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Environmentally Engaged: Differences in Sustainability Beliefs, Nature Reflections, Emotions, and Nature–Self Representations

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Abstract

Interactions with people who are highly engaged in sustainability (e.g., zookeepers, environmental educators) can have a significant impact on motivating less-engaged individuals to adopt more pro-environmental beliefs and to act on them. The current work examined two groups, graduate students mainly in conservation careers (n = 35) and an undergraduate comparison group (n = 237), to observe how they differed on sustainability beliefs (e.g., reports of willingness to sacrifice for the environment, anthropogenic global warming beliefs), reports of emotional experiences, reflections on nature, and nature–self–humanity cognitive representations. In comparison to undergraduate students, a frequently studied population in sustainability research, the graduate students reported greater willingness to sacrifice for the environment, stronger belief in anthropogenic global warming, and weaker self-interested emotions. When spontaneously reflecting on nature, the graduate students expressed greater connection with nature and stronger negative feelings about how humanity treats the environment. Finally, the graduate students showed more sustainable nature–self representations (e.g., greater inclusion of nature in self, viewing nature as larger than the self). We discuss the implications of these findings for understanding groups that may vary in environmental engagement, for developing measures to assess qualitative and quantitative assessments of nature–self–humanity knowledge, and for providing observations that may spur future work on encouraging people to care more strongly about nature and for supporting people engaged in sustainability fields.

Keywords: sustainability commitment; nature connection; nature reflections; emotions; self-transcendent emotions; self-interested emotions; guilt; nature–self representations

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1. Introduction

The need for greater sustainability has never been more important, and although many people espouse green attitudes and beliefs [1], developing stronger conservation commitment is paramount for addressing critical environmental challenges facing all species on the planet [2]. The gap between people's conservation beliefs and taking pro-environmental actions is considerable [3,4], and thus, it is important to improve our understanding of what translates people's knowledge into concrete conservation outcomes.

Although people can adopt more sustainable beliefs by studying environmental issues through reading books, watching documentaries, attending public lectures, and following news reports, much of what moves people toward greater sustainability action comes from critical social connections and interactions. For example, exposure to environmental educators significantly enhances people's conservation values and knowledge, especially

when those educators focus on local sustainability issues in collaboration with scientists, resource managers, or community organizations [5]. Similarly, interactions with team members at zoos and aquariums can increase visitors' biodiversity knowledge, which encourages them to perform more pro-environmental behaviors [6,7]. Science educators share a wealth of knowledge, and they structure learning opportunities in classroom settings that enhance the personal relevance of environmental issues facing our societies and planet [8].

Furthermore, exposure to individuals involved in community-based conservation and sustainability efforts can promote more pro-environmental beliefs and actions. Active participation in community conservation efforts [9], environmental monitoring (i.e., citizen science) initiatives [10,11], and community-supported agriculture programs [12] inspire positive civic actions from those involved in these efforts. Even interactions with people in the hospitality sector can promote pro-environmental behaviors [13], and employee workplace green behaviors encourage personal environmental actions by guests after they return home [14]. Although people can develop stronger sustainability beliefs through rewards [15] or from their family members [16], it is clear that interactions with educators, professionals at informal science education institutions (e.g., zoos, aquariums, nature centers), conservation experts, and environmentally minded private sector employees improve people's sustainability beliefs and personal commitment to act on them.

Indeed, interactions with these highly engaged people (e.g., educators, zookeepers) play a significant role in motivating others (e.g., students, zoo visitors) to adopt more pro-environmental beliefs and behaviors. Yet, what makes these individuals psychologically distinct from the less environmentally engaged people whom they can inspire? Although some past work has studied groups such as park volunteers [17] or community members engaged in citizen science [10,11], these studies have mostly examined differences in pro-environmental attitudes or in science knowledge. Having a better understanding of the potential psychological differences between highly engaged and less-engaged individuals, especially with respect to emotions and nature–self representations that help motivate sustainable behaviors, would be valuable. For example, emotions serve important signaling functions in directing people's actions, especially behaviors expressing concern for others and for nature [18–20]. Similarly, how people view nature and its integration into their self-concepts helps shape pro-environmental engagement [21–23] and inspires their place attachments [24,25]. The current work seeks to understand differences between two groups of students who might represent individuals who vary in their level of environmental engagement, observing differences in their reports of sustainability beliefs, everyday emotional experiences, views of nature, and nature–self–humanity representations.

Documenting these differences could be valuable for several reasons. First, to the extent that differences are observed in specific emotions and nature connectedness that promote sustainability, they could speak to qualities that differentiate those who might ultimately serve in these influential roles (e.g., conservation educators, zookeepers). Second, documenting these differences might identify paths by which people "can grow more green" through social interactions with people serving in these engaged roles in ways that promote future pro-environmental actions. Third, identifying differences between people who pursue graduate training in conservation (relative to a comparison group) might provide insights for future scholars to better understand what motivates people to pursue careers in sustainability. Finally, understanding the qualities that differentiate people who seek graduate conservation degrees and have careers in sustainability fields might provide insights for conservation organizations to conduct future work and explore policies to better support the long-term morale of people in these roles.

2. The Current Work

To explore these issues, we collected data from graduate students in primarily sustainability-related careers (e.g., people developing environmental educational programming, working in zoos and aquariums, participating in community-based conservation organizations) and compared them to undergraduate students, a population frequently studied in sustainability research [26]. Specifically, we examined two groups enrolled at the same academic institution, Miami University. To obtain our graduate students, we selected Miami University's Earth Expeditions (EE) program for our sample because these students participate in conservation through hands-on global field experiences, direct interactions guided by local community experts, and instruction focused on global and local applications of knowledge [27].

The EE program typically enrolls graduate students in three years of coursework engaged in participatory conservation efforts throughout the world. What is particularly useful about studying EE students is that most of them are students already employed in jobs involving sustainability-related careers. Students' self-reported job titles from 2022 to 2025 include teaching and education (38%), zookeeping and animal care (24%), conservation and field science (16%), and hospitality (11%). When examining their workplace contexts, EE students hold positions in zoos, aquariums, sanctuaries, and museums (43%), K-12 education settings (38%), business and technology firms (9%), or in nongovernmental or public sector organizations (7%). In other words, these individuals participate in a graduate program while holding careers that uniquely position them to potentially have a meaningful impact on the general public in their jobs [5,7]. Although we acknowledge that studying college students at one institution has limitations for generalizing across cultures and contexts [26,28,29], focusing on two groups enrolled at the same university can help reduce some third variables that might contribute to differences observed in samples coming from different settings.

Having identified useful subsamples to compare, we assessed both groups on measures relevant to sustainability. First, we assessed people's reports of willingness to sacrifice for the environment [30], presuming EE graduate students would be more willing to make these sacrifices. We also explored people's beliefs about anthropogenic global warming, that is, acknowledging that human activities are primarily responsible for climate change [2,19]. In addition to examining agreement with anthropogenic global warming, we assessed a variable correlated with climate skepticism, political ideology [31,32]. Past work found that climate change skepticism (e.g., endorsing statements such as "I do not believe climate change is a real problem" and "Climate change is just a natural fluctuation in earth's temperatures") among UK citizens was reliably predicted by respondents holding a conservative political affiliation, and this relation was as strong of a predictor of climate change skepticism as their reporting less sustainable environmental beliefs [32]. Thus, we assessed people's endorsement of anthropogenic global warming and their political ideology, with the latter being a correlate of climate change beliefs. We expected that EE graduate students, compared to undergraduates, would show greater endorsement of anthropogenic global warming and less endorsement of conservatism.

