

CONSILIENCE

THE JOURNAL OF SUSTAINABLE DEVELOPMENT

Investigating Environmental Values and Psychological Barriers to Sustainable Behaviors Among College Students

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Abstract

While college students acknowledge that climate change is a major threat in today's world, a multitude of structural and psychological barriers exist which prevent these individuals from engaging in eco-friendly practices. The Honors Culture of Sustainability Lab is a campus living laboratory in which undergraduate students engage in interdisciplinary research exploring cultural and social aspects of sustainability. As part of a course-based undergraduate research experience in Spring 2022, the team undertook a study investigating environmental values and psychological barriers to pro environmental behavior among their peers: the student population at Virginia Tech, a large university in the Eastern United States. Data were collected through a survey that received 765 responses and used the New Ecological Paradigm - NEP and the Dragons of Inaction Psychological Barriers - DIPB measurement scales. Students widely expressed environmental values and concern about climate change. Agreement or strong agreement with statements reflecting the New Ecological Paradigm ranged from 67% to 92%. The research found that Virginia Tech students do think that action should be taken to promote sustainability and do want to engage in more sustainable behaviors but face a number of barriers to transform their habits and need support to translate their beliefs into action and concrete behavior change. The most influential psychological barriers showed: resistance to transforming habits and lifestyles, need for more information on how to change, and a feeling of unfairness in face of industry-caused environmental degradation. Identifying what prevents students from changing their habits and behaviors will help guide institutional efforts to promote a culture of sustainability on the university's campus. By understanding how students view and practice sustainability on an individual level, measures can be implemented that effectively address and overcome psychological barriers to pro-environmental behaviors. The answers to these questions will provide more insight into the state of environmental awareness and behavior at Virginia Tech and perhaps hint at trends in American college campuses in general.

Keywords: Sustainable Actions, Environmental Values, Psychological Barriers to Pro environmental Behavior, Dragons of Inaction, College Students

Introduction

Given the current condition of our climate and environment, it is important that people adopt pro-environmental mindsets and participate in behaviors that align with these mindsets. Committing to more sustainable behaviors and actions is dependent on social, psychological, and structural factors. Many understand that climate change is a major issue, they are aware that changes must be made to address this issue, and even have pro-environmental values – however, many are reluctant to change their behavior patterns so that their actions are more sustainable. Identifying and understanding the psychological barriers that people struggle with is an important part of explaining and resolving the dissonance between sustainable values and sustainable action.

To investigate values and attitudes regarding the environment and understand how this value-action gap manifests itself among college students, the undergraduate research team in the Virginia Tech Honors Culture of Sustainability Lab undertook, under the coordination of a faculty advisor, a study investigating values and ideas about sustainability and psychological barriers to sustainable behavior among their university's student population.

Virginia Tech has recently started implementing its new Climate Action Commitment through a set of fifteen goals. Increased information on environmental values and attitudes and barriers to sustainable action among students is necessary to inform and contribute to goals 10 (integrate the Climate Action Commitment into the university's educational mission) and 12 (diminish barriers to sustainable behaviors through institutional change, education and social marketing). The study was then proposed, in partnership with the Virginia Tech Office of Sustainability and sponsored by a grant from the Office of Undergraduate Research.

The study aims to answer the following research questions: What are Virginia Tech students' values and opinions regarding the environment? What are the most prominent psychological barriers to pro environmental behavior among these students? For each set of constructs, the study investigates: how they manifest in the overall sample, differences between demographic groups, and relationships among constructs. The answers to these questions will provide more insight into the state of environmental awareness and behavior among the student population. These insights will be used to inform the Office of Sustainability's efforts on campus and will guide the implementation of measures that will more effectively assist students in addressing the psychological barriers that are most prominent at the college level.

Literature Review

Environmental attitudes are defined as the care or concern that one has for the environment and can be affected by factors such as: personality and values, education and environmental knowledge, direct experience with nature, and demographic background. It is important to study the relationship between environmental values, attitudes, and behavior to understand how these dimensions affect people's willingness to engage in sustainable action (Gifford & Sussman, 2012).

Several measurement scales have been developed to assess people's values and attitudes regarding the environment. The New Ecological Paradigm Scale (Dunlap et al. 2000) is used to gauge

whether a respondent supports the ideas of the prevailing anthropocentric worldview (Dominant Social Paradigm), or alternatively the ideas of a pro-environmental worldview (New Ecological Paradigm). There are 15 statements in this scale and respondents are prompted to rate the agreement with each statement. Seven items reflect the Dominant Social Paradigm (DSP), which encompasses ideas related to humans having the right to take control over the land and modify their environment, support of existing structures and ways of life, general resistance to conservation or lack of concern for the environment. The eight remaining items reflect the New Ecological Paradigm (NEP), which includes perceptions of environmental abuse, concern for consequences of unbalanced human interference in natural processes and states the need for environmental protection and action.

The process of behavior change toward sustainability is complex and does not correspond to a linear model in which ecological knowledge would lead to awareness, then directly to action (Roizman, 2001; Blake, 1999). This discrepancy is described as the value-action gap in pro environmental behavior (Kollmuss & Agyeman, 2002). While authors discussed a variety of external and internal factors that contribute to the value-action gap, our research only focuses on the latter as we were exploring psychological barriers to environmental action. Structural barriers are important as well -- however, for “almost everyone who is not severely restricted by structural barriers, adopting more pro-environmental choices is possible, but this is not occurring to the extent necessary” (Gifford, 2011, p.1). The purpose of our study was to investigate in our local setting why people expressing pro-environmental values and attitudes do not always engage in behaviors that match these values. People may care about the environment, but their lack of sustainable behaviors is due to other significant factors that must be considered. Lack of pro-environmental action is not necessarily due to a lack of awareness, or a lack of ability to change.

