Indigenous approaches emphasize emotional learning as essential (Evans, 2015; Mbah *et al.*, 2022; Nelson, 2008; Ryan *et al.*, 2010; Ulmer

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and Wydra, 2020). Taken together, previous research has highlighted the importance of providing students with holistic and culturally rich educational experiences. These studies also point to the significant ways in which sustainability education can intersect with efforts to advance DEI, suggesting that integrating these areas may offer valuable opportunities for both student learning and institutional change.

Study site and case context

The research site is a mid-sized public American university that offers undergraduate and graduate educational programs across five schools: Business, Education, Fine and Performing Arts, Liberal Arts and Sciences, and Science and Engineering. This project focused on undergraduate students. The university offers Environmental Science and Environmental Studies as majors and minors and hosts a sustainability learning community and fellowship which supports faculty and staff in implementing sustainability into their campus work. Over 40 courses are designated as sustainability-focused or sustainability-related. These include Introduction to Sustainability and courses in ecology, sustainable fashion, international business, American literature and feminist economics. The campus has active clubs focused on sustainability and numerous events and lectures engage students on sustainability topics, such as an Earth Day celebration, a student-led campus sustainability conference, and a seminar series featuring guest speakers on environmental issues. Given the university's investment in sustainability and significant educational opportunities, it is an appropriate research site to study student definitions of sustainability and to understand whether these experiences promote an understanding of DEI.

Method

The goals of this study were to:

- understand how students who have self-reported sustainability educational experiences define sustainability; and
- investigate if there are links between their understanding of sustainability and DEI.

This project utilized a qualitative focus group method. In contrast to previous studies, this allowed students to create their own definitions of sustainability rather than rely on researcher definitions like "environment" or "social" (Kruger *et al.*, 2020; Owens and Legere, 2015). Furthermore, focus groups are well-suited to evaluating student perspectives on curriculum and assessing its effectiveness (Palmer *et al.*, 1996; Pugsley, 1996; Williams and Katz, 2001). This project was approved by the university's Human Research Ethics Board and participants received a gift card in exchange for their participation.

The project aimed to capture student perspectives from those who reported any formal or co-curricular sustainability educational experiences. The focus groups also intended to reflect the diversity of sustainability educational opportunities available on campus, with recruitment targeting sustainability-designated classes, related events and relevant student groups and clubs. Participants were screened to ensure they had sustainability educational experiences, thus making it a non-random sample.

Four two-hour focus groups were conducted, with a total of 33 student participants. Participants spanned all five of the university's major academic schools and represented all levels of undergraduate education. Participants self-selected to be part of this study based on existing sustainability knowledge and experience. Third-year students composed the majority of the focus group (42%) followed by second-year (27%), first-year (15%) and fourth-year (12%). The top majors and minors represented were Environmental Studies,

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English, Visual Arts and Creative Writing. Regarding sustainability educational experiences, participants referenced specific classes (39%), involvement in clubs/campus life (39%), academic programs (30%) and personal goals, values, or relationships (18%) when describing their connection to sustainability. Data saturation was considered achieved once participants were recruited from all five academic schools and the sample demonstrated a good balance of academic major and year of study. The focus groups' demographic composition skewed white and female. Detailed demographic information was not collected for this project; information collected in the recruitment process focused on academics and sustainability experience.

The focus group questions were open-ended and followed a guidebook. Participants were asked to provide their personal definition of sustainability and view of its importance and to share how sustainability was incorporated into their educational experiences. Participants then completed a concept-mapping exercise (building on previous sustainability education research) to map perceived connections between sustainability and DEI (Lourdel *et al.*, 2007). Concept maps are ordered by an underlying "focus question" and utilize a hierarchical structure, incorporating shapes like boxes to signify important concepts (Novak, 1995). For guidance, students were provided with instructions and sample concept maps on an unrelated topic. Students were also provided with the university definition of DEI. Drawing on their educational experiences, participants created concept maps in small groups to depict any perceived relationships between the university definition of DEI and sustainability concepts. Each group member then presented and discussed their maps.

