The effect of group counseling on hope with diverse undergraduates during sustainability-focused internship

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Many adolescents report feeling overwhelmed, depressed, anxious, and hopeless in the face of global climate change. These feelings are both valid and antithetical to the necessary hope and courage it takes to address real-world environmental crises and contribute to meaningful societal impact. The Green Teams Program, an internship-based experiential learning initiative, prepares young professionals with skills and knowledge needed to address these challenges and provides an intentionally inclusive and safe environment for students from all backgrounds to do so. This structured environment includes psychoeducational group counseling among other supports. Intern self-assessments revealed significant gains in measures of *Hope*, *Agency*, and *Self-Clarity*, likely attributed to the Program's intentional and inclusive pedagogical practices. Results from a pre- and post-program assessment instrument, the Hope Action Inventory, indicated that participation in the Green Teams Program impacted individuals' hope for the future and their ability to implement this hope into tangible steps toward their career development. The findings will inform and enhance existing and future STEM-focused experiential learning programs so that students from all backgrounds are well-supported to address the global challenges that impact their generations most.

KEYWORDS

counseling, undergraduate, internship, sustainability, STEM

Introduction

In 2023, among several unparalleled climate events, were record-breaking sea surface temperatures, accompanied by the hottest Northern Hemisphere extratropical summer in 2000 years (Cheng et al., 2024; Esper et al., 2024; Ripple et al., 2024). The climate crisis is here, and it is weighing heavily on younger generations who will have to live with its adverse and far-reaching effects. Climate anxiety, a recently recognized form of psychological distress, is plaguing many adolescents as climate-related events, the uncertainty of the future, and slow progress have become increasing sources of worry (Dodds, 2021; Boehme et al., 2024). In a sample of 10,000 adolescents, 45% claimed that anxiety about climate change impacts their ability to function in everyday life (Hickman et al., 2021). As climate events become more severe and frequent, the psychological toll is expected to worsen (Cianconi et al., 2020). Many undergraduate students report feeling hopeless about climate change (Hiser and Lynch, 2021), yet it is the younger generations—those most affected by the psychological impacts of an uncertain future—that are tasked with solving it.

Hope and action have a symbiotic relationship. Hope can inspire action, and action can sustain and validate hope. Taking action against climate change can empower individuals and improve mental health (Schwartz et al., 2022). Qualitative studies suggest that collective action can help participants manage fears, enhance hope, and increase feelings of connection with others and to causes outside of themselves (Kleres and Wettergren, 2017; Nairn, 2019). There is a profound urgency to address climate change, but there are several barriers to doing so, especially for students from historically and systemically marginalized groups who continue to face discrimination, exclusion, and inequity in STEM (Berhe et al., 2021; Carter et al., 2019; Flores et al., 2024; McGee and Bentley, 2017; Smith et al., 2014). Note, the term historically excluded group (HEG) refers to any group of individuals that has been "denied access and/or suffered past institutional discrimination in the United States and, according to the Census and other federal measuring tools, includes African Americans, Asian Americans, Hispanics or Chicanos/Latinos, and Native Americans," (Emory University, 2024). These groups are also the most affected by the impacts of climate change. Climate change disproportionately affects populations that are geographically vulnerable as well as those who lack access to resources, education, and protective measures, and often the same individuals who have been historically excluded from such protections (Gregory et al., 2023; Morello-Frosch and Obasogie, 2023). The prevalence of unsafe and non-inclusive STEM learning and career environments makes it challenging for these groups to participate in solutions to the very problems that unjustly affect them most (Martin et al., 2022; Schwarz, 2023).

Inclusive educational practices in STEM fields, which can help foster a sense of belonging and increase participation and retention from underrepresented groups, are critical to engaging students in climate action and motivating them to complete college and make meaningful career choices (Alexiades et al., 2021; Valdez and Kelp, 2023). These settings must actively integrate students from diverse disciplines and backgrounds, ensuring all perspectives are equally valued. Additionally, instilling hope and resilience in undergraduate students is linked to better outcomes in academic and career pursuits, ultimately equipping them to tackle complex global challenges like climate change (Gonzalez et al., 2016; Solberg et al., 2020; Yoon et al., 2015; Niles et al., 2011, 2014). Understanding and addressing climate anxiety, which can be done through engaging in climate work, is crucial for the mental wellbeing of adolescent populations (Corvalan et al., 2022), and conjointly, mental wellness is necessary to contribute to addressing global crises.

Diversity within STEM fields is increasingly seen as a valuable but scarce resource (Tsui, 2007; Fry et al., 2021). The PSEG Institute for Sustainability Studies' Green Teams Program, inaugurated in 2016 (Kay et al., 2018), was created to bring students from all majors and backgrounds with an interest in sustainability together to solve sustainability challenges for municipalities, nonprofit organizations, and corporations. Prior research has shown that undergraduate STEM students significantly benefit from internship experiences and early career exposure (Doerschuk et al., 2016; Lewis et al., 2017; Muhamad et al., 2009; Ortiz et al., 2019). Previous research conducted during the Program indicated that participating in a group and having hands-on experience is especially beneficial for college students who are first-generation,

economically vulnerable, and/or members of HEG groups (Kay et al., 2018). Recognizing the need for inclusivity in STEM and the barriers many of these students confront in undergraduate education, internships, and careers, the Green Teams Program was intentionally designed to meld teamwork, professional development, skill building, well-rounded and inclusive support structures, mental wellness, antiracism work, and climate action into a 10-week, summer internship program hosted on Montclair State University's campus. The Program provides students with wrap-around support structures including free on-campus housing for the duration of the Program, access to food, technology, and professional clothing upon need, livable wages, travel stipends, and newly introduced in 2022, psychoeducational group counseling.

The Hope Action Inventory Survey (HAI) is a validated psychological assessment tool that gauges participants' level of hope, motivation, and action-oriented behavior in career and life (Niles et al., 2020a,b). The tool is derived from Snyder's Hope Theory from 2022, which argues that hope is a combination of goal-directed energy (i.e., agency) and planning to meet goals (i.e., pathways). While originally designed for career contexts, the HAI has been applied to broader psychological research, particularly in the study of wellbeing, resilience, and mental health (Amundson et al., 2018; Bedi et al., 2020; Currie et al., 2023; Lutz et al., 2023). The HAI was used in this study to measure the levels of Hope and other essential traits for success working in sustainability fields among participants in the Program (Grinnell College, 2018; Snyder, 2002; Yoon, 2020; Niles et al., 2020a,b).