The piece of literature most central to our study is *Dragons of Inactions: Psychological Barriers that Limit Climate Change Mitigation and Adaptation* (Gifford, 2011), which categorizes, and labels psychological barriers faced by humans which limit their environmental behaviors, informally called ‘dragons of inaction’. There are seven categories of barriers, ‘dragon families’, labeled as Limited Cognition, Ideologies, Comparisons with Others, Sunk Costs, Discredence, Perceived Risks, and Limited Behaviors. While in this foundational work there are a total of 29 dragons distributed throughout the seven families, later work in psychometrics (Lacroix et al, 2019) developed the *Dragons of Inaction Psychological Barriers (DIPB) Scale*, a measure to investigate psychological barriers to pro environmental behavior into five subscales: *Change Unnecessary*, *Conflicting Goals and Aspirations*, *Interpersonal Relations*, *Lacking Knowledge*, and *Tokenism*.

The *Change Unnecessary* subscale is composed of barriers in the categories Ideologies and Discredence. Ideologies consist of our worldviews, religious beliefs, ideas, and system justification where the status quo is upheld. The idea of ‘techno salvation’, for example, describes when humans believe they will mitigate all their negative environmental behaviors through technology. Discredence can manifest in the form of mistrust between citizens and their governments or scientists, inadequacy of existing sustainability programs, and denial of climate change as a whole. Overall, the subscale lines up various arguments to justify the idea that change motivated by environmental concern is not necessary.

The *Conflicting Goals and Aspirations* subscale consists of barriers related to Sunk Costs and Perceived Risks. The idea of Sunk Costs can weigh heavily on our consciences, and our lifestyles, financial investments, and behaviors may not match our pro-environmental attitudes. This is especially true if the process of changing our habits appears too difficult. There are many barriers which fall into the Perceived Risks family, including risks that are physical, temporal, social, psychological, financial, or functional. Overall, the Perceived Risks family suggests that people are deterred from engaging in pro-environmental behaviors by the negative consequences they assume will happen. Our goals to be successful and comfortable, and/or our long-settled habits, are often directly countered by our goals to have a positive environmental influence.

The *Interpersonal Relations* subscale is composed of the ‘dragon families’ Comparison with Others and Perceived Risks. Comparison with Others tackles ideas of social comparison, social norms, and perceived inequities. In this case, Perceived Risks can manifest in different fashions, most importantly social, psychological, and temporal. Our pro-environmental behaviors are often limited by our fears of being judged poorly by others, criticisms which affect our self-confidence, and the idea of investing non-trivial amounts of time in our behaviors only to reap little or no benefit.

The *Lacking Knowledge* subscale is made up of barriers related to Perceived Risks and Limited Cognition. Limited Cognition manifests itself through our “ancient brain”, which has not evolved as quickly as our societal advancements. This presents complex issues, including our ignorance, uncertainty, perceived behavioral control, and self-efficacy. Perceived Risks are once more present, especially in the form of spatial, temporal, and functional risks. People might feel they do not fully understand the complexities of the situation, that they do not have enough information to enact change, and even that they do not know how or where to start the change.

Lastly, the *Tokenism* subscale consists of the Limited Behavior dragon family. The Limited Behavior barriers include Tokenism and Rebound Effect dragons. In regard to the environment, Tokenism can be demonstrated when individuals are most inclined to adopt low-cost behaviors (in terms of time, money, and effort) as symbolic exercises in pro-environmental behavior. This is referred to as the “low-cost hypothesis”, which implies that humans are likely to avoid high-cost behaviors that are more effective in favor of less intense behaviors that align with their values. Rebound Effect describes when people undermine the minimal positive environmental impact of some of their actions with other, non-sustainable behaviors. The classic example is someone who buys an electric car for environmental reasons, but then drives more miles than they ever did with a traditional car.

Our survey utilizes the Dragons of Inaction to frame the obstacles that students at Virginia Tech face, contributing to the value-action gap. Each of the five developed subscales are used to summarize the critical ideas presented by Gifford’s Dragons of Inaction (Gifford, 2011; Lacroix et al, 2019).

Methods

The study surveyed students at the Virginia Tech main campus (Blacksburg, Virginia, United States) in the Spring of 2022. The team collected 765 responses through an online questionnaire over the course of a three-week-long data collection period. 90% of respondents were undergraduate students, 40% lived on campus. The colleges with the greatest representations were Engineering (27%), Science (18%), and Liberal Arts and Human Sciences (15%), matching approximately the student population distribution. 55% of students were in their first/second year and respondents’

average age was 20.8 years old. 38% identified as male and 58% as female. 65% are White, 16% are Asian/Asian American, 7% Black/African American, 6% Hispanic/Latinx. 94% of students are from the US. When asked if they have ever participated in a sustainability-related class, 58% of respondents answered 'yes', while 46% informed that they have previously participated in a sustainability-related project.

