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Graduating Greener: Analysis of a Non-price Intervention to Encourage Pro-environmental Behavior Among College Students

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GRADUATING GREENER: ANALYSIS OF A NON-PRICE INTERVENTION TO ENCOURAGE PRO-ENVIRONMENTAL BEHAVIOR AMONG COLLEGE STUDENTS

by

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Abstract

According to the Yale Program on Climate Communication, a majority of Americans report worrying about climate change, yet the proportion of Americans who discuss climate change often with friends and family is around half of the worried percentage. This discrepancy illustrates a habit of climate avoidance and climate inaction. Drawing upon psychology and human-centered design, I assisted Dr. Michael A. Smyer in developing *Graduating Greener*, a workshop aimed at disrupting climate avoidance and promoting pro-environmental behavior through a sequence of social, environmentally-based activities. In this thesis, I investigate concepts from the field of behavioral economics which inform and align with the approach of the workshop as a non-price behavioral intervention. I also discuss the shortcomings of mainstream economic theory in solving the climate crisis and the ways in which this workshop appeals to aspects of human behavior which neoclassical theory fails to address. In the Spring of 2022, I conducted a pilot study to evaluate the impacts of the workshop on small groups of two to five students. Data from the pilot study did not indicate notable treatment effects for aggregate levels of pro-environmental behavior and hope. Although a significant treatment effect was not detected, likely due to small sample size, the results from the pilot study show that the greatest increase observed between pre- and post-treatment data is in aggregate concern. Furthermore, qualitative observations based on open-ended responses in the post-treatment questionnaire suggest that the *Graduating Greener* workshop impacted levels of efficacy and retention of climate action strategies for participants in the experimental treatment group. My findings suggest that *Graduating Greener* and other behavioral interventions which engage similar behavioral and psychological phenomena are particularly promising for increasing concern. I recommend that this study be expanded and replicated for a larger subject pool. Additionally, this

workshop is a low-cost intervention which institutions of higher education could offer as programming through student organizations or first-year Orientation. The *Graduating Greener* workshop, intended to be facilitated by a member of the community to which they are presenting (e.g. a college student leading a workshop for other college students) promotes peer-to-peer connection pertaining to climate change as well as a social norm of climate communication among college students.

I. Introduction

The existential threat of climate change and environmental degradation poses risks to current and future generations. Due to the magnitude of the crisis, it is common for people to worry about climate change but lack the belief that they can personally make a difference in solving such a massive issue and are unaware of pro-environmental action strategies which they can implement in their daily lives to combat climate change. Facing this feeling of powerlessness, these individuals may strategically avoid anxiety-inducing climate discussion altogether and instead form habits of climate avoidance. This climate avoidance problem demonstrates a need for an intervention which promotes climate discussion in order to increase levels of pro-environmental behavior and combat the climate crisis on an individual level and social level.

This paper analyzes the *Graduating Greener* workshop, a behavioral intervention which I helped to develop with Dr. Smyer at Bucknell University. *Graduating Greener* is based in human-centered design which draws upon concepts from behavioral economics and climate psychology in order to promote pro-environmental behavior. This intervention, typically performed in a group setting, consists of a visualization/sketching exercise, an online card-sorting module, and a goal-setting activity. Climate psychologists Van der Linden, Maibach, and Leiserowitz (2015) provide five key suggestions from psychological science for improving public engagement with climate change: "(a) emphasize climate change as a present, local, and personal risk; (b) facilitate more affective and experiential engagement; (c) leverage relevant social group norms; (d) frame policy solutions in terms of what can be gained from immediate action; and (e) appeal to intrinsically valued long-term environmental goals and outcomes" (Van der Linden *et al.*, 2015). The workshop aims to critically engage participants with consideration

of these insights. To emphasize the personal nature of climate risks, participants are presented with prompts to think about a place which has special meaning to them in order to induce place attachment. Participants and the presenter engage affectively through sharing anecdotes about personal experiences. Furthermore, during the card-sorting module, previous experience with climate behavior is celebrated and participants are invited to set a goal to carry out a climate action in the future. The workshop leverages peer social comparison by identifying descriptive norms of pro-environmental behavior from other participants. Although short-term gains are framed as avoidance of losses (via a self-imposed consequence in the event that a participant fails to honor their climate goal), participants are empowered to derive meaning and gain from engaging in problem- and meaning-focused coping strategies. The workshop appeals to intrinsic motivations for combating climate change through place attachment induction and meaning-focused coping instead of extrinsically incentivizing pro-environmental behavior through price intervention.

Climate change has been labeled the "greatest market failure the world has ever seen" (Stern, 2006). In this paper I argue that the mainstream economic approach is inadequate to solve climate change issues. I identify shortcomings within the neoclassical model and I demonstrate relevant deviations to behavioral economics and psychology made by the *Graduating Greener* intervention to incorporate human behavior. I critically review policy implications which derive from mainstream economic theory, primarily the market regulation of carbon (emissions taxes and cap-and-trade policies). Behavioral economics offers a critique of such theory and posits instead that consumers are irrational and employ non-price considerations (such as moral considerations) when consuming and exhibit consumption behaviors which are subject to change through various interventions, nudges, and other strategies. Behavioral economics and climate

psychology share the objective of effecting social change and have developed nominally different strategies towards this end. Applying behavioral economics concepts to climate psychology strategies will allow an analysis of the individual actor in the collective action problem of the climate crisis. I discuss theories of identifiable victims, intertemporal choice, strategic avoidance of information, moral wiggle room, nudge theory, and prospect theory in the context of climate concern and climate behavior. Behavioral economics explains (market and non-market) aspects of human activity which the neoclassical approach either ignores or rejects.

In this thesis, I will review the important concepts and literature which informed workshop design through a synthesis of climate psychology and behavioral economics. I will then examine how this synthesis challenges and complicates climate conceptions and subsequent policy solutions proffered by mainstream economic theory. Additionally, I will provide an overview of the pilot study which I carried out to determine the impacts of the workshop on participants' levels of climate concern, pro-environmental behavior, and hope for future climate solutions. Finally, I will discuss the trends and outcomes indicated by the data resulting from the study.