Pedagogical framework(s)

The Green Teams Program was established to support historically excluded groups in STEM to diversify the STEM pipeline, support students from first-generation and low-income backgrounds in their career journeys and engage more individuals in efforts to address climate change. Our work is informed by three important and complementary theories: Maslow's Hierarchy of Needs (Maslow, 1943), Critical Race Theory in Education (Ladson-Billings and Tate, 1995) and Hope Action Theory (Niles et al., 2020a,b). Maslow's Hierarchy of Needs argues that human motivation is driven by stages of hierarchical needs (Maslow, 1943). The hierarchy is depicted as a pyramid with five related levels of needs, where each stage of needs must be met before a person can reach the next. At the base are physiological needs, such as food, water, and shelter, which are essential for survival. Above these are safety needs, including personal security, employment, and health. The third level comprises love and belongingness needs such as relationships, friendships, and social connections. The fourth level includes esteem needs, which involve the desire for respect, self-esteem, and external recognition. At the top of the hierarchy is self-actualization (Maslow, 1943). Maslow's Hierarchy of Needs is relevant to the structure of the Green Teams Program because interns' physiological and safety needs are met through employment and housing, and social and esteem needs are met through teamwork, group counseling sessions, and living-learning communities in shared-housing on campus. The internship provides the base levels of Maslow's pyramid so that students can reach the final level, self-actualization, as they continue toward graduation and journey into their careers.

Ladson-Billings and Tate's Critical Race Theory in Education (1995) is born from Critical Race Theory (CRT; Bell, 1995; Delgado and Stefancic, 2001). CRT scholars argue that racism, and specifically various forms of White supremacy, are ordinary, embedded, and intrusive phenomena that impact the lived experiences of people of color (García et al., 2022; McGee and Stovall, 2015). Delgado and Stefancic (2001) articulated that race is a socially constructed concept and that those who benefit from racism are vested in maintaining the racial hierarchy that esteems Whiteness as superior. CRT in education reminds readers that this form of racism and White supremacy influences schooling in America (Ladson-Billings and Tate, 1995; Ladson-Billings, 2021). We assert that systemic racism in education is fundamentally responsible for the historical exclusion of specific students from STEM education and intentionally use the Green Teams Program as a means of confronting and disrupting these racialized norms by providing opportunities for students who have been pushed to the margins.

In the Hope Action Theory, several key concepts play a role in personal and professional development. Hopefulness refers to the level of optimism one holds about their future (Niles et al., 2020a,b). Self-Reflection involves critically examining one's thoughts, beliefs, behaviors, and circumstances. Self-Clarity is the ability to understand one's interests, values, skills, motivations, and goals. Visioning entails brainstorming potential career paths and identifying preferred future outcomes. Goal Setting focuses on defining specific objectives and outlining actionable steps to achieve them. Implementing emphasizes taking actions toward one's goals, while Adapting involves using new insights about oneself and the surrounding environment to refine plans and aspirations (Niles et al., 2020a,b). Maslow's Hierarchy aligns with the Hope Action Theory, another foundation for the design of the Program, by emphasizing that the fulfillment of basic physiological and psychological needs provides a strong footing for individuals to develop the skills necessary for purposeful action and long-term success. CRT in Education (Ladson-Billings and Tate, 1995; Ladson-Billings, 2021) aligns with both Hope Action Theory and Maslow's Hierarchy of Needs in the context of this program because they all acknowledge and attempt to meet the breadth and depth of students' needs, while working to disrupt institutional norms of representation in STEM. The complementary nature of these three theories in the context of this specific work* attempts to do at least three things: (1) address and attend to the interns' basic needs in culturally and developmentally appropriate ways (i.e., Maslow, 1943); (2) acknowledge, affirm, and equip interns to more deeply understand the ways racism and other various forms of oppression function as barriers to opportunity in educational settings (i.e., Ladson-Billings and Tate, 1995); and, (3) provide a specific, strength-based framework to support the interns' career development and exploration.

Learning environment

The Green Teams Program is a 10-week, paid internship that combines professional internships with educational training, focusing on projects that utilize STEM skills with an environmental emphasis, both in laboratory settings and field research. Students are paired with a hosting organization (e.g., a municipality, organization, corporation, or nonprofit) to work on deliverables regarding that organization's sustainability challenges. Unlike traditional models where a single student works with one mentor, the Program fosters teamwork through peer collaboration, facilitated by near peer leaders who are Assistant Project Managers (APMs) and Project Managers (PMs), as well as faculty mentors, subject-matter experts from diverse disciplines, professional counselors, and hosting organization representatives. APMs and PMs, chosen from previous cohorts for their experience and representation of the intern population, provide ongoing support and track team progress. Subject-matter experts and faculty mentors provide valuable training and feedback throughout the projects, and hosting organization representatives meet with their teams weekly to discuss progress on deliverables. Counselors support students' wellness via group counseling by helping them set goals, acclimate to professional settings, reduce and cope with stress, and inspire hope for their futures. To this end, our learning objectives and desired outcomes for the Green Team interns are to: (1) mitigate factors that might contribute to interns'/students' psychological distress associated with performing in spaces where they have been historically and contemporarily excluded (e.g., tokenization, microaggressions, and/or explicit biases based on racism, sexism, heterosexism, etc.); (2) increase students' sense of hope for careers as researchers and/or STEM professionals; and, (3) assist APMs and PMs, company representatives, and faculty research mentors in supporting culturally and linguistically diverse undergraduate students in developmentally appropriate ways.

Participants engage in various STEM activities, bridging the classroom-to-career gap with daily schedules that consist primarily of teamwork. The first 2 weeks of the internship are packed with training on a range of hard and soft professional skills to prepare students for the remaining weeks of the internship, where they work on deliverables from hosting organizations. Interns received hands-on data analysis, visualization, and experimental design training, alongside networking and communication activities such as Myers Briggs assessments and professional counseling. Technical skills were honed through geographic information systems mapping (GIS), report writing, public speaking workshops, and project-based learning focused on green technologies, including robotics, drones, and extended reality. Students also complete a leadership certification during the Program to improve their sense of confidence, communication, team-management, and decision-making skills.