The research was designed as an exploratory, quantitative, cross-sectional study aimed to identify characteristics, patterns and correlations and test relationships between variables related to values and attitudes regarding environment and psychological barriers to pro environmental action. The survey questionnaire investigated the following constructs and measures:

Values and Opinions Regarding the Environment

Assessed using the New Ecological Paradigm, a scale with 15 items proposed by Dunlap et al. (2000), which is divided into two sub-scales: New Ecological Paradigm (NEP) and Dominant Social Paradigm (DSP). Example items in the NEP subscale would be "Plants and animals have as much right as humans to exist" and "Humans are seriously abusing the environment". Example items in the DSP subscale would be: "Humans have the right to modify the natural environment to suit their needs" and "The so-called ecological crisis facing humankind has been greatly exaggerated". The response choices were five-level Likert items ranging from strongly disagree (1) to strongly agree (5).

Psychological Barriers to Pro Environmental Behavior

Assessed with the Dragons of Inaction Psychological Barriers (DIPB), a 22-item scale proposed by Lacroix et al. (2019) and composed by five subscales. The measurement strategy starts with a question prompting respondents to select one of the major types of pro-environmental behavior that they could perform more/better than they already do (eating less meat, engaging in more sustainable forms of transportation, wearing a sweater in the winter instead of turning up the heat, reducing water use, making more eco-friendly purchases, or properly recycling everything you can). Respondents were then invited to respond why they did not adequately engage in that behavior by rating their agreement to 22 sentences. The response choices were five-level Likert items ranging from strongly disagree (1) to strongly agree (5). Reliability analyses confirmed the internal consistency of four out of the five original subscales (*Change Unnecessary*, *Conflicting Goals and Aspirations*, *Interpersonal Relations*, *Lacking Knowledge*) for the data in the present study. A factor analysis confirmed that the *Tokenism* subscale needed change since response trends to one item were significantly different from all other items. The last item in the subscale was then proposed as a separate 'subscale' named *Industry Causing*. Example items for the DIPB scale would be:

- Change Unnecessary: "There's not much point in making this change because I feel confident that technological innovators will solve environmental problems".
- Conflicting Goals and Aspirations: "I can't change because I'm invested in my current lifestyle".
- Interpersonal Relations: "If I made the necessary change, I probably would be embarrassed when others noticed what I was doing".
- Lacking Knowledge: "There's so much information out there that I'm confused about how to make this change".

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- Tokenism: “The pro-environmental efforts that I currently engage in make further changes unnecessary”.
 - Industry Causing: “It’s not fair for me to change when really it’s industry that’s causing the majority of environmental problems”.

Willingness to Engage in Sustainability-Related Campaigns. Assessed with a measurement scale proposed for this study, based on three priorities to promote change towards sustainable action on campus: reducing waste, saving energy in campus buildings, and changing to more sustainable modes of transportation.

Data analysis was conducted using quantitative methods and non-parametric statistical tests. Reliability analyses confirmed the internal consistency of all measurement scales and subscales for the data in the study. Descriptive statistics and internal consistency for all measures in the study are presented in Table 1.

Table 1

Descriptive Statistics and Internal Consistency for Study Measures

Scale	# Items	Mean	SD	Median	IQR	Internal Consistency
Values & Attitudes Regarding the Environment						
New Ecological Paradigm	8	4.10	0.52	4.13	0.71	.73
Dominant Social Paradigm	7	2.67	0.62	2.57	1.00	.71
Psychological Barriers to Pro Environmental Behavior						
Change Unnecessary	5	1.82	0.65	1.80	1.20	.82
Conflicting Goals and Aspirations	5	2.79	0.81	2.80	1.00	.73
Interpersonal Relations	4	1.76	0.73	1.75	1.67	.86
Lacking Knowledge	3	2.86	1.00	3.00	1.00	.79
Tokenism	4	2.03	0.68	2.00	2.00	.83
Industry Causing	1	3.00	1.01	3.00	2.00	one-item
Willingness to Engage in Sustainability Campaign ¹	3	3.44	1.08	3.67	0.66	.86

Note. All measures have responses choices ranging from 1 (*strongly disagree*) to 5 (*strongly agree*), except when noted. ¹ Response choices range from 1 (*not at all engaged*) to 5 (*extremely engaged*).

Results

I. What are Virginia Tech students' values and opinions regarding the environment?

In general, respondents displayed pro-environmental values and opinions: high agreement with statements reflecting the New Ecological Paradigm ($M = 4.10$), and low agreement with the Dominant Social Paradigm ($M = 2.67$). 92% of respondents agree/strongly agree that humans are seriously abusing the environment ($M = 4.49$), while 90% agree/strongly agree that humans are still subject to the laws of nature, despite special abilities ($M = 4.32$). "If things continue on their present course, we will soon experience a major ecological catastrophe" had 89% in agreement ($M = 4.42$), while 85% agree / strongly agree that plants and animals have as much right as humans to exist ($M = 4.30$) (Figure 1).

Reflecting similar trends, several statements in the Dominant Social Paradigm subscale (DSP) had high levels of disagreement. When prompted with the statement "The so-called ecological crisis facing humankind has been greatly exaggerated", 79% of respondents disagreed or strongly disagreed ($M = 1.85$). 72% of participants disagree that the balance of nature is strong enough to cope with industrial impact ($M = 2.21$). The domination of humans over nature is not a widely held belief among Virginia Tech students: 69% of respondents disagree or strongly disagree with the statement "Humans were meant to rule over the rest of nature" ($M = 2.16$). The higher levels of agreement with DSP items were 57% for "The Earth has plenty of natural resources if we just learn how to develop them" ($M = 3.57$) and 47% for "Human advancement and innovation will ensure that we do not make the Earth unlivable" ($M = 3.32$). Responses were widely balanced on the statement regarding human's right to modify the environment to suit their needs: 31% responded neutrally, while 34% agreed and 35% disagreed ($M = 3.00$). One of the strongest relationships found in this study reflects the contrast between the ideas of the New Ecological Paradigm and Dominant Social Paradigm. A Pearson correlation coefficient showed a negative relationship between students' agreement with each paradigm (correlation of -0.48 , $p \leq .001$) (Figure 2).