To begin the analysis, after the focus groups were complete the authors carefully recreated each concept map, ensuring that all identifying information was removed. Next, these materials were imported into nVivo 12 research software, where two coders independently coded the data using a thematic analysis (TA) approach. The analysis followed the six stages of TA as outlined by Braun and Clarke (2006). The authors first "familiarized" themselves with the data by transcribing the focus group discussions and reviewing the maps in detail (Braun and Clarke, 2006, p. 584). Next, initial codes were generated, working both inductively to capture unexpected student perspectives and deductively, drawing on the TSP framework to guide the analysis. In the following stage, codes were organized into themes that reflected how students understood sustainability and its connections to DEI. The authors further refined these themes through research memos, allowing them to capture the complexity of student perspectives. Coding differences were discussed and resolved through consensus, supported by the analytic memos. After defining final themes, they produced the written analysis along three dimensions – experiential/participatory learning, systems thinking and affective/emotional engagement – to demonstrate how TSP sustainability education can foster DEI outcomes. Unlike the closely-related grounded theory, which works to generate new theory through constant comparison and theoretical sampling, TA offered a flexible way of organizing and interpreting data into themes that helped answer two research questions (Braun and Clarke, 2006; Castleberry and Nolen, 2018).

The coding process is available in the Appendix, though some overlaps between themes have been summarized for visual clarity. Ten total concept maps were also created in the focus groups. The transcribed concept maps that underscore relevant elements of TSP are in the results section below whereas a full summary table of all concept maps is also available in the Appendix.

Results

Transformative learning theory (TLT), developed by Mezirow (1978), suggests that education can alter a learner's worldview by promoting self-reflection and heightening awareness of underlying assumptions. Building upon this, Burns (2015) integrates the

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Indigenous Okanagan concept of the whole self to adapt TLT within the context of sustainability education, termed TSP. She contends that TSP transforms learners through techniques including:

- experiential or participatory learning;
- systems thinking; and
- emotional engagement.

Specific pedagogical strategies which she discusses include group learning, community collaboration, and curriculum that introduces alternative viewpoints. Unlike more conventional teaching approaches, TSP attempts to shape perspectives and values. Burns' (2015) framework offers a model for interpreting the findings from this study.

Experiential and participatory learning: co-constructing knowledge of sustainability and DEI

At the outset of the focus groups, participants introduced themselves and shared their definition of sustainability. Most participants defined sustainability through "environmentalism," resource management or protection of the natural world. Some students concentrated on human elements of sustainability with an emphasis on personal actions and choices. As an illustration of this individualist framework, one participant stated that it is important to "be like individually sustainable. So like, changing acts in your life." Nevertheless, a handful of students described sustainability using systems-thinking, defining sustainability as "making sure that everybody's needs are met," or "having an equal share of resources and just equal opportunity." A few participants cited DEI in their definitions, including one participant who explicitly stated that sustainability promotes diversity and equity. Although most students explained sustainability in terms of environmentalism, these views offer evidence that some recognized DEI principles within their definitions (Gal and Gan, 2020; Kagawa, 2007).

Students who initially provided a broader definition of sustainability were more likely to describe varied educational experiences, such as taking "sustainability-focused" coursework and participating in related clubs and conferences. For example, the student who defined sustainability through a DEI-lens had taken three courses in sustainability, served as a Teaching Assistant in a sustainability course, and participated in two related campus clubs and programs. Consistent with TSP, this indicates that robust educational opportunities and training lead to a more robust definition of sustainability as a concept.

Although students initially defined sustainability through environmentalism or individualism, when the focus groups moved to the participatory exercise, students mapped complex ways that sustainability education enriched their understanding of DEI, drawing on the university definition reported above.

As the Community Map (Figure 1) demonstrates, the focus groups' setting and concept-mapping activities made space for shared meanings, enabling students to expand their definitions by building on one another's insights.