Deliverables from hosting organizations in the past have included data management and analysis, web communications, coding, voice-assisted programming, sustainability reporting, geographic information systems (GIS) mapping, energy efficient and water-saving industrial processes, emissions reduction planning, the feasibility of renewable natural gas, stormwater mitigation, and green infrastructure. Students from different majors, both in STEM and other disciplines, work together in teams of five to complete the projects (The U.S. Department of Homeland Security (DHS), 2024). Over its first 9 years, 420 undergraduates from 102 universities and 163 majors have collectively completed over 350+ projects for 53 different external organizations.

The program ensures equity by offering targeted resources, such as travel stipends, housing, and professional attire, alongside project-specific support like access to experts and training, and a holistic application review in which there is no minimum GPA and lived experiences are valued more significantly than technical skills. This approach allows interns, particularly those underrepresented in STEM, to thrive in their roles while developing valuable skills and connections. Participants complete the summer internship with impactful project deliverables, professional experiences, and enhanced STEM competencies, equipping them for future career opportunities. At the end of the Program, students present their findings and recommendations to a large public audience, including representatives from the companies they worked with as well as other industry and government professionals, academics, and community members, followed by an opportunity to network. Students find the projects meaningful because companies implement the outcomes.

A crucial component of the Green Teams Program's ability to support students from HEGs is the addition of psychoeducational group counseling. Psychoeducational group counseling was designed to create psychologically safe environments for students from HEGs. This form of counseling helps participants engage with topics that are normative to the intern experience, while giving attention to the unique experiences interns might disclose. The group counseling sessions are facilitated by a mental health professional; the sessions are not treatment-oriented like traditional group counseling (Corey et al., 2014). Rather, the sessions provide participants a structured space to make sense of their collective experiences, deepen relationships, clarify their personal and collective goals, and address culturally relevant topics such as racial and gender representation and conflict management while navigating the complexities of the workforce. Documented as an effective way to support students' mental wellness in P-20 educational settings (Hines et al., 2020; Jenkins, 1999; Steen and Bemak, 2008; Steen et al., 2014; Steen, 2011; Steen et al., 2007, 2022), the intervention was introduced as part of the internship to address a noticed increase in anxiety and depression among students post-COVID-19 pandemic.

Results

The results reported for this specific paper include members of the 2023 and 2024 intern cohorts, which totaled 100 students. There were no sampling efforts to gather other individuals, as the research team was only interested in conducting research on Green Teams interns. As such, they were majority female, with 60 interns (61%) identifying as female and 34 (34%) identifying as male, while 5 interns either opted not to answer or chose "Other gender." Out of the 100 students in these two cohorts, and those who identified their race and ethnicity, 32% self-identified as Hispanic or of Latin origin, and 33% of students identified as Black or African American. Respondents were reminded prior to the survey that participation was not required, and respondents reserved the right to negate any answers they wished to keep private. As such, the ns of individual HAI scores may be different depending on which individuals opted out of answering specific questions.

The Hope Action Inventory (HAI), informed by the Hope Action Theory, measures participants' attitudes toward their future,

beliefs about their capabilities, and reflections on past experiences. The *HAI* survey contains 28 statements related to seven dimensions of the Hope Action Theory: Hope, Self-Reflection, Self-Clarity, Visioning, Goal Setting and Planning, Implementing, and Adapting. Participants' responses are documented on a Likert scale (e.g., 1 = Strongly Disagree to 5 = Strongly Agree), self-evaluating their confidence, motivation, and action-oriented behaviors in career and life contexts. Sample items include *"In general I stay hopeful even when I face difficulties in my life"* (Hope) *and "I am open to change that might improve my chance to reach my goals"* (Adapting). Higher scores indicate greater strengths in these areas, with results offering insights into participants' abilities to envision, plan, and pursue their goals effectively. The instrument was administered at the start of the Program and participants were encouraged to reflect on their personal and professional goals, as well as their sense of agency in achieving them. The instrument was administered again post-Program so students could reflect on their experiences and any changes in their sense of hope or self-efficacy. Pre- and post-program data were analyzed using Welch's t-tests, with a significance threshold of $\alpha = 0.05$, and results for each group are presented in Table 1. To calculate effect size, Cohen's d values were also calculated, presented as absolute values in Table 1.

Hispanic vs. non-Hispanic participants

Hispanic interns reported significant increases in Goal Setting, Hope, Implementing, Self-Clarity, and Visioning from the pre-to-post Program experience (see Table 1). The largest increases for Hispanic participants were in Goal Setting (11.54% increase, $p < 0.001$); Hope (11.31% increase, $p < 0.001$, $d = 0.73$), Implementing (9.73% increase, $p < 0.001$, $d = 0.74$); and Self-Clarity (10.19% increase, $p < 0.001$, $d = 0.61$). Pre- to post program scores in visioning also increased significantly (5.90% increase, $p < 0.5$). Non-Hispanic Participants experienced significant gains in Hope (4.43% increase, $p < 0.01$), Implementing (4.67% increase, $p < 0.01$), Self-Clarity (8.57% increase, $p < 0.001$, $d = 0.50$), and Visioning (4.16% increase, $p < 0.05$), but did not experience significant gains in Goal Setting. Hispanic participants reported larger increases in Goal Setting, Hope, and Implementing from pre- to post-program compared to non-Hispanic participants.

Black/African American vs. non-Black participants

Black/African American participants showed greater increases in Hope and Self-Clarity compared to non-Black participants, as detailed in Table 1. The largest differences between Black and non-Black participants were observed in Hope (5.36% increase, $p < 0.01$) and Self-Clarity (8.41% increase, $p < 0.001$, $d = 0.53$). Black/African American participants did not have significant gains in Agency, Adapting, Self-Reflection, Visioning, Goal Setting, or Implementing.

URG race and ethnicity (HEG) vs. non-URG (HEG)

We use terminology referencing the National Science Foundation's guidelines on underrepresented groups in STEM (URM/URG), but we also acknowledge that these groups of

TABLE 1 Pre- and post-program HAI mean scores ± one standard deviation, with percent change by group and category.