We also examined different types of emotional experiences: self-transcendent emotions (STEs) and self-interested emotions (SIEs). STEs shift people's attention toward others (e.g., gratitude, awe, love), whereas SIEs focus people's attention on oneself (e.g., pride, amusement, happiness). Research has shown that people who experience stronger STEs perform more prosocial behaviors [20,33–35] and show greater commitment to protecting the environment in particular [36–38]. Because most environmental challenges represent social dilemmas that pit one's selfish interests against the needs of others [39,40], we

anticipated that EE graduate students might show relatively stronger STEs and relatively weaker SIEs than comparison undergraduates.

To be clear, we are not implying that people who feel emotions like "pride" or "happiness" are predisposed to harm the environment or are undesirable people. However, people who systematically focus more on self-centered motivations are relatively more likely to experience SIEs because emotional appraisals reflect a focus on individual goal pursuits [41,42]. Conversely, people who characteristically adopt other-oriented motivations are relatively more likely to experience STEs because they are more concerned about others' needs. Past work [36] found that when simultaneously regressing people's reports of STEs and SIEs on pro-environmental measures, STEs uniquely predicted stronger endorsements of biospheric and altruistic environmental concern [23], more inclusion of nature in self-concepts and viewing nature as relatively larger than the self [43], and valuing more self-transcendent universal values such as benevolence and universalism [44]. These outcomes (e.g., concern about the environment because of its implications for nature and others, seeing nature as larger than the self) predicted more pro-environmental beliefs and behaviors [36]. On the other hand, these authors found that SIEs uniquely predicted less biospheric environmental concern and more egoistic environmental concern [23], less inclusion of nature in self and viewing the self as relatively larger than nature [43], and valuing self-interested universal values such as power and achievement [44]. These outcomes (e.g., concern about the environment more because of its implications for one's lifestyle than for nature, seeing the self as large) reflect a general emphasis on self-centeredness instead of others. Thus, past theoretical frameworks and findings [20,33,35,36] establish distinct roles for STEs and for SIEs in predicting pro-environmental outcomes and demonstrate their independence through differential predictive utility.

In addition to these more established measures, we explored two other classes of assessments focused on views of nature. First, we asked participants to describe their views of nature, providing a more qualitative perspective on how people see nature. Participants wrote open-ended descriptions of their views of nature, which were coded for the presence of six factors identified as important to pro-environmental outcomes, and we expected that the EE graduate students, relative to comparison undergraduates, would show more pro-environmental content. Specifically, we examined their nature reflections for evidence of spontaneous discussions of nature connection [22,45], which should be relatively stronger for EE graduate students. Next, we explored whether nature reflections featured STEs and SIEs [20,36], expecting that EE graduate students would express relatively stronger STEs and weaker SIEs when thinking about nature. In addition, we examined whether the nature reflections included negative emotions tied to concerns about how humanity treats nature [46–48] because more environmentally concerned people should exhibit more negative emotions about how people treat the environment, and thus we expected the EE graduate students to express relatively more of these negative emotions. Also, we examined the extent to which people expressed negative emotions about nature itself, assuming that less sustainable individuals might describe nature more negatively (e.g., chaotic, dangerous) based on findings that people holding negative nature beliefs tend to be less committed to the environment [49,50]. Therefore, we expected the EE graduate students to show fewer negative emotions about nature than the undergraduate students. Finally, we explored the extent to which people described actions they perform in nature, expecting that EE graduate students would report performing more behaviors in nature, which has been linked to more sustainable attitudes and behaviors [51,52]. Because this was the debut of the nature reflections measure, these predictions (i.e., EE graduate students would show greater nature inclusion, stronger STEs and weaker SIEs, more negative emotions about

humanity's treatment of nature, less negative emotions about nature itself, and more actions performed in nature) were exploratory.

Second, we assessed people's representations of nature, the self, and humanity, using size and overlap measures [23,43,53], and these depictions are shown in Figure 1. Specifically, people were asked to indicate their perceptions of the size of nature, self, and humanity separately, each using seven diagrams where the size of each entity varied. In addition, people reported the extent to which they view nature as relatively larger than the self. The concept of size has been implicated in sustainability, including that feelings of awe and wonder about nature emanate from nature seeming vast and larger than the self [54], seeing nature as an expansive benefactor that takes care of people's needs often elicits gratitude to nature [37], and seeing the self as small reflects greater humility that reduces selfish acts [34]. Participants also reported three different inclusion measures, indicating the extent to which they view nature as included in their self-concept (i.e., nature–self inclusion), humanity as included in their self-concept (i.e., humanity–self inclusion), and humanity as included in nature (i.e., humanity–nature inclusion). Past work found that viewing nature as larger than the self and seeing nature as more included in one's self-concept predicts pro-environmental outcomes [23,43]. Finally, we included humanity representation measures to explore whether people who feel more connected to humanity or view humanity as more connected to nature might show more concern about the environment for altruistic reasons (e.g., concern about nature because they view humanity and nature as interrelated, or they view one's sense of self as connected to humanity). This exploratory work considered the possibility that some people are concerned about the environment for altruistic reasons [23,55], though support for a connection between altruistic motivations and pro-environmental outcomes has been mixed [43,56]. It is also possible that people's pro-environmental motivations require a sense of personal connection (i.e., self) rather than involving perceptions of humanity, which would anticipate no relations between views of humanity and sustainability outcomes.

Thus, based on past sustainability research [23,34,37,43,53], we predicted that EE graduate students, relative to comparison undergraduates, would reveal more pro-environmental cognitive representations, showing greater nature size, smaller self size, viewing nature as relatively larger than the self, and greater nature–self inclusion. Our exploratory predictions involving humanity representations were more tentative. To the extent that altruistic motivations might promote greater sustainability [23,55], we considered that EE graduate students, relative to comparison undergraduates, might show less humanity size, greater humanity–self inclusion, and greater nature–humanity inclusion. On the other hand, in light of mixed findings in the literature involving altruistic motivations [43,56], it was also possible that views of humanity (size or inclusion) might not reveal differences between the groups or relations to other sustainability measures.

To summarize, the current work compared EE graduate students to undergraduate students to examine differences in self-reported measures of sustainability beliefs. We compared these two groups because they could potentially provide insights for individuals who vary in level of environmental engagement (e.g., EE graduate students typically have careers in sustainability fields and are pursuing advanced degrees in conservation science). Predictions involving sustainability beliefs, emotions, and nature–self representations were stronger because they were based on past work, whereas those involving nature reflections and humanity representations were exploratory. The cross-sectional, correlational nature of the current group comparisons can offer suggestive, rather than causal, insights because unmeasured differences certainly exist between the two groups examined. That being said, the opportunity to compare EE graduate students (a group pursuing advanced studies and

sustainability careers) to a frequently studied undergraduate sample population offers a valuable opportunity to better understand the psychology of groups who plausibly differ in sustainability engagement.