II. Literature Review

A. Current State of Climate Change and Climate Opinions

In a presentation titled "Climate Change: Identifying Publics to Enhance Understanding and Engagement" from 2013, Edward Maibach, professor and director of the Center for Climate Change Communication at George Mason University, summed up five key messages about climate change in ten simple words: "It's real. It's us. It's harmful. Scientists agree. There's hope." (Maibach 2013). ***It's real:*** the Fourth National Climate Assessment (2018) reports

observable changes in the atmosphere (including increased global average temperature); ice, snow, and water; oceans and coasts; and land and ecosystems at unprecedented rates over the previous decades. ***It's us:*** According to the Intergovernmental Panel on Climate Change (IPCC), "Growth in anthropogenic emissions has persisted across all major groups of [greenhouse gasses] since 1990, albeit at different rates. By 2019, the largest growth in absolute emissions occurred in CO2 from fossil fuels and industry followed by CH4, whereas the highest relative growth occurred in fluorinated gases, starting from low levels in 1990 (high confidence)" (Intergovernmental Panel on Climate Change 2022). The IPCC report on Impacts, Adaptation and Vulnerability asserts human society is responsible for the recent increase in extreme weather events which causes increasingly irreversible damage to certain ecosystems. ***It's harmful:*** Climate change and extreme weather also pose significant risks to human health (both physical and mental), water security and food production, infrastructure and the economy, and ecological biodiversity (Intergovernmental Panel on Climate Change, 2022; U.S. Global Change Research Program, 2018). ***Scientists agree:*** there is a broad consensus of 97% within the scientific community that climate change is primarily caused by increased concentration of greenhouse gas emissions resulting from human activity (Cook *et al.*, 2013; Cook *et al.*, 2016). ***There's hope:*** Although the IPCC notes that some ecosystems have suffered irreversible damage, the report emphasizes the imminent need for risk reduction, mitigation, and adaptation in order to establish ecological and societal resilience and limit warming. In other words, we have to act fast, but it's not too late!

The Yale Program on Climate Change Communication (YPCCC) segments climate opinions in the United States into six categories: alarmed, concerned, cautious, disengaged, doubtful, and dismissive. These "Six Americas" denote different levels of climate concern and

engagement, ranging from “alarmed” (the most concerned and engaged) to “disengaged” (the least concerned and engaged) to “dismissive” (whose concern and engagement may be directed toward discrediting the impacts of climate change). According to the most recent Global Warming Six Americas report from September 2021, 33% of Americans are alarmed, 25% are concerned, 17% are cautious, 5% are disengaged, 10% are doubtful, and 9% are dismissive. The report notes that, since data collection and reporting for these six groups began in 2008, the ‘alarmed’ group has seen the most growth (+15). In 2008, the largest groups were ‘concerned’ (32%) and cautious (22%). Though the plurality of the U.S. population falls under the ‘alarmed’ designation, the ‘concerned’ and ‘cautious’ groups account for nearly half of the nation, for which further climate engagement is recommended (Maibach 2013).

According to the YPCCC, 64% of the U.S. population is “somewhat worried” or “very worried” about global warming, yet only 33% reported discussing global warming “occasionally” or “often” with family members or friends. This discrepancy illustrates the phenomenon of climate avoidance. Dr. Smyer, psychologist and professor emeritus, describes the climate avoidance habit through the following thought process: “*Climate change>It’s too big>I can’t do anything about it>I’m not going to talk/think about it*.” (Smyer, 2018). Thunström *et al.* (2014) theorized that strategic ignorance of environmental harms, which is associated with reduced levels of pro-environmental behavior, is useful to minimize feelings of guilt, but the cost of strategic ignorance is increased when one receives information about the pro-environmental behaviors of others because this ignorance violates the social norm. Golman, Hagmann, and Loewenstein (2017) consider climate denial, by the rejection of scientific consensus, to necessarily require information avoidance. However, information avoidance does not require climate denial - someone can believe in climate change and still avoid information about the

extent of risk and damage of the climate crisis in order to avoid subsequent feelings of anxiety.[1] The *Graduating Greener* intervention seeks to disrupt this climate avoidance, increase the cost of strategic ignorance, and engage the 'concerned' and 'cautious' groups.

B. Concern

The *Graduating Greener* workshop is designed to employ several different concepts and theories from psychology and behavioral economics that are hypothesized to increase participants' pro-environmental behavior. In particular, the workshop targets aspects of concern about negative impacts of climate change, hope that humans will be able to solve problems caused by climate change, and behavior which seeks to combat climate change (energy reduction, recycling, etc). I decided to focus on the three domains of concern, behavior, and hope to frame the measurements of outcomes of the pre-/post-treatment questionnaires for the pilot study. Additionally, I structure my literature review through these three categories.

These domains of inquiry derive from a proposed model by Stevenson *et al.* (2018) which posits that increased levels of concern and hope correlate with increased pro-environmental behavior (Stevenson *et al.*, 2018; Stevenson and Peterson, 2016).

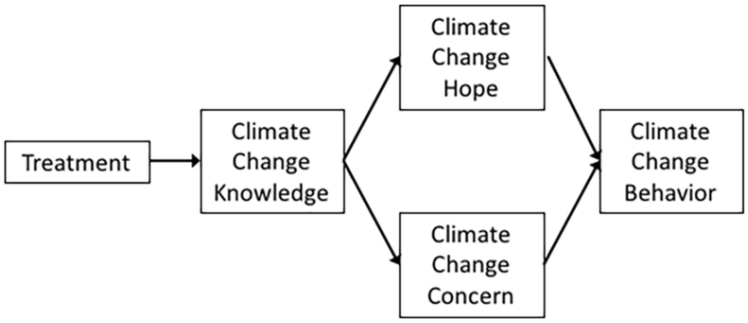

Figure 1: Hypothesized Model of Climate Change Behavior (Stevenson et al., 2018)

[1] Information avoidance will be discussed further in the Theory section.

The hypothesis depicted in *Figure 1* is that educational interventions will expand climate change knowledge. Increased knowledge will then impact hope and concern, which will in turn impact environmental behavior. Although Stevenson *et al.* did not find that knowledge predicted behavior (they suggest that this effect was mediated by hope and concern), this model serves as a useful framework to identify the primary domains which affect climate change behavior.