Category	Pre	Post	% Change	Cohen's d	Pre	Post	% Change	Cohen's d
	Hispanic means (n = 29)				Non-Hispanic (n = 70)			
Goal Setting	78.45 ± 15.27	87.5 ± 12.05	11.54***	0.12	76.16 ± 15.36	79.38 ± 14.21	4.23	0.22
Hope	81.9 ± 13.71	91.16 ± 11.51	11.31***	0.73	80.54 ± 14.46	84.11 ± 13.49	4.43**	0.26
Implementing	81.9 ± 11.97	89.87 ± 9.51	9.73***	0.74	78.39 ± 11.4	82.05 ± 12.08	4.67**	0.31
Self-clarity	80.39 ± 14.05	88.58 ± 12.73	10.19***	0.61	76.07 ± 13.83	82.59 ± 12.27	8.57***	0.50
Visioning	83.84 ± 13.73	88.79 ± 12.76	5.90*	0.37	79.64 ± 16.3	82.95 ± 13.16	4.16*	0.22
	Black means (n = 33)				Non-Black means (n = 66)			
Hope	84.66 ± 13.08	89.2 ± 11.08	5.36**	0.37	79.07 ± 14.44	84.66 ± 14.09	7.07***	0.39
Self-clarity	78.79 ± 13.25	85.42 ± 11.55	8.41***	0.53	76.61 ± 14.35	83.81 ± 13.2	9.40***	0.52
	UR race/ethnicity means (n = 56)				Non-URE race/ethnicity (n = 43)			
Goal Setting	78.79 ± 15.93	84.26 ± 13	6.94***	0.38	74.27 ± 12.73	78.49 ± 13.1	5.68	0.29
Hope	83.26 ± 13.38	90.29 ± 11.3	8.44***	0.57	77.91 ± 17.95	80.81 ± 15.8	3.72	0.20
Self-clarity	79.91 ± 14.14	86.94 ± 12.23	8.80***	0.53	73.98 ± 10.94	80.96 ± 11.26	9.43***	0.54
Visioning	84.93 ± 14.24	88.62 ± 11.56	4.34*	0.28	75.58 ± 16.09	79.51 ± 14	5.20*	0.26
	Female means (n = 60)				Male means (n = 34)			
Adapting	85.21 ± 12.39	89.17 ± 10.48	4.65**	0.34	89.89 ± 9.36	89.52 ± 9.7	−0.41	0.04
Hope	79.79 ± 12.68	86.25 ± 12.06	8.10***	0.52	85.48 ± 14.25	88.42 ± 13.43	3.44	0.21
Implementing	79.58 ± 11.15	85.63 ± 10.57	7.60***	0.56	79.04 ± 12.39	82.9 ± 13.08	4.88*	0.30
Self-clarity	76.04 ± 14.61	85.1 ± 11.74	11.91***	0.68	80.7 ± 11.95	85.11 ± 12.21	5.46**	0.37
Visioning	81.67 ± 15.39	87.29 ± 11.04	6.88***	0.42	80.15 ± 16.53	81.25 ± 15.62	1.37	0.07
	URM Means (n = 78)				Non URM Means (n = 21)			
Adapting	86.7 ± 12.43	89.9 ± 10.38	3.69***	0.28	86.61 ± 8.68	85.71 ± 9.3	−1.04	0.10
Goal Setting	78.37 ± 15.63	83.17 ± 14.04	6.12***	0.32	71.13 ± 12.73	76.49 ± 13.1	7.54	0.41
Hope	81.89 ± 12.96	87.9 ± 12.06	7.34***	0.48	77.38 ± 17.95	79.76 ± 15.8	3.08	0.14
Implementing	80.69 ± 11.49	85.66 ± 11.09	6.16***	0.44	74.7 ± 11.09	79.46 ± 13.71	6.37*	0.38
Self-clarity	77.08 ± 14.72	85.26 ± 12.9	10.61***	0.59	78.27 ± 10.94	80.95 ± 11.26	3.42	0.24
Visioning	82.21 ± 15.34	86.78 ± 12.29	5.56***	0.33	75.89 ± 16.09	76.79 ± 14	1.19	0.06

Significance is represented by asterisks.
$^*p < 0.05$; $^{**}p < 0.01$; $^{***}p < 0.001$.

students have been historically excluded (National Center for Science and Engineering Statistics (NCSES), 2023). Participants identifying as underrepresented in race and ethnicity showed increases in Goal Setting (6.94% increase, $p < 0.001$), Hope (8.44% increase, $p < 0.001$, $d = 0.57$), Self-Clarity (8.80% increase, $p < 0.001$, $d = 0.53$), and Visioning (4.34% increase, $p < 0.05$) compared to their non-UR Race/Ethnicity counterparts. Non-UR Race/Ethnicity self-reported similar gains in Self-Clarity (9.43% increase, $p < 0.001$, $d = 0.54$) and Visioning (5.20% increase, $p < 0.05$) but less significant for Visioning than their UR Race/Ethnicity peers.

Female vs. male participants

Female interns had the largest improvements of any other category, including increases in Adapting (4.07 % increase, $p < 0.01$), Hope (8.32% increase, $p < 0.001$, $d = 0.52$), Implementing

(8.98% increase, $p < 0.001$, $d = 0.56$), Self-Clarity (13% increase, $p < 0.001$, $d = 0.68$), and Visioning (7.61% increase, $p < 0.001$) compared to their male counterparts. Males experienced a slight gain in Self-Clarity (5.02% increase, $p < 0.05$).