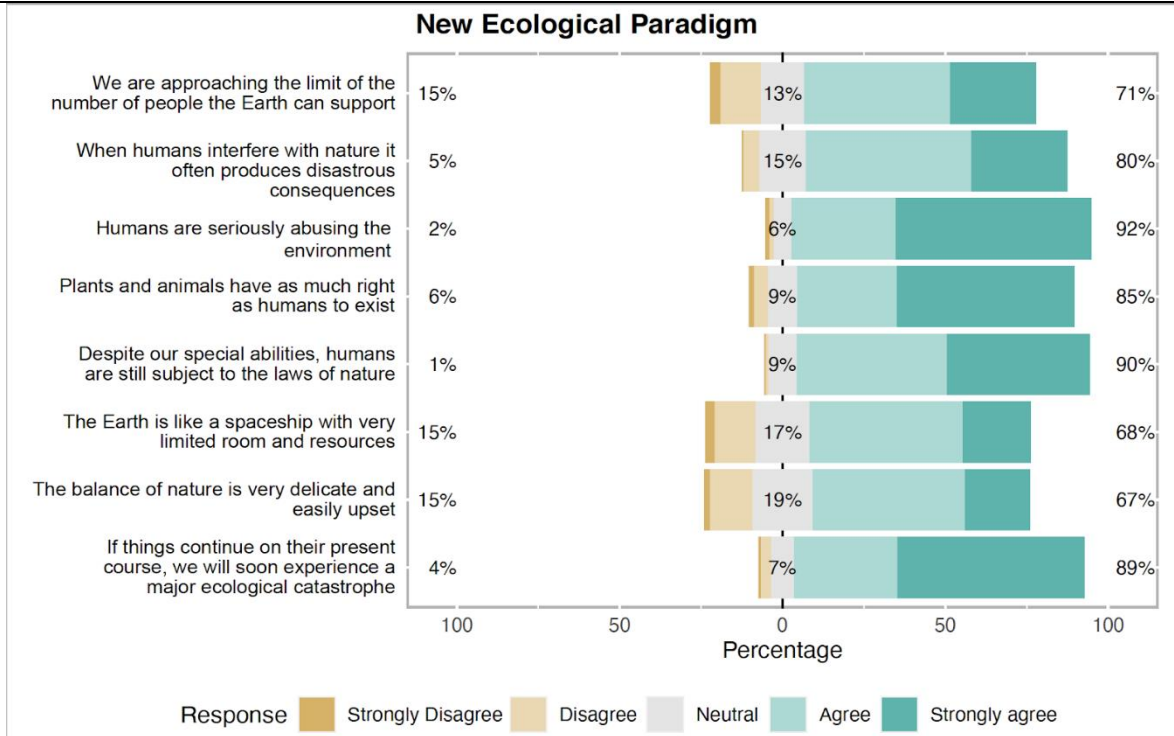


Figure 1: Distribution of Responses to the New Ecological Paradigm subscale - NEP (N = 765).