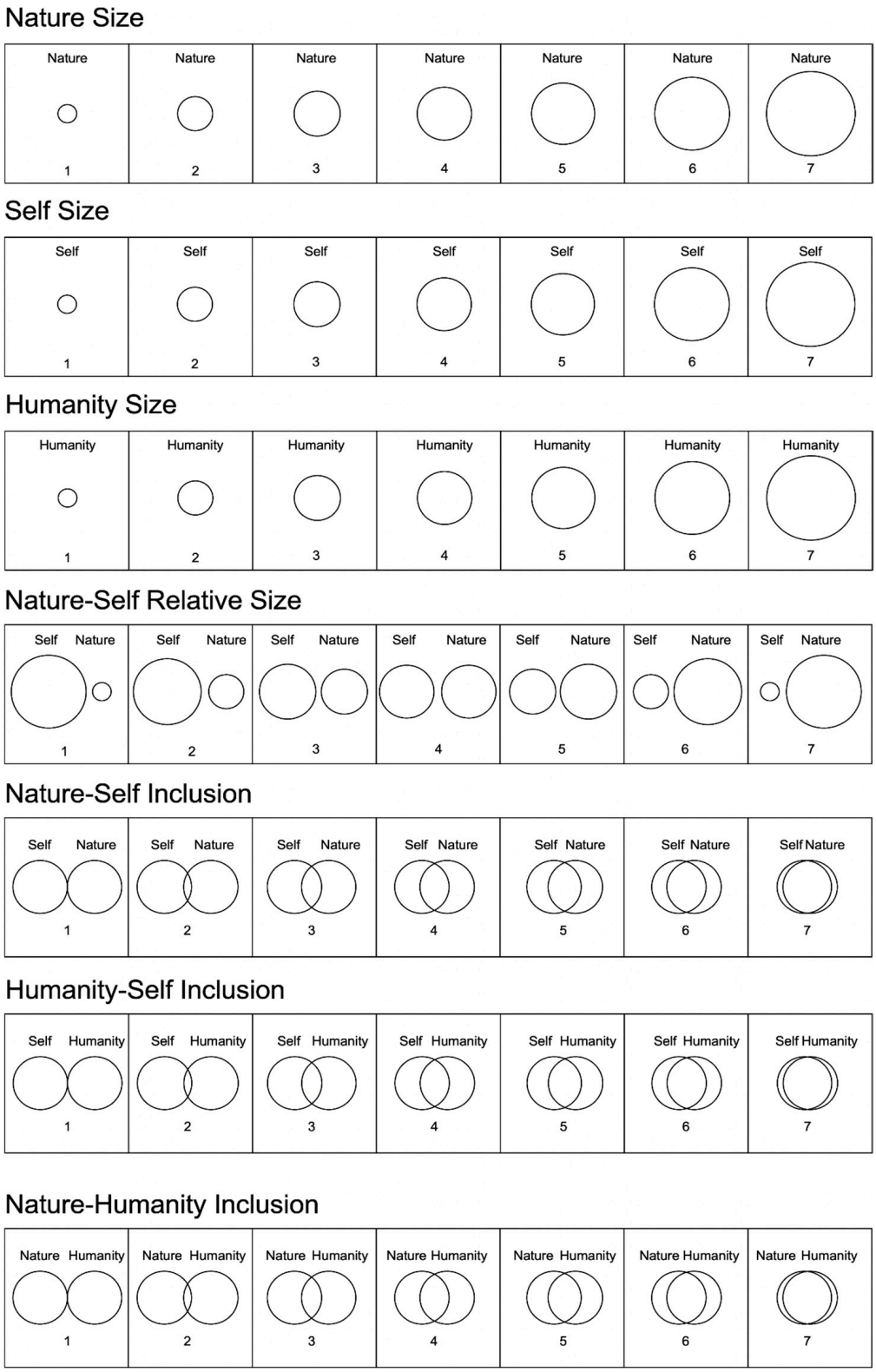

Figure 1. Cognitive representation measures (size and inclusion) for nature, self, and humanity.

3. Methods

3.1. Participants

A total of 291 students enrolled at Miami University participated. Forty-one of these individuals were graduate students enrolled in the university's Earth Expeditions (EE) program who responded to an email inviting them to complete a voluntary online survey related to their international fieldwork experiences. To avoid possible coercive pressure to participate, they were recruited after class completion, and they volunteered to complete the study without any compensation or credit. The remaining 250 participants were Miami University undergraduates who participated in the study for course credit.

Each group completed the same measures on Qualtrics, except that the graduate students completed three additional questionnaires assessing their international field-based experiences (undergraduates did not complete these measures, and thus these graduate student-specific measures receive no additional discussion). All participants completed an off-topic reading check item embedded in one of the questionnaires, asking them to select a specific response to indicate that they were reading the questions closely [57]. With 13 undergraduates and 6 graduate students failing the reading check item, the final sample consisted of 237 undergraduates and 35 EE graduate students.

3.2. Materials and Procedures

Nature reflections: All participants were first asked to write an open-ended response to the following prompt: "In the text box below, we would like for you in your own voice to reflect on how you view nature and the natural world. We would appreciate your providing as much detail (e.g., thoughts, emotions, feelings) as possible."

STEs and SIEs: Next, all participants completed a measure of dispositional positive emotions to assess trait-level self-transcendent (STEs) and self-interested emotions (SIEs) used in previous work [37], responding to how much they "typically feel each emotion" on a scale ranging from 1 (strongly disagree) to 7 (strongly agree). Specifically, they responded to eight items assessing STEs (i.e., compassion, empathy, love for others, trust in others, awe, wonder, being moved, inspiration) and eight items assessing SIEs (i.e., joy, happiness, contentment, peace, amusement, humor, pride, self-respect). Mean responses to the eight items for each emotion type were calculated to create indices of STEs (M = 5.58, SD = 0.78, α = 0.79) and of SIEs (M = 5.38, SD = 0.90, α = 0.86).

Willingness to sacrifice: Participants then responded to a 10-item measure about their willingness to sacrifice for the environment [30], expressing their agreement on a scale ranging from 1 (very strongly disagree) to 7 (very strongly agree) for related behaviors (e.g., "I would defend environmental causes to which I am truly committed even if my loved ones rejected me"). Mean responses for the items (four reverse scored) were computed (M = 3.32, SD = 1.03, α = 0.80), with larger scores indicating greater willingness to personally sacrifice for the environment.

Climate change beliefs: We assessed two measures associated with climate change beliefs [31,32,43]: endorsements of conservative ideologies (a predictor of climate change beliefs) and belief in anthropogenic global warming (a more direct measure). Specifically, participants indicated on a scale ranging from 1 (very strongly disagree) to 7 (very strongly agree) the extent to which they believe that "Conservative political and social values are better than liberal political and social values" with larger scores reflecting greater endorsements of conservatism (M = 3.22, SD = 1.87), and the extent to which they believe that "Global warming is real and is caused by human behavior and activities," with larger scores indicating greater endorsements of anthropogenic climate change (M = 5.97; SD = 1.37). Admittedly, assessing political ideology can be fraught [58,59], and although multi-item measures of political ideology can capture important nuance, research has

demonstrated that single-item measures of political ideology reliably predict outcomes such as voting, prejudice, and motivated reasoning [59] as well as people's sustainability beliefs [32,36].

Representation measures: Next, participants completed cognitive representation measures for nature, self, and humanity, borrowing from past work [23,25,36,43], assessing elements of size and inclusion of all possible pairings of the entities of nature, self, and humanity (see Figure 1). Specifically, participants were asked to report on their views of the size of nature, the self, and of humanity, each on scales ranging from 1 (smallest) to 7 (largest). Size endorsements were calculated such that larger values reflected viewing greater size for nature (M = 5.93; SD = 1.20), for the self (M = 4.57, SD = 1.66), and for humanity (M = 4.62; SD = 1.62). Because past research, e.g., [43], examined people's views of relative nature size compared to the self, participants reported their sense of nature–self relative size on a scale ranging from 1 (self much larger than nature) to 7 (nature much larger than the self; M = 5.15; SD = 1.56). Finally, participants completed three different measures to assess perceived inclusion between all possible pairings of these three entities, ranging from 1 (no overlap) to 7 (nearly complete overlap) for nature–self inclusion (M = 4.41; SD = 1.51), humanity–self inclusion (M = 4.44; SD = 1.70), and nature–humanity inclusion (M = 4.14; SD = 1.93).