URG (HEG) vs. non-URG (HEG) participants

Results showed that groups historically underrepresented in STEM (female, Black or African American, Hispanic or Latino, Alaskan-Natives, American Indians) had an increase in all categories including Adapting (3.69% increase, $p < 0.001$), Goal Setting (6.12% increase, $p < 0.001$), Hope (7.34% increase, $p < 0.001$), Implementing (6.16% increase, $p < 0.001$), Self-Clarity (10.61% increase, $p < 0.001$, $d = 0.59$), and Visioning (5.56% increase, $p < 0.001$). Students who did not identify as URM did not experience the increases in Adapting, Goal Setting, Hope, and Self-Clarity that their URM counterparts reported; however, they did
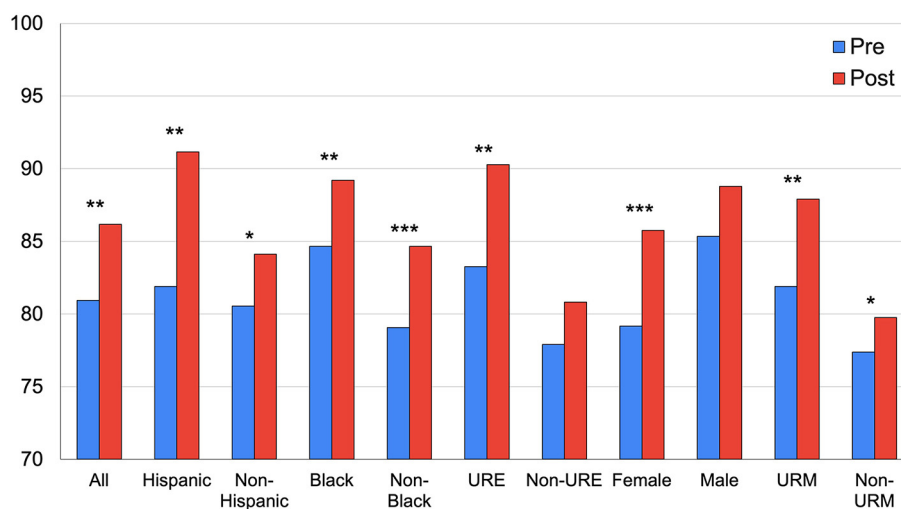
FIGURE 1
HAI pre- and post-comparison of Hope means by group. Significance is represented by asterisks. $^*p < 0.05$; $^{**}p < 0.01$; $^{***}p < 0.001$. URE refers to Underrepresented Race and Ethnicity, and URM refers to Underrepresented Minority Groups who are referred to throughout the paper also as Historically Excluded Groups.

experience an increase in Implementing ($p < 0.05$). The majority of participants in the internship self-identified as URM (44 of 50) and the sample for non-URM students was small.

When all groups were combined, participants showed significant percentage increases in Hope (see Figure 1 below). The overall average increase in Hope was 6.47%, with a pre-mean of 80.93 ± 1.18 and a post-mean of 86.17 ± 1.03. Welch's t-tests confirmed the statistical significance of this improvement ($p < 0.01$). However, the results suggest that individuals from historically underrepresented backgrounds in STEM are likely to experience significant improvements in key areas such as Hope, Adaptability, Goal Setting and Implementation, Self-Clarity, and Self-Visioning following participation in this thoughtfully designed Program. However, Black and African American students did not report the same increases in Goal Setting, Implementing, Visioning, and Adapting as students from other URGs.

Discussion

Upon completing the program, there was a measured increase in Hope among all participants, including among HEGs, which we suspect stems from the intentional Program design, its wide-ranging support structures, and its focus on engaging students with real-world solutions. Programs such as the Green Teams are important not only for climate action and modeling successful inclusivity practices but also, according to the results, for helping students reignite their sense of hope in the world so that they can meaningfully engage with it.

The Green Teams Program was informed by research and practices that improve equity over equality. Equity focuses on providing individuals with the resources and opportunities they need based on their unique circumstances (George Washington University, 2020). Since the Program is designed for and primarily serves students from historically excluded groups, we expect that

the Program's emphasis on equity contributes to the high increases in Adapting, Goal Setting, Hope, Implementing, Self-Clarity, and Visioning for URGs. Since students whose identities have been historically included and supported in STEM (e.g., White students, male students, students from economically stable backgrounds) have likely experienced these supports before, we suspect this explains why the results across the seven dimensions were less significant for them, compared to first-generation, low-income, and/or historically excluded students who may have encountered these services for the first time or less frequently. The Program allowed all participants to finish with similar gains, but the supports offered are what we believe contribute to the equity in the Program.

Females were the only participants compared to other specific group categories to have a significant increase in ability to Adapt, which we hypothesize stems from the unique challenges such as gender bias, underrepresentation, and stereotype threat that females can often encounter in STEM environments not tailored specifically to provide an inclusive, equitable experience (Bowen, 2009; Ertl et al., 2017). These challenges may make adaptability a more crucial skill for women to cultivate to succeed and persist in male-dominated fields. An increase in adaptation for females in a STEM program would signify improved resilience, problem-solving, and goal adjustment in response to challenges stemming from their ability to navigate unique obstacles like gender bias or underrepresentation, ultimately enhancing their success and persistence in the field (Di Bella and Crisp, 2015). In contrast, males, who are generally more represented in STEM, may not encounter the same level of adversity and, therefore, may not experience the same pronounced need for adaptability in their educational and work experiences. This is what we hypothesize also drives the increase in URG for Adapting as a whole.

Students who identified as Hispanic were the only individual comparison group to experience a significant increase in Goal Setting. Hispanic students may have experienced greater increases

in their ability to set goals compared to their non-Hispanic peers due to a combination of cultural, social, and contextual factors. A culturally informed approach to teamwork highlights how students from high-context cultures, such as many Hispanic cultures, benefit from collaborative environments where group dynamics and shared goals play a central role. High-context cultures emphasize collective decision-making and implicit communication, which can enhance group learning and goal setting through mutual understanding and support (Hall and Hall, 1990; Hall, 1976). For many Hispanic students, the desire to overcome barriers and create better opportunities for themselves and their families may serve as a strong motivator (Crisp et al., 2015). Additionally, programs that emphasize empowerment, community support, and mentorship, which the Green Teams Program aims to do, may provide Hispanic students with tools and encouragement to set and pursue their goals effectively.

While Hispanic and female students greatly benefited from the Program across several dimensions, Black students reported increased pre- to post-program scores specifically in the areas of Hope and Self-Clarity. It is possible that the significant increase in Self-Clarity may be attributed to the addition of the psychoeducational group counseling component of the Program, which encourages students to reflect deeply on their culture and how their experiences shape them. The counseling is aimed at helping students gain clearer insights into their values, strengths, and aspirations, and since many of the counselors also identify as Black or African American, this type of representation in the intervention might have been particularly important for these students to gain an increased understanding of self. Black students face unique challenges and experiences, such as navigating cultural identity, societal expectations, and the need to define their personal and professional goals in the context of underrepresentation (Berhe et al., 2021; Carter et al., 2019; Flores et al., 2024; McGee and Bentley, 2017; Smith et al., 2014). The Program provides opportunities for mentorship and community, which can further enhance self-awareness and clarity. Black students did not report similar increases in dimensions including Goal Setting, Hope, or Adaptation, potentially because these dimensions may require more than a 10-week period to significantly shift.