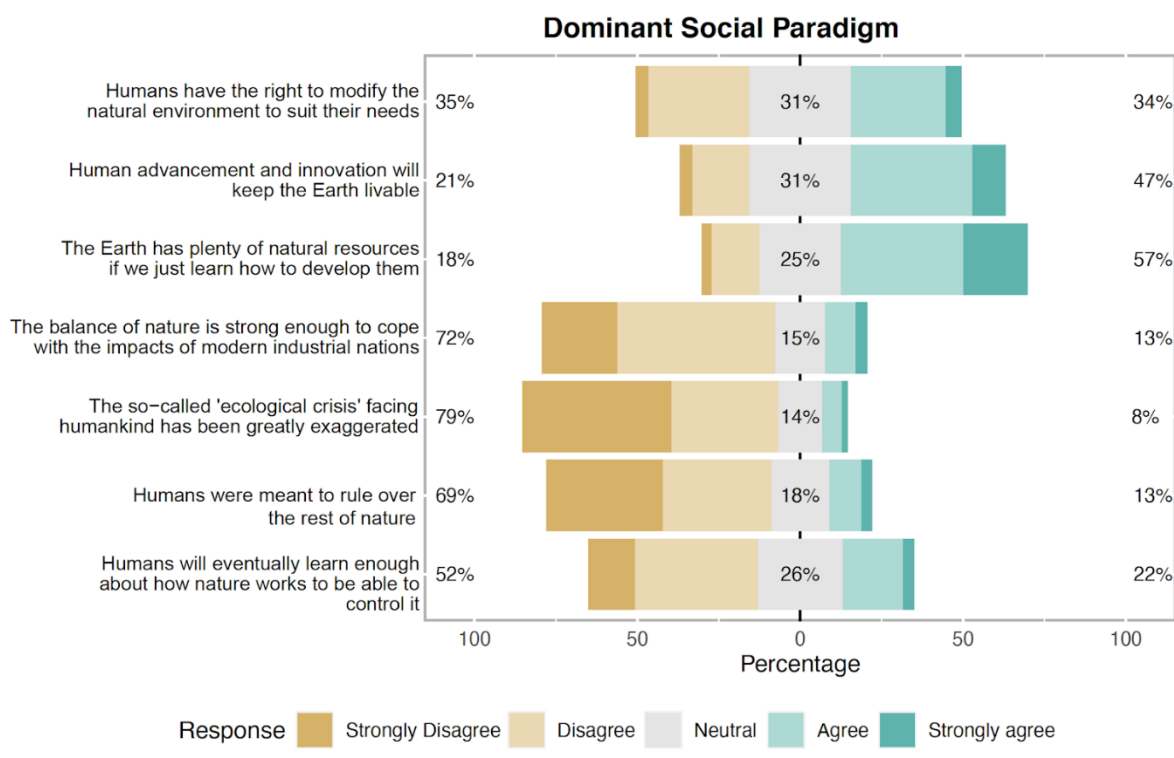


Figure 2: Distribution of Responses to the Dominant Social Paradigm subscale - DSP (N = 765).

Differences across demographic groups

A Kruskal-Wallis test showed a significant difference was found in the level of agreement with the Dominant Social Paradigm across the nine different colleges ($H = 30.671, p \leq .001$). Members of some colleges align more closely with the Dominant Social Paradigm than others: a Pairwise Wilcoxon rank sum comparison revealed that students in Agriculture and Life Sciences and Architecture and Urban Studies were less likely to follow the Dominant Social Paradigm than were students in Engineering. Significant difference between gender groups regarding environmental values and attitudes was found for both subscales. For support to the New Ecological Paradigm, females ranked higher than males (Mdn = 4.25 over 4.00, $p \leq .001$), while for support to the Dominant Social Paradigm, males ranked higher than females (Mdn = 2.86 over 2.43, $p \leq .001$).

Influence of participation in sustainability classes or projects

Participation in sustainability classes granted less support for the Dominant Social Paradigm. A Wilcoxon Rank Sum test showed that there was a statistically significant ($W = 63454, p \leq .001$) between the participants who had taken a sustainability class before (Mdn = 2.57) compared to participants who have not taken a sustainability class before (Mdn = 2.71) regarding agreement with the Dominant Social Paradigm. Previous participation on a sustainability-related project affected students' values and attitudes regarding the environment. Students who participated in projects supported statistically significantly more the New Ecological Paradigm than students who did not participate in these projects (Mdn = 4.12 over 4.12, $W = 85043, p \leq .001$). Conversely, students who did not participate on a project supported more the Dominant Social Paradigm than those who participated on a project (Mdn = 2.71 over 2.57, $W = 58280, p \leq .001$).

II. What are the most prominent psychological barriers to pro environmental behavior among Virginia Tech students?

Data analysis showed that the three most prominent psychological barriers were Conflicting Goals & Aspirations ($M = 2.79$), Lacking Knowledge ($M = 2.86$), and Industry Causing ($M = 3.0$). There was no significant difference among these three barriers. There was a clear contrast between responses to these scales and the responses to the least prominent psychological barriers: Change Unnecessary ($M = 1.825$), Interpersonal Relations ($M = 1.76$), and Tokenism ($M = 2.03$). Overall, the individual items with the highest rate of agreement were "These issues are important to me but it's too hard to change my habits" and "I'd like to change but I'm not sure where to start" with 55% and 50% of respondents who agree, respectively. On the other side, several items in the three least prominent barriers had exceptionally high levels of disagreement, ranging from 73% to 89%. In addition to the prevalence of the three main psychological barriers, there are a number of significant positive correlations among the subscales: positive correlations between Conflicting Goals & Aspirations and Industry Causing ($r = .36, p \leq .001$), Conflicting Goals & Aspirations and Lacking Knowledge ($r = .23, p \leq .001$), Change Unnecessary and Tokenism ($r = .62, p \leq .001$), Change Unnecessary and Interpersonal Relations ($r = .53, p \leq .001$), and Interpersonal Relations and Tokenism ($r = .47, p \leq .001$) (Figure 3).

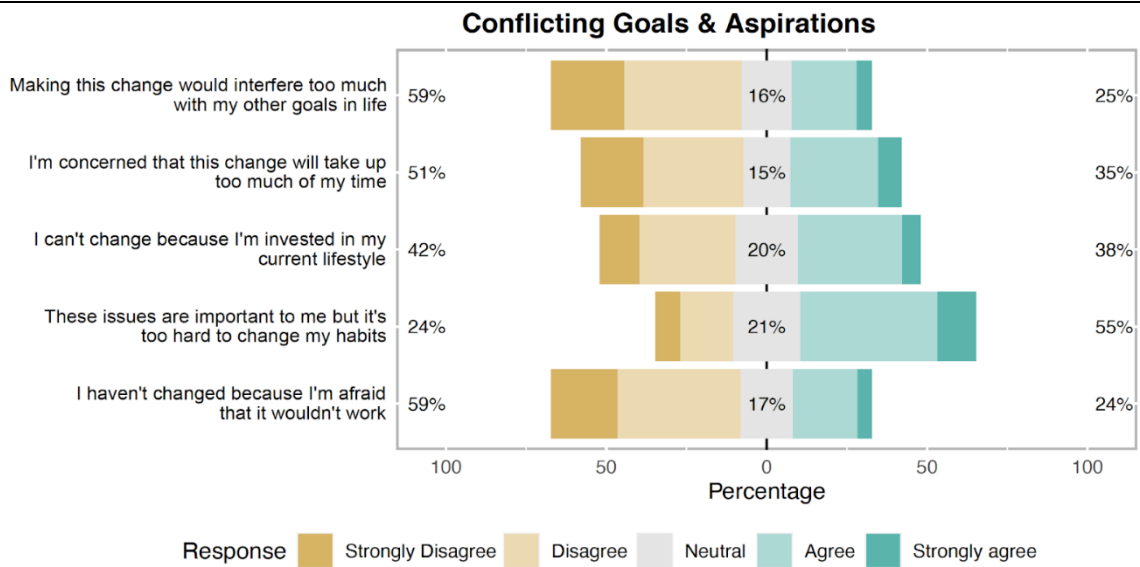


Figure 3: Distribution of Responses to the Most Prominent Barriers: Conflicting Goals and Aspirations (N=765)