Demographics: At the end of the study, students provided self-reports of age and race–ethnicity information. The EE graduate student sample had an average age of 34.62 years old (SD = 9.62), was composed of 32 cisgender females and 3 cisgender males, and was composed of 29 White non-Latine, 3 Asian, 1 White Latine, 1 North African, and 1 Multiracial people. In the undergraduate sample, students reported an average age of 19.00 (SD = 1.58) and was composed of 170 cisgender females, 62 cisgender males, 2 nonbinary students, 2 questioning students, and 1 student who did not report gender information. Based on self-reports, the undergraduate sample was composed of 189 White non-Latine, 10 White Latine, 9 Black American, 8 Asian American, 4 Native American, 1 Pacific Islander, 13 Multiracial, and 3 students who did not report race and ethnicity information.

4. Results

4.1. Nature Reflections Coding

Open-ended responses to the nature reflections prompt (average of 58.41 words) were assessed by two graduate student judges (neither involved with the EE program) who were unaware of the hypotheses or the sourcing of the participants. The judges were provided with six *a priori* categories identified by the authors as potentially related to sustainability (see Table 1). The judges were already familiar with the general concepts under investigation (e.g., nature connectedness, STEs, SIEs), although they were uninvolved in the current project (judge instructions are provided in the Supplemental Materials).

Independently, judges read and evaluated each reflection for the presence of each of the six categories on a three-point scale: 0 (no evidence of the category at all), 1 (category is present), 2 (category is present in large amounts). Overall, interjudge agreement was good, with four categories (i.e., SIEs and nature, negative emotions about humanity's impact on nature, negative emotions about nature, actions in nature) revealing substantial agreement (K_ws > 0.6), one category (i.e., connection with nature) showing moderate agreement (K_w = 0.552), and one category (i.e., STEs and nature) showing fair agreement (K_w = 0.265) [60]. The mean of the judges' assessments was calculated for each of the six categories to capture the extent to which the open-ended responses reflected connection with nature (M = 0.32, SD = 0.54), STEs and nature (M = 0.35; SD = 0.49), SIEs and nature (M = 0.74; SD = 0.66), negative emotions about humanity's impact on nature (M = 0.14;

SD = 0.40), negative emotions about nature (M = 0.12; SD = 0.35), and actions performed in nature (M = 0.49; SD = 0.64).

Table 1. Nature reflections coding categories, weighted kappas, category features, and example statements by category.

Categories	K_w	Category Features	Examples
Connection with nature	0.552	Feelings of connection, interdependence, and harmony when reflecting on nature	"We are all connected to nature in a reciprocal way" "We often view people as separate from nature, but really we are one with it"
STEs and nature	0.265	Feeling self-transcendent emotions when reflecting on nature	"I am immensely grateful for nature" "[Nature] deserves to be treated with awe and reverence"
SIEs and nature	0.614	Feeling self-interested emotions when reflecting on nature	"It is very calming to breath (sic.) in fresh air that is provided from all the trees" "I feel happy and calm in nature"
Negative emotions about humanity's impact on nature	0.672	Feeling negative emotions when thinking about humanity's impact on nature	"People are killing the environment" "Many people just see nature as something to exploit, which is very frustrating"
Negative emotions about nature	0.677	Negative emotions or appraisals about nature	"[Nature] is destructive and cruel" "Natural world is full of chaos"
Actions in nature	0.628	Actions performed by the person in nature	"When I swim in the ocean" "I am a nature boy, I go hiking, camping, hunting, and fishing."

4.2. Correlational Analyses

We investigated the relations among the variables by conducting zero-order correlations, both to assess the predicted relations and to establish the validity of our measures. Specifically, we focused on whether willingness to sacrifice for the environment, climate change beliefs, and dispositional emotions (STEs and SIEs) were predicted by each other as well as by the nature reflections and cognitive representations measures.

As shown in Table 2, people who reported a greater willingness to sacrifice for the environment reported stronger endorsement of anthropogenic global warming, less endorsement of conservative ideology, and feeling stronger dispositional STEs. In addition, these individuals' nature reflections showed greater levels of connection with nature, greater STEs with nature, and stronger negative emotions about humanity's impact on nature. Finally, people who were more willing to sacrifice for the environment saw nature as larger in size, saw the self as smaller in size, saw nature as relatively larger than the self, and reported greater inclusion of nature in their self-concepts.

Turning to climate change-associated beliefs, as people more strongly endorsed anthropogenic global warming, they reported a greater willingness to sacrifice for the environment, weaker endorsements of conservatism (consistent with past work [32] finding a relation between conservatism and weaker beliefs in anthropogenic global warming), weaker dispositional SIEs, more negative feelings about humanity's treatment of nature, smaller self size, greater perceptions of nature as being larger than the self, more humanity–self inclusion and more humanity–nature inclusion. In general, as people reported stronger endorsements of anthropogenic global warming, they showed indicators of greater sustainability, as well as greater inclusion of humanity in their self-concepts and views of nature.

On the other hand, as people endorsed conservatism more strongly, they reported less willingness to sacrifice for the environment, less endorsement of anthropogenic global warming, weaker dispositional STEs, stronger dispositional SIEs, less connection to nature

in their nature reflections, less negative feelings about humanity's treatment of nature in their nature reflections, smaller nature size, greater self size, and viewing nature as relatively smaller than the self. Thus, as people reported greater agreement with conservative ideology, they showed a pattern of indicators of less sustainability.

Table 2. Zero-order correlations among the key variables of interest grouped by primary outcomes, nature reflections content, and nature–self–humanity cognitive representations.

	Willingness to Sacrifice for Environ.	Anthropogenic Global Warming	Conservatism	Dispositional Emotions	
				STEs	SIEs
Primary Outcomes					
Willingness to Sacrifice	--				
Anthro. Global Warming	0.26 ***	--			
Conservatism	−0.28 ***	−0.53 ***	--		
Dispositional STEs	0.21 **	−0.06	−0.13 *	--	
Dispositional SIEs	−0.02	−0.18 **	0.19 **	0.60 ***	--
Nature Reflections					
Connection to Nature	0.20 **	0.18 ***	−0.26 ***	−0.07	−0.16 **
STEs in Nature	0.19 **	−0.06	−0.02	0.15 *	0.08
SIEs in Nature	0.06	−0.01	0.09	0.06	0.06
Negativity about Humanity	0.18 **	0.17 **	−0.22 ***	0.08	−0.08
Negativity about Nature	0.07	−0.01	−0.05	−0.08	−0.13 *
Actions in Nature	0.12	0.08	−0.02	0.04	0.04
Representation Measures					
Nature Size	0.31 ***	0.08	−0.17 **	0.20 ***	0.07
Self Size	−0.15 *	−0.20 ***	0.13 *	0.19 **	0.38 ***
Humanity Size	0.00	−0.08	0.08	0.17 **	0.18 **
Relative Nature–Self Size	0.26 ***	0.18 **	−0.15 *	0.04	−0.15 *
Nature–Self Inclusion	0.27 ***	0.08	−0.11	0.13 *	0.01
Humanity–Self Inclusion	0.07	0.14 *	−0.08	0.13 *	0.14 *
Humanity–Nature Inclusion	0.07	0.16 *	−0.12	0.10	0.01

Note. *** $p < 0.001$, ** $p < 0.01$, * $p < 0.05$.