Interestingly, maps underscored the role of the entire university as a place for learning. Regarding formal education experiences, students described seminar classes and hands-on courses as especially powerful. For instance, one student mentioned a specific community-based science project on the biodiversity in a local waterway that made a "such a difference" in their connection to the material. Yet, Figure 1 also suggests that informal learning experiences like events or residence life activities enrich understanding of DEI (Gramatakos and Lavau, 2019). In fact, students identified a range of campus initiatives, including waste management practices, the development of pollinator fields, and the installation of microplastics filters in university laundry facilities as all contributing to their understanding

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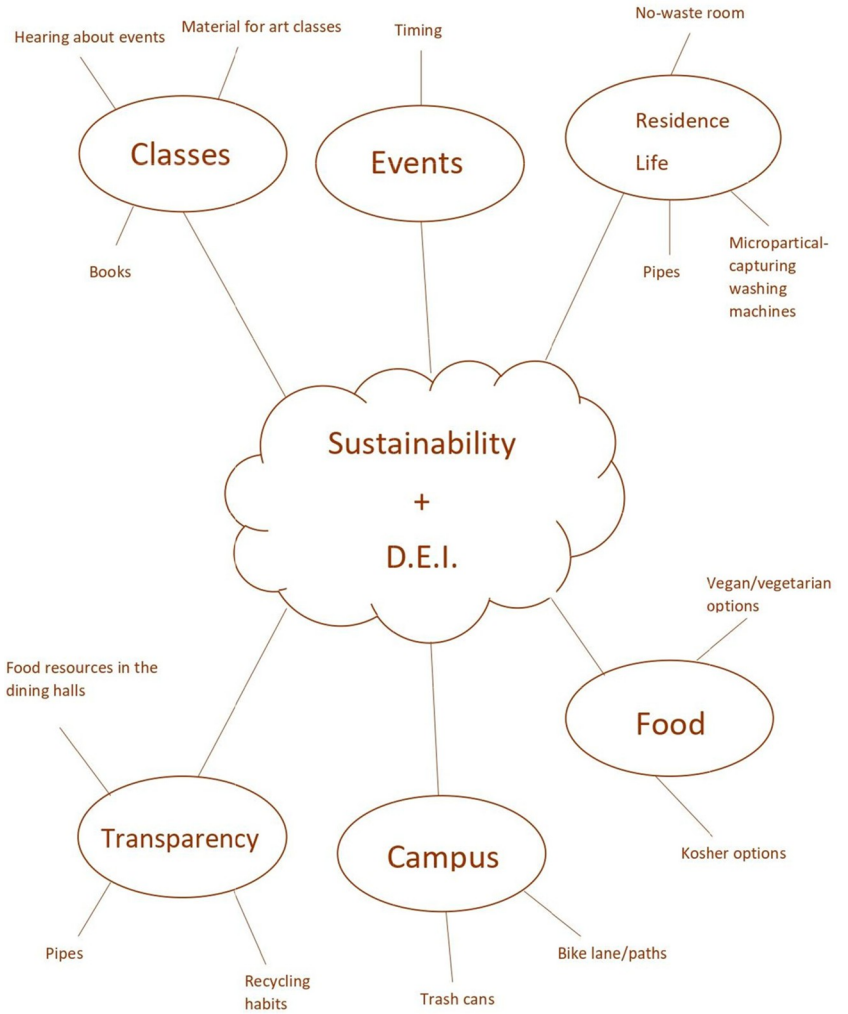


Figure 1. *Community map*: Concept map focusing on local connections between sustainability and diversity, equity, and inclusion
Source: Authors' own work

of sustainability. In addition, students emphasized the significance of activism and community service in shaping their learning. Taken together, these findings suggest that sustainability education grounded in community-based, experiential learning – both within and beyond the classroom – fosters greater awareness of DEI.

Cultivating systems thinking: linking sustainability to diversity and social inequalities
At the center of Burns's TSP is the idea that students must understand sustainability through the lens of "living systems," and thus develop critical perspectives that will enable them to

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see links between environmental and social harms (Burns, 2015, p. 261). Students in this study demonstrated the beginnings of systems thinking by moving beyond narrow, environmentally focused definitions of sustainability to mapping its intersection with diversity and equity. Across both the discussions and the concept mapping activities, participants identified important connections between sustainability and issues such as racial and socioeconomic disparities, unequal access to resources, and the disproportionate effects of climate change on the Global South. These findings suggest that, through the concept-mapping exercise, students expanded their understanding of sustainability beyond individual actions.