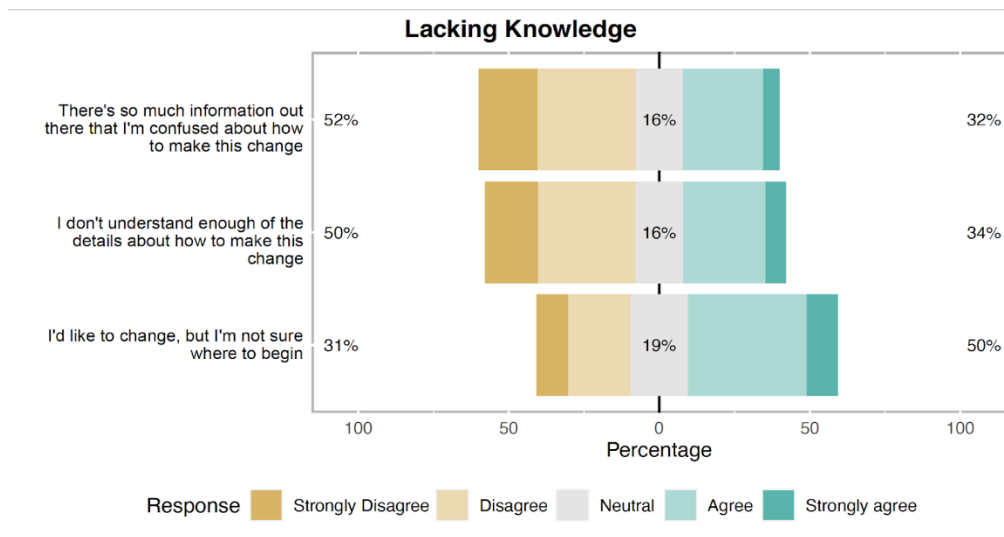


Figure 4: Distribution of Responses to the Most Prominent Barriers: Lacking Knowledge (N=765)

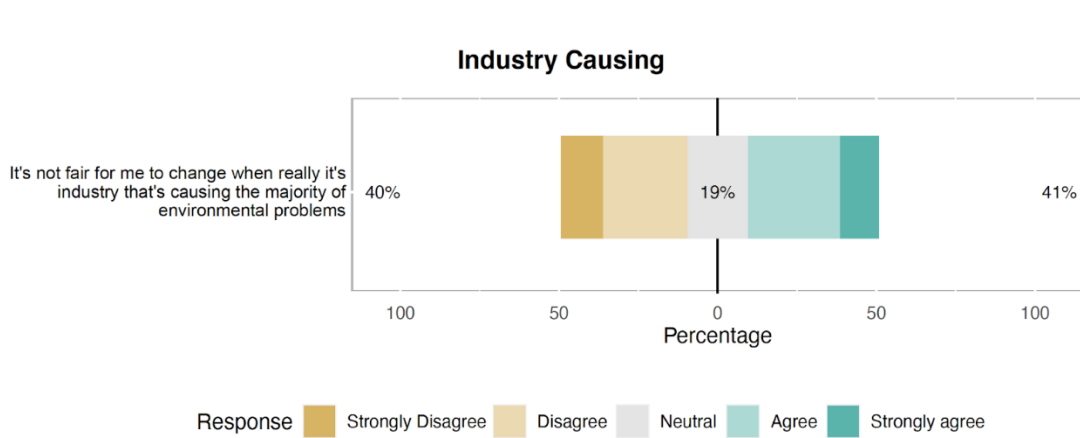


Figure 5: Distribution of Responses to the Most Prominent Barriers: Industry Causing (N=765)

Differences across demographic groups

After analyzing the data on how the psychological barriers were distributed across demographic groups, a few significant differences have been found. For instance, Lacking Knowledge as a psychological barrier to pro-environmental behavior was different when comparing first-year and fourth-year students ($H = 16.466, p \leq .001$): first-years were more likely to consider the lack of knowledge as a barrier (Mdn = 3.00) than fourth years (Mdn = 2.67). This key piece of data can help to guide the Office of Sustainability in their efforts of assisting younger students in knowing more about sustainable efforts. A significant difference in psychological barriers across the colleges was found only for the Change Unnecessary subscale ($H = 28.729, p \leq .001$). Students in Architecture and Urban Studies (Mdn = 1.40) were less likely to agree that pro environmental change is not necessary than students in three other colleges: Engineering (Mdn = 1.80), Science (Mdn = 1.80), Business (Mdn = 2.00).

Males had higher agreement with the Change Unnecessary barrier than females. Females were also less likely to agree with the Interpersonal Relations. For Tokenism, tests also indicated a statistically significant difference between males and females. Lastly, for Industry Causing, differences were found between males and females and between respondents who prefer to self-identify and those who prefer not to disclose their gender.