When examining dispositional emotions, people who typically feel stronger STEs reported greater willingness to sacrifice for the environment, were less likely to endorse conservative ideologies, and had more STEs in their nature reflections. When looking at their cognitive representations, people with greater dispositional STEs saw all three entities (i.e., nature, self, humanity) as larger, and they reported more inclusion of nature and of humanity in their self-concepts. In sum, those who typically experience stronger dispositional STEs showed many indicators associated with sustainability such as greater willingness to sacrifice for the environment, more STEs in their nature reflections, and viewing nature as especially large and more integrated into their self-concepts. In addition, people with greater dispositional STEs also reported a larger sense of self, a larger sense of humanity, and more inclusion of humanity in their self-concepts, likely reflecting the other-focused nature of STEs.

Finally, as people reported typically feeling stronger SIEs, they showed indicators of weaker commitment to sustainability (e.g., less belief in anthropogenic global warming, less connection to nature in their nature reflections, greater self size, viewing nature as relatively smaller than the self). In addition, those reporting more dispositional SIEs reported fewer negative emotions in their reflections about nature, they saw humanity as relatively large, and they included humanity in their self-concepts to a greater degree. Thus, people who typically feel SIEs more strongly showed a pattern of associations consistent with less sustainability (e.g., less endorsement of anthropogenic global warming, less

nature inclusion in nature reflections, viewing nature as relatively smaller than the self), and they reported seeing humanity as larger and as more included in self-concepts. In addition to direct correlations, readers might wonder whether dispositional STEs and SIEs uniquely predict the other variables, similar to past work showing their independence [34]. Multiple regression analyses were conducted where dispositional STEs and SIEs were simultaneously regressed on each measure presented in Table 2. These findings, presented in the Supplementary Materials, showed unique predictive utility for dispositional STEs and dispositional SIEs, predicting patterns of relatively greater and weaker sustainability, respectively (see Supplementary Table S1).

4.3. Differences Between Groups

Having observed that the constructs of interest showed expected relations with each other, we now turn to the key issue of whether the EE graduate students differed from comparison undergraduate students on the measures. To assess whether there were systematic differences between the groups on the 18 variables presented in Table 2, we conducted a multivariate analysis of variance (MANOVA) with group (EE graduate students vs. undergraduates) as a between-subjects factor. The effect of group was significant, $F(18,250) = 5.382$, $p < 0.001$, Wilks' $\Lambda = 0.721$, $\eta_p^2 = 0.279$, indicating reliable systematic differences between the EE graduate student and undergraduate student groups across the variables.

We then followed up on this omnibus analysis to explore differences between the groups on each of the 18 variables of interest, using between-groups *t*-tests (all two-tailed) comparing the EE graduate students to the undergraduate students, which are presented in Table 3. As a reminder, predictions involving 9 of these 18 measures (i.e., willingness to sacrifice, anthropogenic global warming, conservatism, dispositional STEs and SIEs, and cognitive representations involving nature and the self) were viewed as strong predictions because they were based on measures previously established to predict sustainability outcomes [23,36,37,43], whereas predictions for the remaining variables (i.e., nature reflections, cognitive representations involving humanity) were viewed as exploratory because these measures were novel to the current work. In cases where Levene's test indicated heterogeneity of variances between the groups [61], we reported Welch's *t*-test instead of Student's *t*-test (and with adjusted degrees of freedom, instead of 270, in these rows). To control for false discovery rate across the family of comparisons in Table 3, *p*-values were adjusted using the Benjamini–Hochberg procedure [62].

As Table 3 shows, the vast majority of the strong prediction measures showed significant differences between the EE graduate students and the comparison undergraduate students and in line with predictions such that the EE graduate students showed indicators of greater sustainability. Specifically, EE graduate students reported greater willingness to sacrifice for the environment, greater belief in anthropogenic global warming, less endorsement of conservative ideologies, and weaker dispositional SIEs compared to undergraduates. Also, EE graduate students viewed nature as greater in size, viewed the self as smaller in size, viewed nature as relatively greater than the self, and viewed nature as more included in their self-concepts than the undergraduates. The only strong prediction that was unsupported was the lack of group differences on reports of dispositional STEs.

Turning to the exploratory analyses, there were three significant differences observed in the nature reflections measures. Specifically, EE graduate students (relative to comparison undergraduates) showed more evidence of connection to nature in their nature reflections, more STEs in their nature reflections, and more negativity about how humanity treats the environment in their nature reflections. There were no reliable differences in the other three nature reflection measures (i.e., SIEs in nature, negative feelings about nature, actions

in nature). Finally, there were no significant group differences observed on any of the cognitive representation measures involving humanity.

Table 3. Differences between EE graduate student and undergraduate student groups (means and 95% CIs), *t*-tests and 95% CIs for the mean difference, effect sizes (Hedges' g), degrees of freedom, *p*-values, and Benjamini–Hochberg *p*-values.

	EE Grad Students		**Undergrads**							
	M	**95% CI**	**M**	**95% CI**	***t***	**95% CI**	**g**	**df**	***p***	**BH-*p***
Primary Outcomes										
Willingness to Sacrifice	**3.97**	**[3.71, 4.23]**	**3.22**	**[3.09, 3.36]**	**5.07**	**[0.45, 1.04]**	**0.74**	**54.03**	**<0.001**	**0.003**
Anthro. Global Warming	**6.80**	**[6.63, 6.94]**	**5.85**	**[5.66, 6.03]**	**7.73**	**[0.71, 1.19]**	**0.71**	**147.62**	**<0.001**	**0.003**
Conservatism	**2.14**	**[1.67, 2.72]**	**3.38**	**[3.13, 3.63]**	**−3.74**	**[−1.89, −0.59]**	**−0.68**	**270**	**<0.001**	**0.003**
Dispositional STEs	5.60	[5.36, 5.84]	5.58	[5.48, 5.68]	0.16	[−0.25, 0.30]	0.03	270	0.861	0.861
Dispositional SIEs	**4.96**	**[4.62, 5.22]**	**5.45**	**[5.33, 5.57]**	**−3.04**	**[−0.80, −0.17]**	**−0.55**	**270**	**0.003**	**0.007**
Nature Reflections										
Connection to Nature	**0.90**	**[0.66, 1.15]**	**0.24**	**[0.19, 0.31]**	**4.90**	**[0.39, 0.93]**	**1.34**	**37.27**	**<0.001**	**0.003**
STEs in Nature	**0.57**	**[0.37, 0.80]**	**0.31**	**[0.25, 0.37]**	**2.46**	**[0.10, 0.44]**	**0.57**	**39.03**	**0.019**	**0.034**
SIEs in Nature	0.70	[0.48, 0.92]	0.75	[0.66, 0.83]	−0.42	[−0.29, 0.19]	−0.08	270	0.679	0.764
Negativity about Humanity	**0.40**	**[0.20, 0.62]**	**0.10**	**[0.06, 0.15]**	**2.73**	**[0.08, 0.53]**	**0.77**	**36.96**	**0.010**	**0.020**
Negativity about Nature	0.17	[0.05, 0.31]	0.12	[0.08, 0.16]	0.83	[−0.07, 0.18]	0.16	270	0.405	0.521
Actions in Nature	0.63	[0.38, 0.90]	0.47	[0.38, 0.55]	1.21	[−0.12, 0.43]	0.24	41.01	0.234	0.324
Representation Measures										
Nature Size	**6.49**	**[6.25, 6.71]**	**5.85**	**[5.68, 6.02]**	**4.42**	**[0.34, 0.93]**	**0.54**	**71.32**	**<0.001**	**0.003**
Self Size	**3.80**	**[3.26, 4.32]**	**4.69**	**[4.47, 4.90]**	**−3.01**	**[−1.46, −0.29]**	**−0.54**	**270**	**0.003**	**0.007**
Humanity Size	4.43	[3.82, 4.98]	4.64	[4.43, 4.83]	−0.72	[−0.80, 0.36]	−0.13	270	0.472	0.566
Relative Size	**5.63**	**[5.18, 6.05]**	**5.09**	**[4.89, 5.31]**	**2.25**	**[0.06, 1.11]**	**0.35**	**51.59**	**0.029**	**0.048**
Nature–Self Inclusion	**5.29**	**[4.85, 5.70]**	**4.28**	**[4.08, 4.48]**	**3.72**	**[0.48, 1.53]**	**0.68**	**270**	**<0.001**	**0.003**
Humanity–Self Inclusion	4.49	[3.88, 5.09]	4.42	[4.21, 4.64]	0.20	[−0.55, 0.66]	0.03	270	0.840	0.861
Humanity–Nature Inclusion	4.74	[4.30, 5.46]	4.05	[3.79, 4.29]	1.80	[−0.09, 1.47]	0.36	42.05	0.080	0.120

Note: Rows in boldface reflect significant differences based on BH-*p* values.