Students demonstrated an awareness of global systems, asserting that people need to have "a more global perspective" when discussing sustainability. Drawing on frameworks like environmental justice, students expressed the need to "hold the Global North accountable for climate change." When explaining their map (see Figure 2), one student highlighted how sustainability education intersects with diversity and identity:

> And so, kind of focusing on the whole world besides just the Global North? And then just involving women, people of color and other diverse people in decision-making, whether that be with like government policies or changing around the economy or production of like new goods that are more sustainable, just involving more people in that.

This student connects sustainability to DEI by noting that efforts towards sustainability require a global power correction and that greater diversity is also needed among policymakers. Similarly, the concept map of one focus group heavily focused on people of color (POC and the Global North) in several areas:

Notably, the group linked the need for increased sustainability action by the Global North to diversity as well as equity. This insight typified the overlap found in all focus groups between the dimensions of DEI and sustainability. Some students demonstrated global



Figure 2. *Diversity map*: Concept map of global connections between sustainability and diversity, equity, and inclusion

Source: Authors' own work

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awareness by referencing Indigenous, Eastern and Asian perspectives on sustainability, whereas others concentrated on local, place-based perspectives. Among those who discussed local connections, some suggested that campus composting, recycling and other waste disposal practices intersected with DEI because they offer students of all socioeconomic backgrounds a way to participate in sustainability.

In the concept-mapping exercise, equity emerged as an essential component for supporting systems thinking, serving as a central node uniting diversity and inclusion. Accordingly, students stated that equity and sustainability "have to be held at the same time" and that they "need each other to like exist." This suggests that students conceptually understand DEI and sustainability to be complementary principles (Chattopadhyay, 2019; Fregosi, 2020; LeVasseur, 2021). Accordingly, one student explained why their group focused on equity as the key connection between principles of DEI and sustainability in their concept maps:

> [We were] thinking about all the different intersecting relationships between diversity, equity, and inclusion and sustainability. It got a little hectic because they all do really connect […] well, like I don't know for instance like equitable […]. equitable opportunities ended up being our like most connected one just because it connected to both housing opportunities but also like career opportunities and healthcare opportunities.

As the concept map in Figure 3 demonstrates, the group described by this student focused on "equity" and "equitable opportunities" as the most prevalent link between sustainability and all the principles of DEI.

The student emphasized that sustainability and DEI require advocacy and accessibility to be fulfilled, whereas another defined it as, "equal access to things like knowledge and resources, food, water." Some participants underscored that education itself is an accessibility issue and a link between sustainability and equity.

Students who demonstrated systems-thinking approaches often engaged with critical frameworks, drawing on these perspectives to inform their understanding and analysis of sustainability issues. In some cases, students directly referenced concepts they learned in class, such as the United Nations Sustainable Development Goals (SDGs) (Gaard, 2017; Kruger *et al*., 2020; Puleo, 2024; Shiva and Mies, 2014). One group applied the framework of ecofeminism (concepts introduced in a Women and Gender Studies course) to argue that women are disproportionately affected by climate change due to their roles in providing food and water for their families. Another systems-thinking concept that students said connected equity and sustainability was "environmental justice." Indeed, students in all focus groups emphasized that environmental justice "can be connected to everything." Notably, involvement in sustainability-focused campus clubs also allowed students to learn critical frameworks. At the same time – as Burns (2015) points out – transformative learning also depends on educational approaches that address the whole person.

Affective and emotional engagement: inclusion through care and empathy

Burns (2015) argues that transformative pedagogies should draw on Indigenous wisdom traditions and emphasize the integration of the whole self to engage students intellectually, emotionally and spiritually. In this study, students' reflections on DEI and sustainability aligned with several principles found in Indigenous pedagogies, particularly an emphasis on inclusivity and interdependence. Students described sustainability and DEI as requiring a commitment to care, which they defined as caring for oneself as well as for others. They also identified the importance of education that supports "care for both people and the environment" and noted that developing empathy is a necessary step before advocating for "equal access to things like food, water, and education."