A characteristic of the climate crisis is the unequal distribution of negative impact over different geographies, communities, and time periods. For some individuals, climate change is not a challenge confronted in everyday life, but an abstract danger with threats to the future or particularly vulnerable locations. Van der Linden *et al*. (2015) note that "[a]s temporal distance increases, mental representations become less concrete and increasingly abstract. Accordingly, research has found that many people view climate change as a psychologically distant, future threat" (Van der Linden *et al*., 2015; Leiserowitz, 2005; Spence *et al.*, 2012). Thus, the larger the psychological distance from environmental degradation, the more avoidable and ignorable climate change becomes. In a meta-analysis, Maiella *et al*. (2020) find that, in general, lower levels of psychological distance foster increased engagement in pro-environmental behavior. Spence and Pidgeon (2012) find that psychological closeness correlates with increasing levels of concern. Wang *et al.* (2019) build upon the findings of Spence & Pidgeon (2012) by analyzing psychological closeness and construal theory with regard to pro-environmental behavior and found psychological closeness to be a predictor of individual-level, as opposed to collective-level, environmental behavior. Thus, closing psychological distance is crucial to breaking habits of climate avoidance.

Another concept similar to the notion of psychological distance/closeness is the theory of the Identifiable Victim Effect, from the field of behavioral economics, which posits that people

feel stronger emotional responses and increased perceived responsibility to help when confronted with an identifiable victim than with a statistical victim (Kogut and Ritov, 2005). For example, an advertisement featuring a malnourished child will be more effective at eliciting donations than an advertisement which displays a relevant statistic about malnutrition. Furthermore, emotional response is maximized when there is a single perceived victim instead of a group; this is known as the singularity effect (Kogut and Ritov, 2005; Lee and Feeley, 2016). Identifiable victims are theorized to decrease psychological distance between an individual and the issue which affects the victim.

Another method thought to increase one's personal concern and decrease psychological distance is by invoking place attachment. Place attachment, though conceptualized in many ways by different studies, can broadly be defined as a personal bond with a place based in meaning and feeling (Krasny, 2020; Jorgenson and Steadman, 2001). Research has shown place attachment to be associated with pro-environmental attitude and behavior (Halpenny, 2010; Wickersham *et al*., 2020). Many studies have observed that increased place identity, a sub-dimension of place attachment which forms one's identity in relation to a particular place through ideas, emotional responses, values, etc., is linked to increased concern for these places of attachment although other studies have observed no association (Proshansky, 1978; Halpenny, 2010; Bricker and Kerstetter, 2000; Kyle *et al.*, 2004; White *et al*., 2008). As such, meaningful places act as an identifiable victim toward which participants can conceptualize environmental threat. Wickersham *et al.* (2020) conducted a study in which they asked participants to complete writing tasks intended to induce legacy concern or place attachment prior to self-reporting their environmental behaviors and find that place attachment inductions are associated with positive impacts in pro-environmental behavior, though they also note that "there was no effect of either

induction on hazard belief and concern." This research suggests that place attachment inductions are promising for increasing concern and pro-environmental behavior (Wickersham *et al*., 2020). As such, the *Graduating Greener* workshop employs an induction for place attachment by instructing participants to visualize a place to which they attach special meaning. This particular exercise is described further in the Workshop Design section of this paper.

C. Hope

Because of the magnitude and existentially-threatening nature of the climate crisis, feelings of hopelessness have been identified as barriers to engaging with pro-environmental behavior (Ojala, 2018). It is necessary to manage negative emotions associated with the negative impacts of climate change. Li *et al.* (2019) argue that higher levels of concern correlate with higher levels of hope. Li *et al.* (2019) apply the Reasonable Person Model (RPM) developed by Kaplan and Kaplan (2009) to climate change and explore the three variables of inquiry within the RPM: model building, meaningful action, and being effective. Model building refers to "participants' level of knowledge and understanding of climate change which will enable them to be comfortable and confident" (Li, 2019). Stevenson *et al*. (2014) found evidence that increased knowledge and "climate literacy" predicted increased concern (Stevenson, 2014). Meaningful action describes "the need for people to know how and believe they can participate in making a difference" in the climate crisis (Li, 2019). The condition of belief in oneself to contribute impactfully in combating climate change is closely connected to the notion of 'being effective,' which entails the belief that society and the general public have the ability to make a difference. It should be noted that Li *et al.* (2019) find these three variables to be associated with each other.

The concepts outlined by the Reasonable Person Model and its application to the climate crisis are useful in effecting pro-environmental behavioral change.

Another, more counterintuitive, effect of high psychological distance is hyperopic concern: increased distance from environmental problems causes an individual to perceive such problems to be more serious and daunting (Uzzel, 2000). This overestimation of seriousness may increase feelings of doom-and-gloom, powerlessness, and climate avoidance. This signals the need for accurate model building in order to clarify misconceptions of the climate crisis and also increase feelings of efficacy.

Meaning-Focused Coping and Action. In the context of the climate crisis, coping strategies are the ways in which an individual processes and responds to the emotional experiences of environmental degradation. The transactional theory of coping posits three types of coping: emotion-focused, problem-focused, and meaning-focused (Lazarus and Folkman, 1984). The objective of emotion-focused coping is to diminish or eliminate negative emotions which arise through psychologically distancing oneself from the problem at hand. Climate avoidance, by which an individual may deny the climate crisis entirely or avoid conversations regarding and confrontations with climate change, is an emotion-focused coping strategy. Problem-focused coping is solution-oriented; problem-focused strategies directly confront the problem through action.

Meaning-focused coping entails the development of positive feelings, such as hope, in the struggle against the problem and may exist in conjunction with problem-focused coping. For example, an environmental activist may find personal hope in community with her fellow activists who share in this struggle. This meaning-focused coping strategy may empower her to

continue climate activism, a problem-focused strategy. Problem- and meaning-focused coping strategies are correlated with pro-environmental behaviors (Ojala, 2016).

Meaningful action has been identified as a sub dimension of hope and fundamental for solution-oriented behaviors. Thus, effective behavioral interventions must serve to identify meaningful actions for participants and provide circumstances conducive to meaning- and problem-focused coping strategies. Besides presenting options of problem-focused climate action strategies, the *Graduating Greener* intervention seeks to elicit positive feelings associated with combating climate change through the social and optimistic qualities of the workshop in order to promote meaning-focused coping.

Efficacy. Li and Monroe (2018) describe self-efficacy as "an individual's belief in his or her capacity to control one's own behavior to produce specific performance-based attainments." This definition is similar to Li's notion of "being effective," which describes "the extent to which people perceive that they have the skills and are able to take actions and address problems."(Li, 2019). A study involving adolescent pro-environmental behavior found that higher levels of perceived self-efficacy were linked to more reported pro-environmental behavior and suggests that perceived self-efficacy is predictive of these behaviors (Meinhold and Malkus, 2005).