4.4. Evaluating Alternative Accounts

Overall, the above analyses revealed good support for the strong predictions, finding that for eight of the nine measures, EE graduate students showed greater indicators of sustainability than comparison undergraduate students. The correlations involving these well-established measures also replicated past findings [23,25,35–37,43]. The new nature reflections measure showed promise both in terms of intercorrelations and between-group differences for three of its six measures (i.e., connection to nature, STEs and nature, and negativity about humanity's treatment of nature). Of course, the cross-sectional, correlational nature of this work means that any conclusions drawn are associative rather than causal. In addition, because there are undoubtedly many differences between the EE graduate and undergraduate students in the current study, one must be cautious in interpreting the current findings because confounding variables might underlie the observed effects. We now turn our attention to evaluating some alternative accounts.

First, as noted in the participant demographics, the EE graduate student sample was composed of a greater proportion of females than was the undergraduate student sample. As a result, gender might represent a confounding factor, explaining the observed group differences in Table 3. To consider this possibility, we revisited the significant findings reported in Table 3, conducting analyses of covariance (ANCOVAs) with a between-subject factor of student group (EE graduate students vs. undergraduates) and covarying gender (using 1 for cis/transgender males, 2 for cis/transgender females, and coding the five remaining students as missing). Of the 11 measures in Table 3 that showed significant group differences, 10 of these 11 effects remained significant when controlling for gender, and the only observed difference was that the once-significant relative nature–self size effect became marginally significant, $F(1,264) = 2.975$, $p = 0.086$. Overall, these

analyses demonstrate that the findings in Table 3 were largely unchanged after accounting for gender.

Another difference between the two groups was age. However, examining age as an alternative explanation in this context is inherently complicated. Because graduate students must, by definition, have already completed their undergraduate degrees, they will on average be older than undergraduates. In our sample, being in the EE graduate student group and age were highly correlated, r = 0.814, $p < 0.001$. Because these variables are relatively redundant, it was not surprising that conducting ANCOVAs including age as a covariate eliminates the between-group effects presented in Table 3 because age and student groups are so highly intertwined. In light of these ANCOVA results, it appears that age, education level, career experience, environmental training, and group membership are strongly bundled and cannot be separated in this design.

A potential ambiguity in Table 3 involves interpreting the three significant differences observed in the nature reflections measures. Although Table 3 reveals that the EE graduate students (vs. comparison undergraduates) showed greater nature connection, more STEs in their nature reflections, and more negative feelings about how humanity has treated the environment in their nature reflections, it is possible that these differences may reflect that the graduate students merely wrote longer reflections overall, increasing the likelihood that their narratives could reveal more of any of the categories assessed (though it should be noted that there were no between-group effects for three of the nature reflection categories). Indeed, the EE graduate students wrote longer nature reflections (M = 97.31 words) than the undergraduate students (M = 52.72 words), t(36.205) = 2.46, $p = 0.019$, g = 0.75. To explore the potential role of passage length as a confounding factor, we conducted ANCOVAs (where student group was the between-subjects factor, and nature reflection word count was the covariate). When covarying out the number of words written, we observed significant student group differences for amount of nature connection exhibited in the reflections, F(1,269) = 40.188, $p < 0.001$, $\eta_p^2 = 0.130$, and for amount of negative emotions expressed about humanity's treatment of nature, F(1,269) = 9.348, $p = 0.002$, $\eta_p^2 = 0.034$. However, the previously significant effect of group for STE content in nature reflections was no longer significant, F(1,269) = 2.697, $p = 0.102$, $\eta_p^2 = 0.010$, when accounting for word count. These supplemental analyses showed that differences between EE graduate students and undergraduates for reported greater nature connection and more negative emotions about how people treat the environment in their nature reflections remained after adjusting for nature reflection word count, although these follow-up analyses suggest that group differences on STEs in nature reflections should be interpreted with caution.

5. Discussion

5.1. Review of Findings

Overall, there was strong support for the key predictions. Specifically, EE graduate students, relative to comparison undergraduates, reported more willingness to personally sacrifice for the environment, stronger endorsement of anthropogenic global warming, weaker endorsement of conservatism, weaker dispositional SIEs, viewed nature as larger, viewed the self as smaller, viewed nature as relatively larger than the self, and viewed nature as more included in their self-concepts. The interrelations among these measures showed strong fidelity with past research [19,31,32,34,36,43,63], and the observed between-groups differences may provide insights for real-world groups that plausibly differ in sustainability engagement.

In addition to these strong predictions, the current work also considered exploratory hypotheses involving two new types of measures. The first involved open-ended descriptions of people's nature reflections, a novel measure used in the current work to provide

qualitative insights into people's views of nature that independent observers could detect. Overall, the extent to which people's nature reflections conveyed greater nature connections and stronger negative feelings about how people treat the environment predicted reports of greater willingness to sacrifice for the environment and stronger belief in anthropogenic global warming. Moreover, the EE graduate students revealed more nature connection and stronger negative feelings about the way people treat the environment in their nature reflections, compared to undergraduates (and these differences maintained when controlling for the length of nature reflections). Although these findings should be viewed as tentative until they are replicated, this work indicates that relatively brief open-ended nature reflections may capture meaningful psychological elements linked to sustainability, especially nature connectedness [22,23] and feelings of concern about how people treat the environment [46,47]. Spontaneously written nature reflections offer a response framework that allows participants to convey their thoughts, feelings, and beliefs in an idiosyncratic fashion and provides scholars with flexibility to explore a multitude of concepts in analyses, including themes not considered in prospect, supporting reviewer inquiries and meta-analytic work.

When examining nature–self–humanity representations, people who reported being more willing to sacrifice for the environment saw nature as larger, viewed the self as smaller, saw nature as relatively larger than the self, and viewed nature as more included in their self-concepts, consistent with past work [19,23,36,43]. When people view the self in relatively smaller terms compared to nature, it reflects less selfish motivations that orient people toward engaging in more prosocial and pro-environmental behaviors [34,35,43]. Also, in the current work, we saw that EE graduate students exhibited more of these qualities than comparison undergraduates.

Among the nine strong predictions for group differences forwarded in the current work, eight were supported and only one was not (i.e., there were no differences in reports of dispositional STEs between the two student groups). Although stronger dispositional STEs showed relations to other sustainability outcomes (e.g., self-reported willingness to sacrifice for the environment, greater inclusion of nature in one's self-concept) consistent with past findings [36], there were no differences between the EE graduate students and comparison undergraduates on this measure. Interestingly, EE graduate students reported weaker dispositional SIEs than comparison undergraduates, consistent with a relative interplay of other-focused and self-interested emotions that underlie prosocial and pro-environmental engagement [39,40]. In addition, although EE graduate students showed some indicators of greater sustainability in their nature reflections (i.e., greater nature connections, stronger negative emotions about humanity's treatment of the environment), other nature reflection categories were less promising (e.g., dispositional emotions in nature, negative feelings about nature, actions performed in nature). Thus, our new nature reflection measure may have promise for offering insights into people's views of nature, but more research will be needed to establish its value as a qualitative vehicle.