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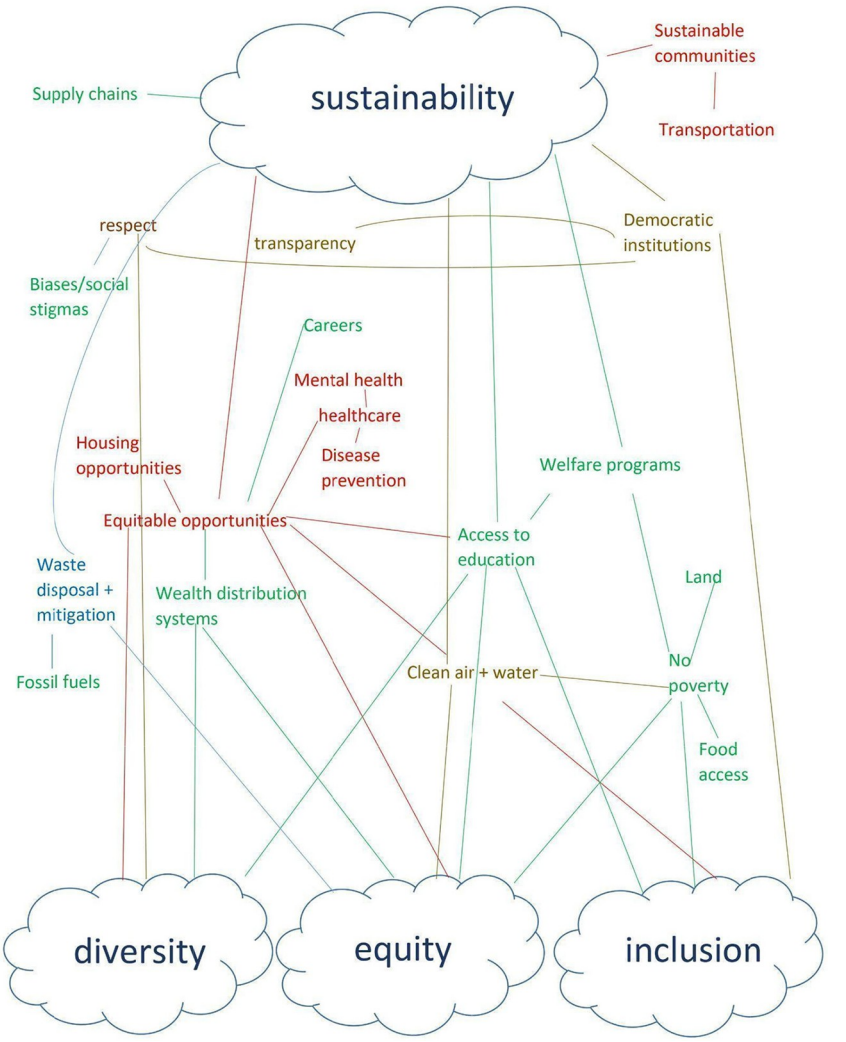


Figure 3. *Equity map*: Concept map demonstrating the interconnectedness of broad issues relating to sustainability and diversity, equity, and inclusion
Source: Authors' own work

Students underlined the role of a range of emotions and capacities in fostering inclusion, citing empathy, mindfulness, awareness of privilege and exposing oneself to different worldviews as important. Addressing affective connections between sustainability and DEI principles, students focused on the shared values and ethics that underpin both sustainability and inclusion, as demonstrated in Figure 4.

When explaining this map, the same student that described Figure 4 outlined how empathy and awareness of personal privilege are necessary to support inclusion and to promote sustainability:

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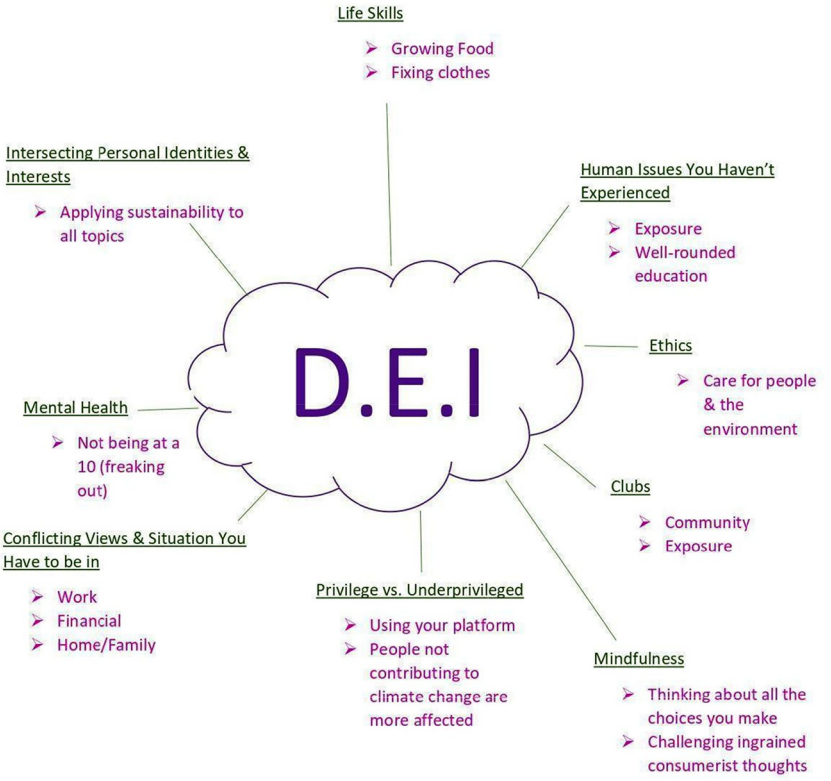


Figure 4. *Inclusion map*: Concept map focusing on ethics and care as they related to issues of sustainability and DEI
Source: Authors' own work

> [So], a big thing is like, human issues that you personally haven't experienced, like, getting close to those, and where you want them, to get grounded. There's ethics. So that's about having like, care for people and the environment. And I can say, like be mindful or mindfulness, like, thinking about the choices you make, and like, how is this going to impact things.

This student pointed out that mindfulness can promote inclusion by helping people make different "choices" as a society. They argued that sustainability requires challenging "ingrained" beliefs such as consumerism and exposing oneself to other worldviews. Another student suggested that personal values "shapes [sic] people's ideas" around both sustainability and DEI. Several students cited a specific interdisciplinary sustainability class that influenced their views on inclusion and ethics.

Participants also emphasized that educational approaches which address emotion foster a sense of inclusion. When addressing the role of affect in their education, students noted that sustainability education should avoid an exclusive focus on negative or distressing topics, as this can be discouraging. Instead, they highlighted the value of courses – such as introductory sustainability classes – that cultivate a sense of agency and hope. In addition, students pointed to the importance of campus clubs, programs and events as spaces where they can

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organize and feel collective joy. At the same time, participants recognized that while a positive curriculum is important, emotions such as climate anxiety may be valuable learning tools, as one student explained:

> I think having major opportunities for students to express grief and fear in the classroom is going to be a major […] that is a huge part of sustainability education. And like, what is our grief and fear trying to teach us?.

To integrate this perspective, it is not necessary for instructors to create a curriculum that avoids difficult realities or challenging facts. Rather, it is essential to provide students with a supportive environment in which they can process emotions more constructively (Ojala, 2016). These insights align closely with Burns' (2015) vision of TSP, which insists that effective sustainability education must engage intellectual and emotional dimensions of learning to support meaningful transformation.

Discussion

This study offers empirical evidence that Burns' (2015) TSP serves as a pedagogical bridge between sustainability education and DEI. Consistent with TSP's framework, student perspectives revealed how its three pillars – participatory learning, systems thinking and affective/emotional engagement – transformed their learning and shifted their perspectives.

Experiential and participatory learning emerged as a chief process in transforming student views. For instance, one student explained how a community biodiversity project made "such a difference" to their connection with the course material. And while students in this study initially defined sustainability in environmental terms, the participatory concept mapping exercise revealed a more nuanced understanding (Alexander *et al.*, 2022; García-González *et al.*, 2020; Kruger *et al.*, 2020; Lourdel *et al.*, 2007; Owens and Legere, 2015). Consistent with Burns (2015), students with exposure to varying types of educational experiences (including informal learning) expressed broader, more sophisticated understandings of sustainability (Gramatakos and Lavau, 2019). Thus while previous TSP research has highlighted the importance of participatory approaches to sustainability education generally, these findings indicate that participation can also play a critical role in building the specific awareness needed to connect sustainability with DEI (Bedford, 2022; Blake *et al.*, 2013; Leite *et al.*, 2022; O'Neil, 2018).