Collective efficacy, which refers to beliefs that a group, collectively (through the aggregation of individual actions and/or collaborative group action), has the ability to impact an issue, is another important component of hope because climate change is a collective action problem and requires group cooperation. Collective efficacy has been found to be an even stronger predictor of reported pro-environmental behavior and problem-focused coping than self-efficacy (Chen, 2015). The notion of participative efficacy posits that strong collective efficacy beliefs will increase an individual's likelihood of participation in behaviors toward a

particular goal through empowering "beliefs that one's own actions will 'make a difference'" to collective efforts aimed at achieving group goals" (Van Zomeron *et al.*, 2013). Jugert *et al.* (2016) also observed that collective efficacy increases self-efficacy and participation in pro-environmental behaviors. They noted that "enhanced feelings of efficacy provide the ground for people to join in collective pro-climate action by tuning their individual everyday decisions to engage in pro-environmental behavior," emphasizing the importance of identifying individual pro-environmental behavior as part of a larger collective (Jugert *et al*., 2016).

D. Behavior

Pro-environmental behavior can be defined as action which intentionally reduces environmental harm or counteracts the negative impacts of climate change (Kollmuss, 2002). Studies have shown that non-price interventions can impact daily behavior (Boudet *et al*., 2016; Andor and Thomas, 2016).[2] For instance, a study in which Girl Scout troops complete an activity-based climate education program and self-report engagement in climate-conscious behaviors found that their intervention "significantly increased" pro-environmental behavior among participating Girl Scouts (Boudet *et al.*, 2016). In developing an Environmental Behavior Model through a meta-analysis of responsible environmental behavior, Hines, Hungerford & Tomera identify the following variables as predictors of pro-environmental behavior: "knowledge of issues, knowledge of action strategies, locus of control, attitudes, verbal commitment, and an individual's sense of responsibility." Expanding one's knowledge of issues and identifying possible action strategies can be characterized as model building. The notion of locus of control, which Hines *et al.* define as "an individual's perception of whether or not he or she has the ability to bring about change through his or her own behavior," is reflected in this

[2] These types of 'nudge' interventions will be discussed further in the Theory section of this paper.

paper through discussion of efficacy. Verbal commitment, which entails expression of intention, is incorporated into the workshop through setting a goal for a particular climate behavior.

Social norms. In a meta-analysis of literature and studies involving pro-environmental behavior, Bamberg and Moser (*2007*) find that, in addition to the individualist/self-interested aspect undergirding the predictors outlined in Environmental Behavior Model, there is a social component evident in ways in which people engage with pro-environment behavior. They find evidence to suggest that, in addition to self-interest, concern for others informs pro-environmental behavior. (Bamberg and Moser, 2007). The implication of this consideration is that morality and social comparison are contributing factors to environmental behavior. Bamberg & Moser define a social norm as a "perceived social pressure that is the expectations of significant reference persons to perform or not perform a behavior" and finds social norms to be predictive of moral norms (Bamberg and Moser, 2007).

There are two broad categories of social norms: descriptive and injunctive. Descriptive norms report "the raw behavior of other individuals" without any evaluative connotation attached to it (Cialdini, 2003). In an article analyzing the influence of normative statements on energy conservation for two studies, Nolan *et al.* (2008) found that, though participants perceived that the consumptive behavior of their neighbors was not an impactful consideration, the descriptive norm on the reports caused more energy conservation more than other appeals to promoting this behavior (Nolan *et al.*, 2008). Injunctive norms are standards associated with morally-evaluative perceptions of approval or disapproval (Cialdini 2003).

Alcott (2011) ran a study to analyze the impacts of Home Energy Reports provided by a company called OPOWER. These reports offer information on one's energy consumption, the average energy consumption of one's neighbors, the energy consumption of "efficient" neighbors

(which indicates the 20th percentile of energy use), and action steps for how to further improve energy efficiency. Additionally, reports include injunctive categories of Great, Good, or Below Average. Alcott (2011) finds programs to reduce energy consumption and notes that low-consumption households did not increase usage in response to information that their neighbors consume more than they do. By comparing participants at the cutoffs of these normative categories, Alcott (2011) finds that injunctive norms did not significantly affect behavior. Other research has shown that injunctive norms are more useful when the descriptive norm for desired behavior is low (Huber *et al.,* 2018). In other words, if a particular behavior is not popularly practiced and only a small proportion of a given population engage with this behavior, a descriptive norm reporting this low participation will not be compelling without a moral or institutional justification attached. Descriptive and injunctive norms are most effective when both norms align to support the same normative message. Conflict between descriptive and injunctive norms (i.e. many people are participating in an undesirable behavior) undermine the effectiveness of social comparison in effecting the behavior in question (Cialdini, 2003). In a meta-analysis of behavioral interventions focused on promoting pro-environmental behavior in the household, Nisa *et al.* (2019) finds that social comparison interventions and nudges report the largest effect sizes. Interventions which provide information on norms by which to socially compare oneself engages the other-regarding component of pro-environmental behavior.

Goal Setting. In addition to social comparison interventions, commitment devices and goal setting have shown promise in promoting pro-environmental behavior in households (Andor and Fels, 2018). In a meta-analysis spanning thirty-five years of goal setting literature, Locke and Latham (*2002*) emphasize that commitment is relevant to goal performance, especially for difficult goals, and note that self-efficacy and importance (the notion that attainment of a

particular goal is important) enhances this commitment. Self-set goals are most effective when realistic and achievable (Harding and Hsiaw, 2014). Locke and Latham (2002) also remark upon the usefulness of public commitment which presumably increases the stakes of the goal by adding the component of personal integrity (Locke and Latham, 2002; Hollenbeck *et al.*, 1989).