We acknowledge that the HAI is self-assessed, and therefore, the results of the survey relied on self-perceptions and may be influenced by temporary emotions or external factors at the time of completion, affecting the reliability, and validity of the results. Given that our students come from different backgrounds, we have not determined representativeness of our data for each subpopulation. The length of the Program can also be considered a limitation to these results; however, the responses are indicative of substantial short-term improvements and further prove the efficacy of the Program.

Future research with larger sample sizes may further validate these findings. Additional research is needed to identify which components of the Program specifically contribute to the positive outcomes and where the Program can improve to better support students from groups that reported less growth. We also plan to embed psychoeducational group counseling with STEM research students participating in one-on-one summer research experiences with faculty mentors to evaluate how the approach translates to different experiential learning environments. Longitudinal studies across more than one site with different demographic profiles would help assess the Program's generalizability and long-term impact. Future research can also examine the role of economic status as a factor in outcomes and explore how specific counseling interventions, such as culturally relevant dialectical behavioral therapy, affect student outcomes. Finally, assessing participants' emotional and contextual states before taking the self-assessments can provide insights into how external factors influence participants' answers.

The increasing frequency of climate disasters highlights an urgent crisis that will continue to intensify unless substantial change occurs. Our actions today are crucial to preserving climate stability (Cheng et al., 2024). As the world continues to face this urgency, programs like the Green Teams play a vital role in preparing the next generation of leaders to approach these challenges with both the confidence and the competence needed to make the difference the world so desperately needs. The Green Teams Program offers a valuable model for integrating hope and action-oriented learning into sustainability education and internships. By providing students with opportunities to engage in real-world environmental projects while providing them with financial and psychological support structures, the program helps participants build not only the technical skills needed for sustainability work but also the psychological resources, such as Hope, Self-Clarity, and Visioning, that are essential for long-term success. The findings from this research suggest that fostering a sense of Hope is critical in empowering individuals to take meaningful action in addressing environmental challenges and that Hope is best fostered in environments that intentionally uplift participants and meet their needs. Implications from this research point to the effectiveness of the programmatic design and can inspire changes in existing and future STEM-focused experiential learning programs so that students from all backgrounds are well-supported.

Data availability statement

The raw data supporting the conclusions of this article will be made available by the authors, without undue reservation.

Ethics statement

The studies involving humans were approved by Montclair State University Internal Review Board. The studies were conducted in accordance with the local legislation and institutional requirements. The participants provided their written informed consent to participate in this study. Written informed consent was obtained from the individual(s) for the publication of any potentially identifiable images or data included in this article.

Author contributions

HS: Conceptualization, Validation, Writing – original draft, Writing – review & editing. MH: Conceptualization, Funding acquisition, Investigation, Project administration, Resources, Supervision, Validation, Writing – original draft, Writing – review & editing. MM: Conceptualization, Data curation, Formal analysis, Investigation, Methodology, Project administration, Software, Validation, Visualization, Writing – original draft, Writing – review & editing. NG: Conceptualization, Data curation, Funding acquisition, Investigation, Methodology, Project administration, Resources, Supervision, Validation, Visualization, Writing – original draft, Writing – review & editing. LB: Conceptualization, Funding acquisition, Project administration, Resources, Supervision, Writing – original draft, Writing – review & editing. AT: Conceptualization, Data curation, Funding acquisition, Investigation, Methodology, Project administration, Resources, Supervision, Validation, Visualization, Writing – original draft, Writing – review & editing.

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The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

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References

Alexiades, A. V., Haeffner, M. A., Reano, D., Janis, M., Black, J., Sonoda, K., et al. (2021). Traditional ecological knowledge and inclusive pedagogy increase the retention and success outcomes of STEM students. *Bull. Ecol. Soc. Am.* 102:e01924. doi: 10.1002/bes2.1924

Amundson, N., Goddard, T., Yoon, H. J., and Niles, S. (2018). Hope-centred interventions with unemployed clients. *Canad. J. Career Dev.* 17, 87–98. doi: 10.53379/cjcd.2018.81

Bedi, R., Niles, S., Amundson, N., and Domene, J. (2020). *The role of hope in promoting the career development of individuals with a history of substance use disorder after treatment.* (University of British Columbia, Vancouver, BC, Canada). Funded by SSHRC.

Berhe, A. A., Barnes, R. T., Hastings, M. G., Mattheis, A., Schneider, B., Williams, B. M., et al. (2021). Scientists from historically excluded groups face a hostile obstacle course. *Nat. Geosci.* 15, 2–4. doi: 10.1038/s41561-021-00868-0

Boehme, B. A. E., Kinsman, L. M., Norrie, H. J., Tessier, E. D., Fleming, S. W., and Asmundson, G. J. G. (2024). Climate anxiety: current evidence and future directions. *Curr. Psychiatry Rep.* 26, 670–677. doi: 10.1007/s11920-024-01538-9

Bowen, D. (2009). Visibly invisible: stigma and the burden of race, class and gender for female students of color striving for an academic career in the sciences. *SSRN Electron. J.* doi: 10.2139/ssrn.1508602

Carter, D. F., Razo Dueñas, J. E., and Mendoza, R. (2019). Critical examination of the role of STEM in propagating and maintaining race and gender disparities. *High. Educ. Handb. Theory Res.* 34, 39–97. doi: 10.1007/978-3-030-03457-3_2

Cheng, L., Abraham, J., Trenberth, K. E., Boyer, T., Mann, M., Zhu, J., et al. (2024). New record ocean temperatures and related climate indicators in 2023. *Adv. Atmos. Sci.* 41, 1068–1082. doi: 10.1007/s00376-024-3378-5

Cianconi, P., Betrò, S., and Janiri, L. (2020). The impact of climate change on mental health: a systematic descriptive review. *Front. Psychiatry* 11, 1–15. doi: 10.3389/fpsyt.2020.00074

Corey, G., Corey, M. S., Callanan, P., and Russell, J. M. (2014). *Group Techniques*. Boston, MA: Cengage Learning.