Students who developed systems-thinking skills also demonstrated a greater awareness of diversity and equity, which further supports the argument of Brundiers *et al.* (2021) that systems thinking is essential within sustainability education. For instance, students in this study articulated connections between sustainability and global systems of inequality, such as the need to hold the Global North accountable for climate change, reflecting Burns's (2015) principle of "living systems" (p. 261). As students mapped connections between DEI concepts, they also drew on frameworks like ecofeminism and environmental justice, demonstrating these models are powerful tools for understanding social justice. So, while previous research has shown students may not recognize social justice as connected to sustainability (Kruger *et al.*, 2020), this study proposes TSP as a path forward.

Students identified shared affective values like care and empathy as necessary for both inclusion and sustainability, citing interdisciplinary coursework as especially sensitive to these values (Burns, 2015; Evans, 2015; Nelson, 2008). In rich detail, they described how sustainability education shaped them on an emotional level: one student affirmed that positive sustainability education "gives a lot of hope," whereas another felt that climate grief is "a huge part of sustainability education." By linking emotion with ethical responsibility, students confirmed that transformative pedagogy must engage the "whole self" (Burns,

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2015). These findings also underscore the value of Indigenous approaches, aligning well with Sipos *et al.*'s (2008) "head, hands, heart" framework and prior research on emotion in sustainability education (Evans, 2015; Maison, 2022; Mbah *et al.*, 2022; McGregor, 2020; Nelson, 2008; Ojala, 2016).

Conclusion

This study highlights how sustainability education designed around TSP can advance DEI more effectively than traditional approaches. In doing so, it also positions TSP-informed sustainability education as a mechanism for advancing DEI. DEI initiatives within higher education are undergoing substantial changes in the USA (Lange, and Lee, 2024) including: diminished grant funding for DEI research (Liptak, 2025), legal actions towards universities who have considered DEI in hiring (Rosenzwieg-Smith and Douglas-Gabriel, 2025), and removal of DEI curriculum (Gretzinger *et al.*, 2025; Lieb *et al.*, 2025). Against this backdrop, this study provides hopeful evidence that TSP-led sustainability education can foster understanding of DEI through qualities embedded organically within the learning experience.

This study has several practical implications. First, to bridge sustainability education and DEI, the data suggest that educators design experiential and group learning opportunities (like concept mapping) which foster reflection and group learning (Evans, 2015; Lourdel *et al.*, 2007). Second, institutions must financially support informal learning opportunities, as students with robust sustainability educational experiences were far more likely to view sustainability in a sophisticated way (Gramatakos and Lavau, 2019). Third, using critical theories like environmental justice, ecofeminism, or the UN Global Goals aids systems thinking. Fourth, instructors should place a strong emphasis on emotional learning, centering empathy and mutual respect to stimulate meaningful engagement and personal growth. Finally, interdisciplinary and transdisciplinary learning is uniquely transformative, reinforcing that better incentives for these types of collaborations is beneficial (Burns, 2015; Howlett *et al.*, 2016; Tejedor *et al.*, 2018). By aligning pedagogy with TSP, institutions can better prepare students to not only understand sustainability as a complex social and environmental issue, but also live and lead in ways that reflect care and community.

There are various limitations to this study that offer opportunities for future research. While focus groups can paint a rich portrait of the impact of sustainability education, this research is grounded within the social and cultural context of one university and not representative of all HEIs. This project also engaged a self-selecting group of students who may be more likely to understand DEI and sustainability concepts. Detailed demographic information beyond academic and sustainability experience was not collected; a more diverse subsection of participants and detailed demographic information would be valuable in future research. Since the authors conducted a focus group project, these findings do not provide insight into population effects, thus quantitative research may be pertinent. And while concept maps yielded unique insights, a formal weighting process of terms and links would further clarify the results. Nonetheless, it is clear that sustainability educational initiatives can offer a foundation to deepen students' awareness and understanding of DEI. The authors are optimistic that HEIs can leverage that foundation as education moves toward a sustainable future.