SMART, a popular goal-setting heuristic with widespread applicability for personal achievement, stands for Specific, Measurable (which requires the identification of a metric or progress indicator), Attainable, Relevant, and Time-bound (originally Timely) (Doran, 1981). Several studies have used the SMART framework to achieve goals in medically rehabilitative, educational, and work settings have yielded mixed results pertaining to the effectiveness of the heuristic (Weintraub *et al.*, 2021; Aghera *et al.*, 2018; Wade, 2009). Day and Tosey (2011) note that the SMART heuristic emerged in the context of business management (as opposed to psychological literature or experimentation) and criticize the framework for the lack of consideration of emotional response or feedback from others. At its inception, the A in SMART stood for "Assignable," indicating that this objective was originally meant to be delegated instead of achieved by the goal-setter. Day and Tosey (2011) suggest that the GROW framework could be implemented in a complementary manner to SMART: establishing the Goal, examining the current Reality of the situation, considering the available Options, and confirming the Will to act and deciding what action to take (Day and Tosey, 2011; Whitmore, 1996). The SMART heuristic can be implemented in the final stage of GROW. The confirmation of one's will to act addresses the emotional, perhaps irrational, aspect of goal-setting which the business-minded SMART framework does not. *Growing Greener* provides the SMART framework to participants as a method for individual goal setting, yet the overarching workshop guides participants through a more holistic approach which accords with the GROW framework.

Reminders. Although goal setting is an important step in effecting behavior change, it is also important to reinforce one's commitment during the period between goal setting and goal achievement. Reminders have been recommended as a cost-effective method to motivate change in target behaviors after several studies found evidence linking getting reminders to increased likelihood of goal achievement. A study by Karlan *et al.* (2016) which focuses on consumer savings in banks in Bolivia, Peru, and the Philippines reports "evidence that getting reminders increases the likelihood of meeting one's commitment to save and weaker but suggestive evidence that reminders increase savings amounts as well," which suggests that reminders may be useful to increase the activity of desired behavior past the original benchmark established in setting one's goal (Karlan *et al.*, 2016). Other studies have focused on promoting healthy daily habits with regards to smoking (cessation) and sunscreen use (Palmer *et al.*, 2018; Armstrong *et al*., 2009). Page *et al.* (2020) found 'significant impacts' of a program of customized reminders on increasing the amount of FAFSA (financial aid) submissions from students at a high school in Texas. (Page *et al.*, 2019) Furthermore, research suggests that the inclusion of the recipient's name in the reminder may increase the effectiveness of the message (Huf and Kerrison, 2020). It should also be noted that the aforementioned studies used text messaging to communicate reminders. For the *Graduating Greener* study, reminders were sent through email, keeping consistent with other communication regarding this research.

III. Theory

A. Neoclassical Economic Analysis of Climate Change

Neoclassical economic theory, also referred to as mainstream economics or marginalism, conceives of the economy as fundamentally rational and profit-maximizing. Mainstream

economists view climate change as a negative externality of greenhouse gas emission, which indicates that emitting at profit-maximizing levels does not align with social optimality. The environment is conceived of as a common pool resource, insofar as it is both nonexcludable (or, able to be consumed by everyone) and rival (or, such that the consumption of one directly affects the consumption of another). For common pool resources, purely self-interested motivations and rational market activity are insufficient to achieve social optimality. Policy solutions offered by mainstream economists are often market-based incentives, such as taxes or subsidies. In order to combat climate change, cap-and-trade policies emerged to efficiently reduce emissions through pursuing self-interest and mutually-beneficial trade.

Broad overview of neoclassical model of decision making. Neoclassical theory assumes that economic agents (i.e. consumers and producers/firms) act rationally in market transactions. The fully-rational agent, with the moniker *Homo economicus*, bases decision-making purely in self-interest. In the market, rational actors are sensitive to prices (and concomitantly, price-based interventions) and use trade in order to exploit personal gains (Krugman and Wells, 2020). Thus, a firm may choose to produce using non-renewable resources if alternative energy sources are more costly. Similarly, a consumer may choose to carry their groceries in single-use plastic bags because it is more personally convenient. However, a tax on single-use plastic bags would induce customers to use fewer plastic bags or perhaps purchase a reusable bag.

Environment as a common pool resource. Common pool resources are commonly available to members of a given community without any claim of private property. All common pool resources satisfy two conditions: nonexcludability and rivalry. Nonexcludability requires that no individual may be denied consumption of the resource. The concept of rivalry means that the usage of the resource by one person directly impacts the usage of others. For example, if a

firm deforests an area for construction, this depletes the ecosystems and human societies which benefited from the forested area. Furthermore, this action depletes the environment of its natural ability to store carbon and releases more carbon into the atmosphere, which contributes to extreme weather conditions. Evidently, the consumption of the environment by an individual or a firm affects all other environmental consumption at both local and global levels. As a common pool resource, the environment is at risk of overconsumption and underinvestment. As illustrated in the parable of the *Tragedy of the Commons*, public goods are vulnerable to exploitation by "free-riders" who can continue to consume the public good and benefit from the efforts of others without facing consequences for shirking payment for or stewardship over the good (Hardin, 1968). Therefore, individuals and firms are liable to act in ways which contribute to environmental degradation because their level of self-interest remains unaffected.

Negative externality of polluting behaviors and tax policy solutions. An externality arises when private economic decisions yield unexpected social consequences. If this consequence is socially beneficial, the externality is positive. Negative externalities, by definition, are socially costly and undesirable.

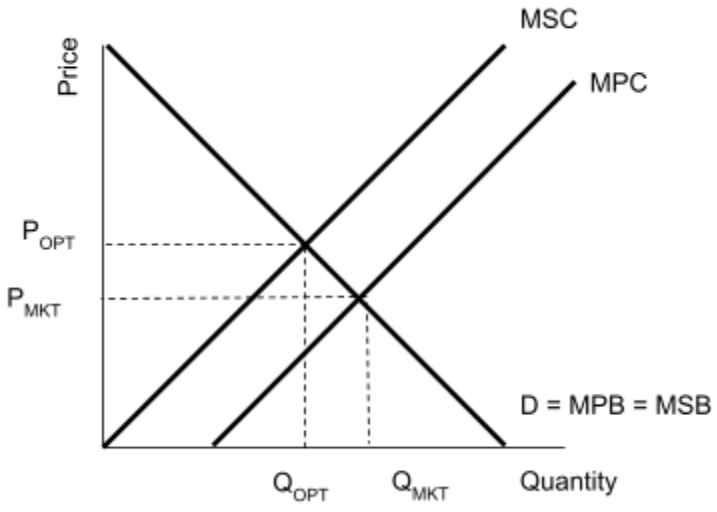

Figure 2: Marginal social cost-benefit model for negative externalities

As depicted in *Figure 2,* the marginal social cost curve is higher than the marginal private cost curve because the social cost curve accounts for the cost associated with the negative externality of which the private firm does not experience the full weight. The quantity reached by the intersection between the marginal private cost curve and the demand curve (which is the same as the curves for marginal private benefit and marginal social benefit) is higher than the quantity reached by the marginal social cost curve. This results in market inefficiency because the market is failing to produce socially optimal outcomes.