Corvalan, C., Gray, B., Villalobos Prats, E., Sena, A., Hanna, F., and Campbell-Lendrum, D. (2022). Mental health and the global climate crisis. *Epidemiol. Psychiatr. Sci.* 31:e86. doi: 10.1017/S2045796022000361

Crisp, G., Taggart, A., and Nora, A. (2015). Undergraduate Latina/o students: a systematic review of research identifying factors contributing to academic success outcomes. *Rev. Educ. Res.* 85, 249–274. doi: 10.3102/0034654314551064

Currie, L. N., Bedi, R. P., and Hubley, A. M. (2023). Psychometric evaluation of the hope-action inventory in individuals with substance use issues. *Meas. Eval. Couns. Dev.* 57, 30–46. doi: 10.1080/07481756.2023.2185157

Di Bella, L., and Crisp, R. J. (2015). Women's adaptation to STEM domains promotes resilience and a lesser reliance on heuristic thinking. *Group Process. Intergr. Relat.* 19, 184–201. doi: 10.1177/1368430215596074

Dodds, J. (2021). The psychology of climate anxiety. *BJPsych Bull.* 45, 222–226. doi: 10.1192/bjb.2021.18

Doerschuk, P., Bahrim, C., Daniel, J., Kruger, J., Mann, J., and Martin, C. (2016). Closing the gaps and filling the STEM pipeline: a multidisciplinary approach. *J. Sci. Educ. Technol.* 254, 682–695. doi: 10.1007/s10956-016-9622-8

Emory University (2024). *Common Terms | Emory University*. Atlanta GA, United States. Available online at: Equityandcompliance.emory.edu, equityandcompliance.emory.edu/resources/self-guided-learning/common-terms.html (Accessed December 2024).

Ertl, B., Luttenberger, S., and Paechter, M. (2017). The impact of gender stereotypes on the self-concept of female students in STEM subjects with an under-representation of females. *Front. Psychol.* 8:703. doi: 10.3389/fpsyg.2017.00703

Esper, J., Torbenson, M., and Büntgen, U. (2024). 2023 summer warmth unparalleled over the past 2,000 years. *Nature* 631, 94–97. doi: 10.1038/s41586-024-07512-y

Flores, G. M., Bañuelos, M., and Harris, P. R. (2024). "What are you doing here?": examining minoritized undergraduate student experiences in STEM at a minority serving institution. *J. STEM Educ. Res.* 7, 181–204. doi: 10.1007/s41979-023-00103-y

Fry, R., Kennedy, B., Funk, C. (2021). *STEM Jobs See Uneven Progress in Increasing Gender, Racial and Ethnic Diversity.* Washington, DC: Pew Research Center.

George Washington University (2020). *Milken Institute School of Public Health. "What's the Difference between Equity and Equality?"* Washington, DC: Milken Institute School of Public Health

Gonzalez, J. M., Trujillo, D., and Espinoza, L. (2016). The role of hope and resilience in academic and career success of underrepresented students. *J. Coll. Stud. Dev.* 57, 467–482.

Grinnell College (2018). *Hope Action Inventory Survey (HAI): A Tool for Measuring Hope in Career and Life Contexts.* Grinnell, IA: Grinnell College Press.

Hall, E, T., and Hall, M. R. (1990). *Understanding Cultural Differences: Germans, French and Americans.* Yarmouth, England: Intercultural Press.

Hall, E. T. (1976). *Beyond Culture.* New York: Doubleday.

Hickman, C., Marks, E., Pihkala, P., Clayton, S., Lewandowski, R. E., Mayall, E. E., et al. (2021). Climate anxiety in children and young people and their beliefs about government responses to climate change: a global survey. *Lancet Planet Health* 5, e863–e873. doi: 10.1016/S2542-5196(21)00278-3

Hines, E. M., Hines, M. R., Moore, J. L., Steen, S., Singleton, P., Cintron, D., et al. (2020). Preparing African American males for college: a group counseling approach. *J. Spec. Group Work* 45, 129–145. doi: 10.1080/01933922.2020.1740846

Hiser, K., and Lynch, M. K. (2021). Worry and hope: what college students know, think, feel, and do about climate change. *J. Commun. Engag. Scholarsh.* 13. doi: 10.54656/IOWF3526

Jenkins, Y. M. (Ed.). (1999). *Diversity in College Settings: Directives for Helping Professionals,* 1st Edn. Routledge.

Kay, M. J., Kay, S. A., and Tuininga, A. R. (2018). Green teams: a collaborative training model. *J. Clean. Prod.* 176, 909–919. doi: 10.1016/j.jclepro.2017.12.032

Kleres, J., and Wettergren, Å. (2017). Fear, hope, anger, and guilt in climate activism. *Soc. Mov. Stud.* 16, 507–519. doi: 10.1080/14742837.2017.1344546

Ladson-Billings, G., and Tate, W. F. (1995). Toward a critical race theory of education. *Teach. Coll. Rec.* 97, 47–68. doi: 10.1177/016146819509700104

Lewis, K. L., Stout, J. G., Finkelstein, N. D., Pollock, S. J., Miyake, A., Cohen, G. L., et al. (2017). Fitting in to move forward: belonging, gender, and persistence in the physical sciences, technology, engineering, and mathematics (pSTEM). *Psychol. Women Q.* 41, 420–436. doi: 10.1177/0361684317720186

Lutz, K., Amundson, N., and Nishikawara, R. (2023). Addressing compassion fatigue using career engagement and the hope-centered model for career development. *Canad. J. Career Dev.* 22, 41–50. doi: 10.53379/cjcd.2023.351

Martin, M. J., Diem, S. J., Karwat, D. M. A., Krieger, E. M., Rittschof, C. C., Bayon, B., et al. (2022). The climate is changing. Engineering education needs to change as well. *J. Eng. Educ.* 111, 740–746. doi: 10.1002/jee.20485

Maslow, A. H. (1943). A theory of human motivation. *Psychol. Rev.* 50, 370–396. doi: 10.1037/h0054346

McGee, E. O., and Bentley, L. (2017). The troubled success of black women in STEM. *Cogn. Instr.* 35, 265–289. doi: 10.1080/07370008.2017.1355211

Morello-Frosch, R., and Obasogie, O. K. (2023). The climate gap and the color line — Racial health inequities and climate change. *New Engl. J. Med.* 388, 943–949. doi: 10.1056/NEJMsb2213250

Muhamad, R., Yahya, Y., Shahimi, S., and Mahzan, N. (2009). Undergraduate internship attachment in accounting: the interns perspective. *Int. Educ. Stud.* 2, 49–55. doi: 10.5539/ies.v2n4p49

Nairn, K. (2019). Learning from young people engaged in climate activism: the potential of collectivizing despair and Hope. *Young* 27, 435–450. doi: 10.1177/1103308818817603

National Center for Science and Engineering Statistics (NCSES) (2023). "Diversity and STEM: women, minorities, and persons with disabilities 2023," in *Special report NSF 23-315* (Alexandria, VA: National Science Foundation).