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Appendix

Table A1. *RQ1*: How students define sustainability – focus group discussion

Level 1	Category	Deductive (Concept)
Nature Earth Ecology Environment	Physical environment	Environmentalism
Natural resources "reduce, reuse, recycle"	Resource management	
Personal choices Personal actions	Choices and actions	Individualism
Raise individual consciousness	Capacities	
Equal access to resources Diversity, equity, inclusion issues Global power imbalances	Social, cultural and economic systems	DEI-related

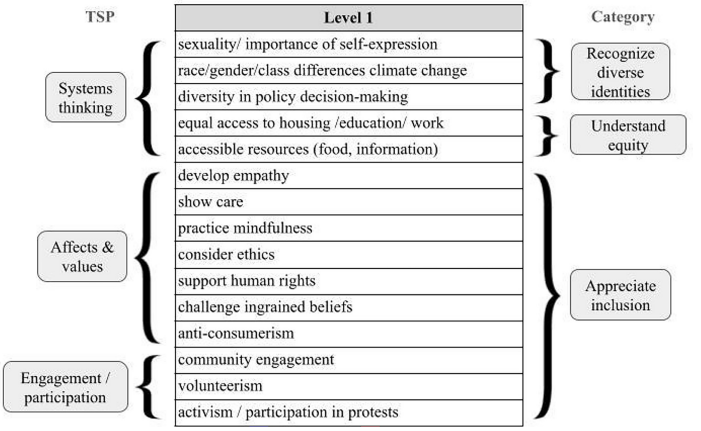


Figure A1. *RQ2*, Part I: Explore relationships between sustainability and DEI – concept mapping + discussion

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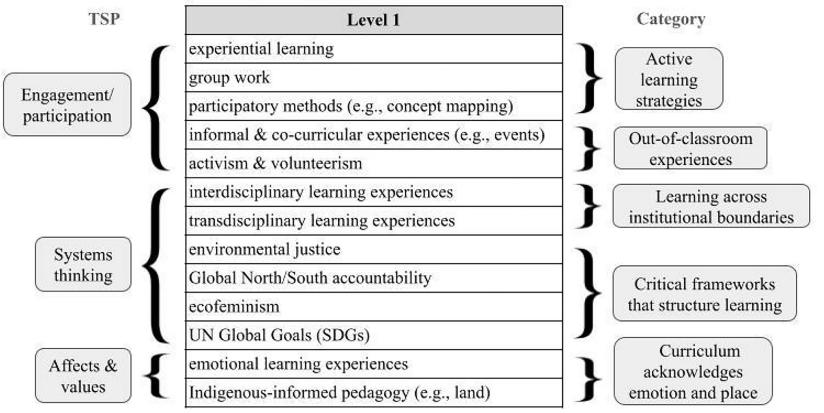


Figure A2. *RQ2*, Part I: Pedagogical approaches and educational opportunities link DEI and sustainability – concept mapping + discussion

Table A2. Additional concept maps

Map	Theme	Description
5	Pedagogy	Focuses on aspects of sustainability learned in coursework and via academic programs, including eco-feminism, environmental justice, archeology field school, United Nations Global Engagement Program and the biology department's greenhouse
6	Work and school	Sustainability and DEI are linked by work and school with various connections highlighting how they contribute to or impact access
7	Justice	Sorts various global and local links between sustainability and DEI by the following key areas: accessibility, activism, community, advocacy, empowerment, transparency, creativity. Justice is mentioned multiple times across areas
8	Engagement	Places DEI and sustainability together in the center of the map and draws connections outward to sections titled: Education opportunities, community, food justice, community/citizen science, ability to address environmental concerns, environmental justice and racism
9	Activism	Emphasizes activism throughout the map with mentions of social media posting, protests, marches, performative activism, exclusionary activism and giving voice to communities
10	Campus	Highlights suggestions for campus features and programs including covered bike racks, better funding for the microfarm and repair workshops

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