Finally, the exploratory measures assessing cognitive representations of humanity size and inclusion did not reveal many systematic effects, suggesting that perceptions of nature and of the self, but not of humanity, appear to play a consequential role in what may motivate people's sustainability beliefs. These findings seem consistent with the mixed data observed in the literature involving the role of altruistic environmental concerns and values (e.g., being concerned about the environment because of its impact on other people or on future generations) in predicting sustainability outcomes [43,56]. Undoubtedly there is a role for concern about humanity and for holding altruistic values in shaping people's pro-environmental orientations, but the lack of consistent effects observed in the current

findings and in past research indicate that more work is required to better understand these possibilities.

5.2. Implications of the Current Work and Why Highly Engaged People Matter

We conducted the current study to compare EE graduate students with undergraduates to explore differences between groups who plausibly differ in sustainability engagement. The correlational and cross-sectional nature of this study limits any strong claims, but part of our motivation in conducting this study (in addition to evaluating new measures) was to reflect on what might differentiate people who pursue careers and graduate education in sustainability fields, especially in terms of psychological differences that might characterize them.

The EE graduate students distinguish themselves from typical undergraduate populations because they have careers in sustainability (e.g., educators, animal care), and careers such as these position people to model their beliefs and behaviors to audiences of students, visitors, and tourists [5–7,9,10]. Whether their workplaces include animal interactions [63–66] or school programming [67,68], people in sustainability careers can influence others to become more sustainable in the future [69]. For example, EE graduate students receive extensive training experiences that integrate science, culture, and indigenous practices at the intersection of the human and ecological dimensions of conservation [70], and these rich graduate experiences inform outcomes ranging from zoo educator programming to engage visitors in global environmental issues [71] to new frameworks instigating new participatory educational practices [21]. People who occupy environmentally engaged roles such as environmental educators [5], zookeepers [6], and members of community-based conservation efforts [9] can have a sizable impact on others by modeling sustainable engagement through significant and integrated commitments to people, ecosystems, indigenous knowledge, and local species [21]. Future work can explore how the differences observed between EE graduate students and comparison undergraduates in the current study extend to other settings not only for people's environmental beliefs (e.g., willingness to sacrifice for the environment, endorsement of anthropogenic global warming) but for their views of nature and in their emotional experiences as well.

The observed differences between the groups studied in the current study may provide insights to inform future work about what motivates people to be more committed to sustainability. For example, EE graduate students reported feeling fewer dispositional SIEs, which could promote sustainability because addressing many environmental challenges requires that people sacrifice selfish interests for the greater good [39,40]. Future research should explore whether the interplay of SIEs and STEs can explain people's involvement in sustainability efforts. Most research on positive emotions and prosocial behavior has focused almost exclusively on the role of people's self-transcendent emotions [20,33], but the current work also suggests a potential role for self-interested emotions as well. Individual decision making guided by reduced self-interest can inspire climate action [72]. These findings indicate that promoting sustainable practices may not only require pro-environmental knowledge and beliefs, but a deeper appreciation of how specific forms of emotions might encourage more pro-environmental outcomes.

The current work may provide insights for researchers studying conservation organizations. For example, EE graduate students were more likely to report negative feelings about people's treatment of nature, and these emotions have been shown in the literature to increase people's commitment to pro-environmental behavior and sacrifice [46–48]. Thus, people in sustainability fields may possibly find greater engagement in organizations where they feel their efforts serve to improve environmental stewardship, and future scholars could investigate whether these motivations contribute to employee effective-

ness in sustainability organizations above and beyond well-studied dimensions such as employee–organization fit [73] or possessing interpersonal skills and cultural awareness [74].

Finally, the current findings may inform future work focused on identifying ways to keep people in sustainability careers motivated. Indeed, scientists and practitioners in conservation fields experience heightened levels of burnout from factors ranging from job insecurity to feelings of frustration and distress about the state of the environment [75–77]. Promoting opportunities to refresh individuals with time for reconnections in and with nature might bolster personal resilience and reinvigorate their moxie to persevere in challenging times, especially when people report experiencing greater negativity about humanity's treatment of nature. Moreover, appreciating that people in sustainability careers often carry considerable emotional concern about environmental harm may prompt organizations to develop policies and support mechanisms to bolster their colleagues' commitment and reduce burnout concerns.

5.3. Limitations and Caveats

Although these findings can provide useful insights into understanding people who differ on sustainability beliefs, dispositional emotions, nature reflections, and nature–self–humanity cognitive representations, some important caveats should be acknowledged. The current sample was drawn from one educational institution, and thus it will take additional work to ascertain the extent to which the current findings extend to other settings and cultures. In addition to general replication, future work should study individuals in a variety of contexts [25,29,78] and with people not exclusively from WEIRD (Western, educated, industrialized, rich, and democratic) societies [28,78]. Assessing students at the same institution who vary in terms of educational programs and career experiences reduces many third variables in the current work, but we encourage readers to interpret our findings with caution until more replications take place, and we believe that assessing groups from many institutions and from a variety of locations would provide valuable heterogeneity to understanding these issues.

Relatedly, the current study involved uneven sample sizes and a relatively small sample of people pursuing advanced degrees and in sustainability careers. As noted, we were drawn to studying EE graduate students because these individuals hold diverse careers (e.g., environmental educators, zookeepers) in sustainability and thus provide an interesting point of comparison with a sample frequently studied in conservation research (i.e., undergraduates). The EE graduate students were also different from our comparison group in many ways, and there are limits to our ability to rule out alternative accounts in the current work. Also, these EE graduate students represent a small sample from a self-selected group, and we note that future scholars should view the current findings with appropriate caution, and we encourage them to replicate and extend our work with larger and more diverse samples who are equally (or more) engaged with conservation.

Another limitation of the current work is that it relied on self-report measures, which have generalizability and demand characteristic concerns, especially in pro-environmental research [4,79,80]. One novel way that the current work attempted to circumvent self-presentational concerns was by assessing people's spontaneous written reflections about nature (in addition to using traditional quantitative scale measures where demand characteristics can seem more obvious), and we believe the nature reflections task has promise for use in future work because it allowed respondents to spontaneously articulate factors such as nature connectedness and negative feelings about humanity's stewardship of nature in unstructured, self-directed ways. That being said, we recommend that future scholars train judges even more rigorously and with greater standardization (e.g., comprehensive

codebooks, larger teams of judges) than we did in this initial effort to improve interjudge agreement of nature reflection responses in their work.

Even though the current findings showed that STEs and SIEs demonstrated different (and hypothesized) patterns in predicting indicators of sustainability (see Table 2, Supplementary Table S1), replicating past work [36], we caution readers to await future research to further document the psychological architecture of STEs and SIEs (e.g., extensive item development, demonstrations of convergent and discriminant validity). These investigations will require a dedicated research effort involving several studies, which is far beyond the scope of the current work. In addition, our assessment of climate change beliefs and correlates relied on single-item measures, and although single-item measures have been predictive of pro-environmental outcomes in past work [34,43], future investigations can consider more multifaceted measures of these constructs [58,59], especially to avoid potential ceiling effects.