Niles, S. G., Amundson, N. E., and Neault, R. (2011). *Career Flow: A Hope-Centered Approach to Career Development.* Boston, MA: Pearson.

Niles, S. G., Amundson, N. E., Neault, R., and Yoon, H. J. (2020a). *Career Flow and Development: Hope in Action,* 2nd Edn. San Diego, CA: Cognella.

Niles, S. G., Amundson, N. E., Neault, R., and Yoon, H. J. (2020b). *Career Recovery: Creating Hopeful Careers in Difficult Times.* San Diego, CA: Cognella.

Niles, S. G., In, H., and Amundson, N. (2014). Using an action-oriented, hope-centered model of career development. *J. Asia Pac. Couns.* 4, 1–13. doi: 10.18401/2014.4.1.1

Ortiz, N. A., Morton, T. R., Miles, M. L., and Roby, R. S. (2019). What About Us? Exploring the challenges and sources of support influencing black students' STEM identity development in postsecondary education. *J. Negro Educ.* 88, 311–326. doi: 10.7709/jnegroeducation.88.3.0311

Ripple, W. J., Wolf, C., Gregg, J. W., Rockström, J., Mann, M. E., Oreskes, N., et al. (2024). The 2024 state of the climate report: perilous times on planet earth. *BioScience* 74, 812–824. doi: 10.1093/biosci/biae087

Schwartz, S. E. O., Benoit, L., Clayton, S., Parnes, M. F., Swenson, L., and Lowe, S. R. (2022). Climate change anxiety and mental health: environmental activism as a buffer. *Curr. Psychol.* 28, 1–14. doi: 10.1007/978-3-031-12350-4_18

Schwarz, J. (2023). "Climate change, human displacement, and STEM Education: toward a more transdisciplinary and inclusive culture of science," in *Migration, Displacement, and Higher Education: Now What?*, eds. B. Murray, M. Brill-Carlat, and M. Höhn (Cham: Springer International Publishing), 219–231.

Smith, B. A., Mills, L., Amundson, N. E., Niles, S. G., Yoon, H. J., and In, H. (2014). What helps and hinders the hopefulness of post-secondary students who have experienced significant barriers? *Canad. J. Career Dev.* 13, 59–74.

Snyder, C. R. (2002). Hope theory: rainbows in the mind. *Psychol. Inq.* 13, 249–275. doi: 10.1207/S15327965PLI1304_01

Solberg, V. S., O'Brien, M., Villareal, P., and Egger, M. (2020). Hope, resilience, and the pursuit of academic and career goals: implications for undergraduates. *J. Couns. Psychol.* 67, 594–605.

Steen, S. (2011). Academic and personal development through group work: an exploratory study. *J. Spec. Group Work* 36, 129–143. doi: 10.1080/01933922.2011.562747

Steen, S., Bauman, S., and Smith, J. (2007). Professional school counselors and the practice of group work. *Prof. Sch. Couns.* 11:2156759X0701100201. doi: 10.1177/2156759X0701100

Steen, S., and Bemak, F. (2008). Group work with high school students at risk of school failure: a pilot study. *J. Spec. Group Work* 33, 335–350. doi: 10.1080/01933920802404144

Steen, S., Henfield, M. S., and Booker, B. (2014). The achieving success everyday group counseling model: implications for professional school counselors. *J. Spec. Group Work* 39, 29–46. doi: 10.1080/01933922.2013.861886

Steen, S., Melfie, J., Carro, A., and Shi, Q. (2022). A systematic literature review exploring achievement outcomes and therapeutic factors for group counseling interventions in schools. *Prof. Sch. Couns.* 26:2156759X221086739. doi: 10.1177/2156759X221086739

The U.S. Department of Homeland Security (DHS) (2024). DHS STEM designated degree program list. Available online at: https://www.ice.gov/doclib/sevis/pdf/stemList2024.pdf (Accessed December 2024).

Tsui, L. (2007). Effective strategies to increase diversity in STEM Fields: a review of the research literature. *J. Negro Educ.* 76, 555–581.

Valdez, C. J., and Kelp, N. C. (2023). Student perceptions of inclusive pedagogy in undergraduate STEM classrooms. *J. Microbiol. Biol. Educ.* 24, e00097–e00023. doi: 10.1128/jmbe.00097-23

Yoon, H. J. (2020). Hope-action theory for organizations. *Organ. Dev. Rev.* 52, 28–34.

Yoon, H. J., In, H., Niles, S. G., Amundson, N. E., Smith, B. A., and Mills, L. (2015). The effects of hope on student engagement, academic performance, and vocational identity. *Canad. J. Career Dev.* 14, 34–45. doi: 10.53379/cjcd.2015.176

Bell, D. A. (1995). Who's afraid of critical race theory. *Univ. Illinois Law Rev.* 1995, 893–910.

Delgado, R., and Stefancic, J. (2001). *Critical Race Theory: An Introduction.* NYU Press. Available online at: http://www.jstor.org/stable/j.ctt9qg26k

García, S. J., Reese, E., and Romero, M. (2022). "Critical race theory: historical roots, contemporary use, and its contributions to understanding latinx immigrant families," in *Sourcebook of Family Theories and Methodologies*, eds. K. Adamsons, A. L. Few-Demo, C. Proulx, and K. Roy (Cham: Springer). doi: 10.1007/978-3-030-9200 2-9_29

Gregory, D., Yang, K., Shteynberg, E., Menachery, H., Perrini, I., and Yee, J. (2023). *Unequal Burden: Exploring the Disproportionate Impacts of Climate Change on Marginalized Communities*. Available online at: https:// ssrn.com/abstract=4416046

Ladson-Billings, G. (2021). *Critical Race Theory in Education: A Scholar's Journey*. Teachers College Press.

McGee, E. O., and Stovall, D. (2015). Reimagining critical race theory in education: mental health, healing, and the pathway to liberatory praxis. *Educ. Theor.* 65, 491–511. doi: 10.1111/edth.12129