Influence of participation in sustainability classes or projects

There was no statistically significant difference in any of the 6 psychological barriers found between respondents who had previously taken a sustainability-related class as opposed to those who hadn't, as shown by a Wilcoxon Rank Sum test conducted. On the other hand, the test showed that previous participation in a sustainability-related project can generate differences in score for two barriers: Change Unnecessary and Interpersonal Relations: those who had previously worked on a sustainability-related project ($n = 353$) were more likely to disagree with items in the Change Unnecessary subscale ($W = 60,302, p < .001$) than those who did not previously participate in a project ($n = 412$). Students who participated in projects were also less likely to agree with interpersonal relations items as barriers than those who did not participate before ($W = 64,696, p < .001$).

III. How much are students willing to engage in sustainability-related campaigns?

Participants demonstrated high levels of willingness to engage in case the Virginia Tech Office of Sustainability proposes a sustainability-related campaign ($M = 3.44$). The questionnaire investigated students' perception of three possible campaigns, based on current strategic goals of the office. 51% of respondents would be very/extremely engaged in a campaign aimed at efforts to decrease waste generation on campus ($M = 3.41$), while 51% would be very/extremely engaged in efforts to save energy on campus buildings ($M = 3.37$). Changing to more sustainable modes of transportation was the topic that would have the highest level of engagement: 57% of respondents would be very or extremely engaged in a campaign towards this goal ($M = 3.52$) (Figure 6).

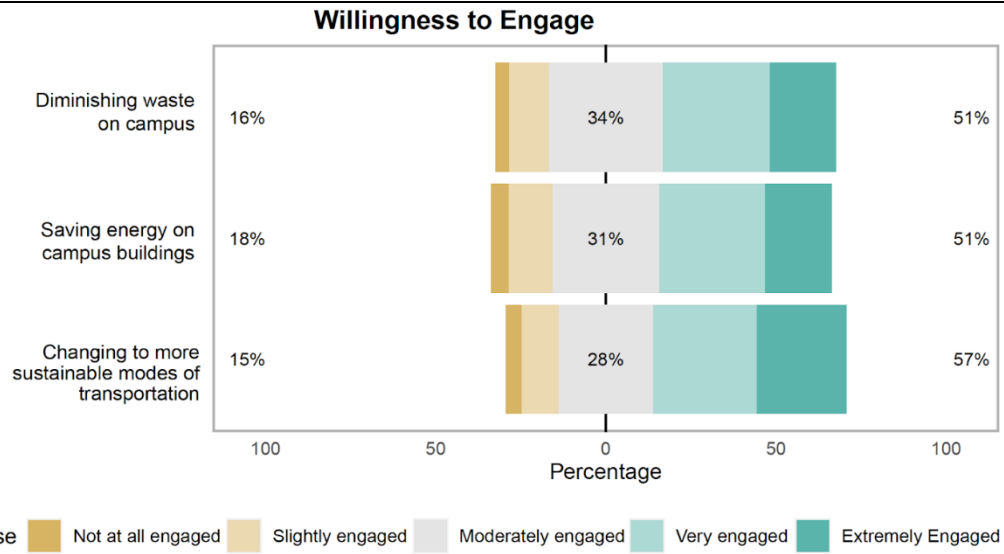


Figure 6: Distribution of Responses to items related to Willingness to Engage in a Sustainability-Related Campaign on Campus (N=765)

Differences across demographic groups

Comparison tests were completed to find statistical significance between respondents' willingness to engage in sustainability-related campaigns and their demographic information. We found a difference across colleges ($H = 35.303$, $p \leq .001$). Students in Architecture and Urban Studies (Mdn = 4.00) were more likely to engage than students in Agriculture and Life Sciences (Mdn = 3.67), Engineering (Mdn = 3.33), Liberal Arts and Human Sciences (Mdn = 3.33), Business (Mdn = 3.00).

Differences in gender groups regarding willingness to engage in a sustainability campaign were statistically significant ($W = 15.264$, $p \leq .001$). Females (Mdn = 3.67) were more likely to engage than males (Mdn = 3.33); and those who preferred to self-identify (Mdn = 4.00) were also more engaged than males.

Influence of participation in sustainability classes or projects

Students who previously attended a sustainability class are more willing to engage in a sustainability campaign at the university than students who did not attend a class before. Comparison tests show a significant difference ($W = 80917$, $p \leq .001$). Similarly, students who participated in a sustainability project before expressed higher levels of willingness to engage than those who had not participated in a project (Mdn = 3.67 over 3.33).

IV. How are the main constructs in the study correlated?

Correlation tests were conducted to identify relationships among the main constructs in the study. A moderate negative correlation was found between the New Ecological Paradigm and the Change Unnecessary Subscale ($r = -.44$, $p \leq .001$). Along the same lines, a moderate positive correlation between the Dominant Social Paradigm subscale and the Change Unnecessary subscale was identified as well ($r = 0.50$, $p \leq .001$). This set of results indicate that participants who responded pro-environmentally did not think their decisions and actions were related to a lack of need for change, while respondents with more support for the dominant social paradigm are more likely to think that change is not necessary. Another relationship was identified between students' agreement with the New Ecological Paradigm and their willingness to engage in a sustainability campaign – a weak positive correlation ($r = .29$, $p \leq .001$).

Discussion

Strong support for pro-environmental values

Results showed wide support for pro-environmental values across respondents and suggest that students at Virginia Tech do recognize the danger of climate change and do think change is necessary. Students, from undergraduate to graduate across different demographics, all expressed concern about current environmental actions. Based on our data, there is a larger portion of students who adhere to the New Ecological Paradigm as opposed to the Dominant Social Paradigm.