Finally, we strongly encourage scholars to consider replications of this study that go beyond cross-sectional work, e.g., ref. [81]. Also, studies developed with indigenous communities, e.g., ref. [25], can identify additional ways of knowing or can shed new light on emotional experiences and views of nature involving underrepresented group members not only as participants but as co-creators of understanding [82]. Further, using experimental manipulations of underlying constructs when possible, e.g., refs. [83,84], and directly assessing environmental behaviors such as sustainability-specific workplace activities and interactions with audiences such as students or zoo patrons occurring across contexts, e.g., ref. [36], would strengthen future work as well.

6. Conclusions

In sum, we explored differences between two groups on self-report measures of sustainability beliefs, emotional experiences, reflections on nature, and nature–self–humanity representations to provide insights about groups who plausibly differ in their level of environmental engagement. The EE graduate students, relative to comparison undergraduates, showed stronger pro-environmental beliefs, different emotional experiences (dispositional and in reflections about nature) that promote greater sustainability, and nature–self cognitive representations that indicate viewing nature as more important and more integrated into their self-concepts. We hope this study offers new insights and measures for future scholars and inspires novel considerations for supporting the morale of people in sustainability careers. The contributions of environmentally engaged people are more important now than ever, and understanding their characteristics can support these individuals so that they may inform and inspire the audiences and communities who they serve.

Supplementary Materials: The following supporting information can be downloaded at: https://www.mdpi.com/article/10.3390/su18147467/s1, Supplemental Table S1. Unique predictivity utility of dispositional STEs and SIEs, with beta weights and 95% CIs for each predictor variable, and overall variance accounted for in the multiple regression equation.

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SUPPLEMENTAL MATERIALS

1) Open-ended response coding instructions

Participants in the study were asked to respond to the following prompt:

In the text box below, we would like for you in your own voice to reflect on how you view nature and the natural world. We would appreciate your providing as much detail (e.g., thoughts, emotions, feelings) as possible.

The attached XLS file has each participant's SUBID code in Column A (it ranges from 1 to 376, but there are only 291 Ps in this dataset), their response to the above prompt in Column H (far right of the spreadsheet… please note some open-ended responses are rather long and may involve punctuation or returns that make it go for several lines… please be super careful to make sure you're reading the entire response and not just its first part or first line), and then Columns B-G (in between A and H, highlighted in yellow) are for you to provide your ratings for each construct listed below (Connection in Column B, self-transcendent emotions in Column C, self-interested emotions in Column D, etc.).

For each construct below (B-G), please use the following scale:

0	1	2
No evidence of the construct at all	The construct is present	The construct is present in large amounts

For each construct (Columns B-G), try hard not to read too much into things. It's okay to give a lot of 0s if the construct is not present. If you give a "1" instead of a "0," it means that it's clearly there and not that "*maybe* the author implied it." When you give a "2" it should reflect a lot of the construct (e.g., strong emotions, very integrated connection and interdependence, extreme negativity about humanity's impact on nature). Be sure to read a lot of responses first to get a sense of "the range of responses" so you have a sense of what is a "1" and what is a "2." We anticipate some participants will have much stronger reactions than others, so try to be consistent in your ratings and do not over think things).

Column B – Connection, interdependence, harmony (e.g., "I feel a spiritual connection to nature," "how dependent and intertwined we are with the natural world," "I see myself as part of nature")

Column C – Self-transcendent positive emotions (e.g., "I will never get over the awe and wonder every time," "I am immensely grateful," "I felt so small bobbing in the vast ocean")

Column D – Self-interested positive emotions (e.g., "[Nature] is a friend, a comfort, peace," "I feel peaceful, healthier, and stress-free," "I am happiest when in nature")

Column E – Negative emotions about humanity's impact on nature (e.g., "We have destroyed and pushed other species to extinction," "saddened by the current environmental degradation worldwide," "many people just see nature as something to exploit, which is very frustrating")

Column F – Negative emotions not involving humanity's impact (e.g., "The natural world of full of chaos," "[nature is] terrifying," "[nature is also life] and death"

Column G – The participant describes an action or response that they have performed (e.g., "Nature is my safe place. It's where I go when life feels too overwhelming," "When I swim in the ocean," "hiking with my dad")

2) Multiple regression analyses involving dispositional STEs and SIEs.

Readers might wonder whether dispositional STEs and SIEs make unique contributions in predicting the variables of interest in the current work, paralleling past analyses by Jacobs and McConnell (2022). Table S1 (below) shows the results for these individual multiple regressions analyses, where self-reports of dispositional STEs and SIEs were regressed on each of the current study variables.

Supplemental Table 1. Unique predictivity utility of dispositional STEs and SIEs, with beta weights and 95% CIs for each predictor variable, and overall variance accounted for in the multiple regression equation.

Variables	**β (STEs)**	**95% CI**	**β (SIE)**	**95% CI**	**Adj. R^2**
Willingness to sacrifice	.347**	[.267, .646]	-.266*	[-.432, -.101]	.071**
Anthropogenic glob. warm.	.085	[-.108, .406]	-.234**	[-.583, -.133]	.031**
Conservatism	.020	[-.306, .401]	.176*	[.059, .667]	.028*
Nature reflections					
Connection	.050	[-.067, .136]	-.192*	[-.204, -.026]	.021*
STEs in Nature	.154*	[.003, .187]	-.012	[-.087, .074]	.014
SIEs in Nature	.040	[-.093, .160]	.040	[-.081, .140]	.002
Neg about humanity	.201**	[.028, .179]	-.199**	[-.156, -.023]	.025*
Neg about nature	.005	[-.065, .070]	-.137	[-.113, .005]	.011
Actions in nature	.036	[-.094, .153]	.014	[-.098, .118]	.005
Cognitive representations					
Nature Size	.252**	[.162, .613]	-.087	[-.314, .081]	.038**
Self Size	-.054	[-.409, .180]	.408**	[.498, 1.013]	.136**
Humanity Size	.105	[-.087, .521]	.112	[-.064, .468]	.030*
Nature-Self Relative Size	.192*	[.091, .674]	-.262**	[-.710, -.201]	.038**
Nature-Self Inclusion	.187*	[.074, .648]	-.101	[-.421, .080]	.015*
Humanity-Self Inclusion	.071	[-.169, .476]	.099	[-.093, .471]	.016*
Nature-Humanity Inclusion	.147	[-.004, .731]	-.083	[-.500, .142]	.007

Notes. *p<.05, **p<.01

In some cases, both dispositional STEs and SIEs simultaneously made unique contributions and always in opposite directions. Specifically, greater dispositional STEs and weaker dispositional SIEs predicted greater willingness to sacrifice for the environment, more negativity about humanity's treatment of nature, and viewing nature as relatively larger than the self. These findings indicate that although dispositional STEs and SIEs were related (r=.60, p<.001), each dispositional emotion measure showed unique variability in predicting outcomes of interest and in opposite directions, further establishing their independence.

In other cases, dispositional STEs but not SIEs uniquely predicted outcomes, such that people reporting greater dispositional STEs also reported greater STEs in their nature reflections, saw nature as greater in size, and perceived greater inclusion of nature in one's self-concept. Finally, dispositional SIEs but not STEs uniquely predicted some outcomes, indicating that as people reported stronger dispositional SIEs, they reported weaker beliefs in anthropogenic global warming, greater endorsements of conservatism, less nature connection in their nature reflections, and viewing the self as being greater in size.

These supplement analyses provide strong evidence that dispositional STEs and SIEs predicted a broad range of sustainability variables, that each emotion measure had idiosyncratic variability in significantly predicting these outcome measures, and that they showed patterns of dissociation in their predictions.