To remedy this failure, governments will institute emissions taxes to disincentivize excessive carbon emissions. Theoretically, a tax on emissions will increase the private cost curve to align with the social cost curve. However, it can be difficult for governments to pinpoint the appropriate tax level for such reconciliation. This type of tax, used to correct negative externalities, is known as a Pigouvian tax (Krugman and Wells 2020).

The Coase Theorem and cap-and-trade policy solutions. Climate change, which is associated with very socially-costly risks and damages, is a negative externality of the usage of greenhouse gasses in production by firms, who produce at profit-maximizing quantities. The Coase theorem stipulates that negative externalities can be "internalized" and remedied through mutually-beneficial private decision-making, so long as the transaction costs of negotiating and making such decisions are adequately low (Krugman and Wells, 2020). The international nature of threats posed by global warming arguably renders transaction costs relatively high. These high transaction costs of climate change undermine the ability of the market to self-correct its socially-costly inefficiencies. Tradable emissions permits (also known as cap-and-trade policies) aim to efficiently allocate emission reduction between firms. These policies incentivize firms

with more technological capacity (which is associated with lower costs) to reduce emissions at a higher rate than other less capable firms by making it profitable to sell excess emissions permits (Krugman and Wells, 2020). Nordhaus (2019) remarks that "universal participation, equalizing marginal costs or carbon prices in all uses in a given year, full participation, and increasing stringency over time" are necessary to incentivize firms toward more pro-environmental activity. Theoretically, cap-and-trade policies encourage private firms to engage in transactions to internalize the externalities on an industry-wide scale.

Mainstream policy and its shortcomings. Following his 2016 TEDTalk *The Case for Optimism on Climate Change*, politician and climate activist Al Gore was asked how we know that the progress we have made and the progress that we are projected to make will be enough to solve climate change. In his response, Gore argues that once the costs of renewable energy fall below fossil fuel costs, the market will automatically adjust to render the fossil fuel infrastructure obsolete.[3] This argument is consistent with mainstream economic theory insofar as the profitability of solar energy will cause non-renewable energy sources to be competed out of the market. Because the Sun and wind are free of charge to use, renewable energy has a marginal cost of zero; costs are only associated with the original implementation of renewable infrastructure. Thus, the market will theoretically correct itself without government intervention (or, with the potential policy recommendation to subsidize renewable energy or regulate fossil fuel emissions in order to expedite this transition process).

[3] Gore responded, "You know, I've only been in the business world for fifteen years, but one of the things I've learned is that apparently it matters if a new product or service is more expensive than the incumbent, or cheaper than. Turns out, it makes a difference if it's cheaper than. And when it crosses that line, then a lot of things really change."

Policy proposals consistent with mainstream economic theory promote regulation of carbon and other greenhouse gas emissions through market interventions. The Stern Review, written by economist Nicholas Stern and published in 2006, thoroughly discusses the climate crisis from a mainstream, market-based perspective. Stern characterizes climate change as "the greatest market failure the world has ever seen" and notes that "it interacts with other market imperfections" (Stern, 2006). The Review proffers three policy solutions: regulation of carbon pricing; support for the innovation and implementation of low-carbon technology; and the removal of "barriers to energy efficiency" through educating individuals about pro-environmental behavior and action strategies to climate change. Stern's third suggestion constitutes a deviation from the mainstream model of rationality which instead appeals to the fields of human psychology and behavioral economics.

Price-based incentives, which are extrinsically-motivating, are predicated on economic actors making decisions with total rationality. The neoclassical model fails to recognize that policies focused on extrinsic motivation are vulnerable to regulatory capture. In other words, corporations may lobby policymakers to control the taxes or emissions cap in order to maximize private interests, thereby undermining the effect of the regulation. The mainstream model assumes that actors are completely rational and narrowly self-interested (without regard for harm to others) in their decision-making. Thus, interventions which engage intrinsic motivators, such as feelings of care for place or fellow community members, instead of market prices would be theoretically ineffective. Gowdy (2008) argues that the rational actor model does not accurately represent human economic activity and notes that these "so-called behavioral 'anomalies' are central to human decision-making." Ultimately, mainstream theory fails to address the irrational human behavior which contributes to the climate crisis.

B. Considerations from Behavioral Economics

Enter: behavioral economics. Croson and Treich (2014) remark that "[t]he new field of behavioral environmental economics combines the best of two disciplines: the normative power of traditional environmental economics together with a more realistic description of individual behavior from psychology (and from other human and social sciences)." The non-price nature of this behavioral intervention is derived from this interdisciplinary field. Other theories and concepts from behavioral economics relevant to the *Graduating Greener* intervention are: other-regarding tendencies, the fear deficit, information avoidance and moral wiggle room, participative efficacy, Nudge theory, and prospect theory.

Self- vs other-regarding tendencies. Contrary to the self-regarding tendencies assumed by the rational actor model, humans are receptive to interventions which elicit social comparison through norms (Bamberg and Moser 2007). This indicates that humans also exhibit other-regarding tendencies which are sensitive to normative messaging and appeals to morality. This notion directly challenges the fundamental assumptions of how neoclassical theorists conceive of individual decisionmaking. Although private firms may have the capacity to act rationally, the day-to-day choices of individuals are not solely governed by maximizing gains and can be largely influenced by social comparison and norms. The *Graduating Greener* workshop engages these other-regarding tendencies by fostering a social atmosphere and instructing neighboring participants to compare levels of pro-environmental behavior.

Fear deficit. Loewenstein and Schwartz (2010) describe the fear deficit as the inability of people to experience appropriate levels of fear pertaining to the climate crisis. They argue that people are less fearful about climate change than they should be given the associated risks. This

phenomenon can be explained by present-bias and the 'drop-in-the-bucket' effect. The theory of present-bias posits that, when faced with a decision which spans temporality (i.e. intertemporal choice), people discount future events and put a higher premium on activities occuring in the present (Loewenstein and Schwartz, 2010; Berns *et al.*, 2007). The 'drop-in-the-bucket' effect describes the notion that climate consequences of small behaviors which contribute to environmental degradation (e.g. using a plastic straw when at a restaurant) are not perceptible, similar to how seemingly inconsequential drops of water can together fill a bucket. Loewenstein and Schwartz (2010) explain that " [e]veryone would gain if everyone made relatively minor sacrifices. But the benefits of any one individual's sacrifices are spread over millions of individuals, including those in future generations. No one is motivated to sacrifice and everyone suffers." These insights highlight the importance of the visualization/sketching activity in the *Graduating Greener* workshop, which aims to reduce the temporal distance of risks associated with climate change and increase the perceptibility of risks caused by non-pro-environmental behavior.