Our survey aimed to understand the potential barriers as to why individuals do not take environmental action. The common assumption for this phenomenon is that people are not aware of the climate issue, do not care about it, or are perhaps unaware of the severity of it. Our data did not confirm this assumption: on the contrary, students showed a high level of awareness and concern for the environment. However, concrete engagement with significant sustainable behaviors is not at the same level. It indicates that, if pro-environmental behaviors are not occurring, it is likely due to psychological barriers as opposed to a lack of pro-environmental values. There seems to be a disconnect between the values of the respondents and their associated action regarding the environment, confirming the existence of barriers and a value-action gap, as stated in the work of Kollmuss and Agyeman (2002), and that of Robert Gifford (2011): values do not always manifest into action, there are psychological barriers which prevent people from acting in total alignment with their values.

Psychological barriers to pro environmental action

The most prominent barriers students at Virginia Tech face were that they lack knowledge about pro-environmental behavior, have conflicting goals and aspirations regarding their behavior, and believe that industry was at fault for propagating issues caused by climate change. Although the need is recognized, change might seem difficult. Several participants were hesitant to change their habits because they are confused about where to begin making changes in their lives. It might seem too hard to change their habits because committing to a more sustainable lifestyle would interfere with other goals or because they were too invested in their current lifestyle. Several students viewed it as unfair that they would have to take the initiative towards sustainability when they believe industry to be the major cause of climate change. Social pressures are not affecting people's environmental attitudes and again there is something else affecting the behavior. Most participants showed barriers related to limited cognition in different ways.

Differences across groups

The demographic group that had the most differences in their responses was gender. Women expressed higher support for the New Ecological Paradigm than men, while men supported the Dominant Social Paradigm more than women. Men were more likely to agree with statements reflecting psychological barriers as Change Unnecessary, Interpersonal Relations, Tokenism, and Industry Causing), while women were more likely to engage in a sustainability campaign. Engineering students were more in agreement with the Dominant Social Paradigm, while students in Architecture and Urban Studies were more likely to agree that pro environmental change is necessary. First-year students agreed more with the "lacking knowledge" barrier.

Engaging in a Sustainability Campaign

Between the initiatives suggested (decreasing waste generation, saving energy, adopting more sustainable modes of transportation), students showed almost equal willingness to engage, with 50% or more participants stating that they would be very/extremely engaged. The demographic factors that increased the likelihood of students engaging in a sustainability campaign were being female and

having previously participated in a sustainability-related project. Students in Architecture and Urban Studies were more likely to engage.

Influence of previous participation in class and projects

Previous participation in sustainability classes and projects granted more support for environmental attitudes and more willingness to engage in a sustainability campaign. These findings might illuminate the importance of engaging students through class and projects. Key factors would be increased environmental knowledge, lived experience and practical involvement with community organizing and alternative lifestyles, peer support for change, among others. One important factor we want to highlight is that, through their participation in classes and projects, students are likely to be more protected against environmental numbness (Gifford, 2011), as their main source of information about the ecological crisis would be other than the constant bombardment of information through social media and other news outlets.

Conclusion

Students at Virginia Tech widely express environmental values and concern about climate change. Sustainability efforts at the university should operate from the understanding that students have concerns about the state of human activity affecting the environment, agree that action should be taken to promote sustainability, and might want to have more pro-environmental lifestyles; but they might need help translating those beliefs into action. Future sustainability campaigns should acknowledge the barriers students face: lack of knowledge about how to change, difficulty to transform habits and lifestyles, and a feeling of unfairness in face of industry-caused environmental degradation.

To address the lack of knowledge, more prominent in younger students, the university could integrate sustainability-related content to introductory courses for all majors. We recommend developing a foundational two-part module series to be added to courses in the university's First-Year Experience program: (a) part one would teach basic knowledge on climate change, impact of human activities in the environment, and potential socio-ecological change in the individual and collective level; (b) part two would investigate the connections between sustainability efforts and the students' specific majors and minors, introducing students to notions of professional responsibility on how social, cultural and environmental resources will be used in the future. Additional courses on these subjects could also be integrated into existing curricula in Pathways, the university's general education curriculum.

To address the difficulty of changing habits, we recommend that the university implements campaigns on campus that are easy to understand and adopt and build upon with students' pre-existing habits. Expanding experiential learning opportunities aimed to provide opportunities to develop sustainability-related skills and competencies is highly recommended as well. Advancing partnerships between academic departments, the Office of Sustainability, and VT Engage: The Center for Leadership & Service Learning might provide increased opportunities for hands-on experience in sustainability projects in direct involvement with the local community, besides offering a way toward collective engagement and citizen participation (which would also balance the feeling of unfairness of taking individual responsibility for a systemic crisis).

Our study investigated research questions about college students' values, attitudes, and barriers to behavior change related to sustainability. The answers to these questions provide insight into the state of environmental awareness and behavior at Virginia Tech and perhaps hint at trends in American college campuses in general. Education and citizen engagement for sustainable development remains a fundamental area for investment as universities strive to fulfill their role in fostering a culture of sustainability.

Acknowledgements

This study is part of a course-based undergraduate project in the Virginia Tech Honors Culture of Sustainability Lab (UH 3504), developed in partnership with the VT Office of Sustainability and sponsored by a grant from the VT Office of Undergraduate Research.

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