Information avoidance. In addition to the psychological components which may hinder the ability of an individual to process climate information rationally (i.e. fear deficit, psychological and temporal distance, etc), behavioral economists theorize that individuals strategically avoid unfavorable information in order to maintain plausible deniability and exploit their moral wiggle room in order to avoid engaging in other-regarding behaviors. Golman *et al.* (2017) argue that information avoidance functions to eschew unfavorable decision-making with more potentially severe consequences, personal criticism, other-regarding behaviors, and challenges to personal beliefs. This constitutes a demand-side problem: although there may be available information, there may be less demand for this information because it produces

negative emotions. Thus, education and social discussion must be implemented to simultaneously lower the social costs of learning climate information and increase the costs of avoidance. The *Graduating Greener* intervention seeks to disrupt this avoidance by establishing a social norm of discussion among college students about climate change, thereby rendering it socially costly to continue this deliberate ignorance.

Participative efficacy. The notion of participative efficacy, which posits that increased collective efficacy toward combating climate change bolsters self-efficacy because personal behavior is seen as contributing to a larger collective impact, seems to stand in opposition with the logic of the free-rider problem, by which the increased efforts of others would incentivize a rational individual toward inaction (because they can continue to receive the same benefit from the environment). Van Zomeron *et al.* (2013) distinguishes between the two theories, explaining that, "[w]hereas his free-rider logic seems more geared toward explaining inaction (i.e., free-riding), the participative efficacy logic is more geared towards explaining participation in collective action." In fact, the logic of participative efficacy is consistent with free-rider logic insofar that it is based in self-interest. Thus, participative efficacy implies that perception of collective efficacy provides an additional reason to act self-interestedly, yet in this case acts of self-interest are not purely economic or market-based, but appeal to broader interests of climate survival. Through the socially interactive components of the *Graduating Greener* workshop, we aim to create space in which participants' climate behaviors and climate experiences are visible to each other. Sharing this information may increase one's belief in the ability of the collective to make an impact (i.e. collective efficacy), thereby increasing one's own self-efficacy by feeling like their impacts contribute to a larger impact.

Nudge Theory. Richard Thaler and legal scholar Cass Sunstein propose 'nudge theory,' which seeks to promote socially-desirable decision-making through non-price, non-coercive interventions (Thaler and Sunstein, 2009). Research has shown nudge interventions to be effective in reducing undesirable behaviors (Andor and Fels, 2018). Schubert *et al.* (2017) analyzed the use of "green nudges," which aim to promote pro-environmental behaviors, and identified three categories of green nudges: those which "capitalize on consumers' desire to maintain an attractive self-image," those which employ socially-normative messaging, and those which set pro-environmental default options (e.g. preset eco-friendly selections on washing machines). The *Graduating Greener* intervention falls primarily into the second category because of its employment of descriptive social norms regarding engagement in pro-environmental behaviors between peers. Schubert *et al.* (2017) also criticize the individualistic approach on which green nudges are predicated, noting the risk that it "overlooks the deeper socio-cultural roots of the environmental problems purportedly addressed, thereby relieving policy-makers from the cumbersome task of actually fixing the flawed institutions at the heart of market failure." Though the *Graduating Greener* intervention is also focused on individual behavior, it is important to note that pro-environmental nudge interventions are not necessarily conflictive with systemic reform and may be useful in promoting problem- and meaning-focused coping with the climate crisis.

IV. Workshop Design

Since beginning research with Dr. Smyer in 2019, I have assisted in the design, development, and implementation of the *Graduating Greener* workshop. We have presented this workshop to various student groups, social organizations, and classes at Bucknell University and

at other institutions of higher education. We adapted this intervention from a workshop called *Graying Greener*, which was intended for audiences of older adults. Both workshops are based in human-centered design and draw upon several concepts from psychology and behavioral economics in order to promote pro-environmental behavior. The design of the workshop is based on findings from the National Academies of Sciences (2011) on how to communicate about climate change: "Keep it social, short, and positive." The 45-minute workshop is a group activity offered to established communities (in this case, the community is Bucknell students, but the workshop has been run for smaller groups of classes and student organizations at Bucknell and at other universities). The social aspect of the intervention is intended to facilitate collective and participative efficacy as well as establish social norms among peers. In *Graduating Greener*, participants are asked to conceptualize climate effects only thirty years into the future. This shorter, more proximal time frame (compared to centuries ahead) reduces temporal distance. The workshop is also positive in two senses: the overall tone is optimistic and clear, and discrete climate action strategies are presented to participants (Smyer, 2017). The *Graying Greener* workshop consists of a slideshow presentation, a sketching/visualization exercise, an online card sorting activity, and a goal-setting worksheet.

The *Graduating Greener* workshop begins with an informal "pop quiz" in which the presenter asks participants to write down what they believe to be 1) the proportion of the U.S. population that is worried about climate change and 2) the proportion of the U.S. population that discusses global warming often with family and friends. Participants are invited to share their answers with the room or the other participants at their table. After this, the presenter reveals the actual statistics (64% and 33%, respectively) and invites participants to share their reactions (Yale Program on Climate Change Communication, 2021). This activity grounds participants in

descriptive statistics. The implications of these statistics depend upon participants' original perceptions. When I gave the workshops and asked participants to share their original answers, I observed that participants consistently underestimated both percentages. Unexpectedly higher descriptive statistics may improve levels of collective efficacy and trust in the national community to combat climate change.

At this point, the presenter offers a brief personal story about their own connection to or stake in the climate crisis. Ganz (2011) argues that narratives are useful for encouraging action because they elicit affective and emotional responses to complement cognitive and logical considerations. My personal story recounts my experience trekking down a highway with members of the Sunrise Movement, a youth climate activist organization, on their way to Washington D.C. to demand federal funding for a Civilian Climate Corps from President Biden. By sharing my story, I hope to emphasize the hope and positive feelings which I developed through my interactions with other young people passionate about combating climate change during the trek. My personal narrative centers on my increased feelings of efficacy and empowerment through meaning-focused coping.

The next section of the presentation entails a visualization exercise and sketching activity. The presenter makes four requests of the participants; the presenter asks participants to think about a place that has special meaning to them, climate risks which this place faces, what they would like this place to look like thirty years in the future, and something that they could do now to help effect this favorable future for the meaningful place. These prompts serve as an induction of place attachment in order to elicit an emotionally meaningful response from the participants as well as an identification of their special place, and indirectly themselves (as a person whose

emotional wellness is related to the ecological wellness of this place), as a victim of environmental degradation caused by climate change.

Following the four requests exercise is an online card-sorting module in which participants are presented with over fifty pro-environmental action strategies and instructed to click-and-drag each action into one of four categories: *Things I Already Do*, *Things I Could Do*, *Things My University Could Do,* and *No Way!* After participants finish sorting, the presenter asks them to briefly compare their *No Way* piles with neighboring participants. The purpose of this cursory comparison is to illustrate the subjective nature of one's personal "climate journey." It is the responsibility of the presenter to actively caution against any evaluative social comparison at this step by affirming the validity of the boundaries that each participant set in their *No Way* pile. Instead, the presenter seeks to foster a sense of respect, non-coercion, and participant autonomy.

Next, the presenter asks participants to count up the actions which they sorted into their *Things I Already Do* pile and figure out which person at their table already engages in the most actions. This comparison between the absolute numbers of habitual pro-environmental actions already implemented in participants' lives makes participants aware of the descriptive norm of climate behavior. The presenter then congratulates the participant with the highest amount of actions that they 'already do.' This social recognition theoretically seeks to mitigate the aforementioned 'boomerang effect' associated with descriptive normative interventions. In other words, by celebrating the participant with the most actions, the presenter hopes to reinforce this pro-environmental commitment and prevent decreased engagement in order to meet the descriptive norm (i.e. the notion that this participant is doing too much and should reduce pro-environmental behavior in order to match their peers). The presenter concludes this section

by celebrating the non-zero nature of most participants' *Things I Already Do* pile, which demonstrates that they are already on their personal 'climate journey.'

The presenter then asks the participants to examine their *Things I Could Do* and *Things My University Could Do* piles and identify one behavior that they will move to their *I Will Do* pile. In other words, the presenter instructs participants to choose a climate action which they will commit to carrying out (or, in the case of choosing an action from the *Things My University Could Do* pile, commit to asking the University to carry out a particular action). By establishing the locus of control within the participants' scope of ability, the workshop seeks to bolster self-efficacy. Because this commitment-making exercise is completed in a social setting, one's level of collective efficacy should increase after witnessing peers set climate goals. These collective- and self-efficacies will theoretically reinforce each other through the effect of participative efficacy.

In the final section of the *Graduating Greener* workshop, participants are invited to set a goal based on the climate behavior they "will do." The presenter discusses two goal setting frameworks to help guide this decision-making: the SMART framework - Specific, Measurable, Attainable, Realistic, Time-bound - and the Big Easy framework, which advocates for choosing the option with high impact and high feasibility, was developed by Ed Morrison as a part of his Strategic Doing intervention for collective action initiatives (Morrison, 2019). The Big Easy framework complements the SMART method by focusing on Attainability without minimizing the impact of the action. Together, these goal-setting frameworks are employed with the intent to reinforce self-efficacy and promote problem-focused coping.

Participants receive a worksheet titled "My Climate Commitment" and are instructed to write down the climate action that they 'will do,' the timeframe for which they plan to begin

carrying out the action, whom they will tell about their commitment to this action, and a self-imposed consequence if the participant fails to carry out their action within their planned time frame.[4] The first two items align with elements of the SMART framework, particularly Specificity and Time. The act of sharing one's goal with an 'accountability buddy' introduces an additional layer of social pressure because one's personal integrity and reputation is also at stake if one does not carry out their climate action (Locke and Latham, 2002; Hollenbeck *et al*., 1989). The final item asks participants to stipulate a personal incentive, framed as a consequence and not an inducement (a stick, rather than a carrot), in the event that the participant does not honor their climate commitment.[5] At earlier stages of development for the workshop, this consequence was more explicitly specified to be a monetary donation to a cause which the participant does *not* support. Through design testing, we changed the consequence from a financial incentive to a personal incentive so as to not exclude or alienate participants who may be experiencing financial instability. Although we have gotten rid of the monetary component, the consequence is still framed as a potential loss. Participants who are loss averse may be more inclined to set realistic goals for their climate action to avoid incurring these losses.

Although the SMART framework is employed for individual goal-setting, it is important to note that the structure of the entire *Graduating Greener* workshop aligns with the GROW - Goal, Reality, Options, Will - methodology. We first establish the overarching goal of combating climate change, we acknowledge the reality of the physical and environmental effects of the climate crisis as well as the reality of the extent to which one individual can make an impact, we review the potential options of pro-environmental behaviors to act upon during the card-sorting

[4] A copy of the worksheet is available in the Appendix.
[5] This consequence-based framing draws upon loss aversion. Loss aversion posits that people weigh losses more severely than gains (Tversky and Kahneman, 1991). In other words, it hurts more to experience a loss of something than it feels good to gain the same thing.

activity, and we ask participants to affirm their will by filling out the Climate Commitment worksheet.

V. Experimental Design

A. Overview

The experiment was conducted over a period of six weeks, spanning from late February to late March 2022. This study was carried out at Bucknell University. The subject pool originally exclusively consisted of first-year students but was expanded to include all Bucknell students for the final two treatment sessions due to recruitment challenges resulting from impacts of COVID-19.

Students were recruited through introductory courses and other student organizations on campus.[6,7] Subjects were randomly assigned to either the control group or the experimental group. Participants were invited to attend one of two treatment sessions which were conducted at separate times.

The control treatment session began with a 15-minute period during which participants completed the pre-treatment questionnaire on their devices.[8] Participants then watched the TED Talk *The Case for Optimism on Climate Change* by Al Gore together on the projection

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[6] Copies of recruitment materials are available in the Appendix.

[7] I originally intended to run treatment sessions based on residential halls as community programming. To recruit participants, I planned to collaborate with residential advisors of halls with first-year students to advertise the events and study. Additionally, I made announcements in introductory courses and academic common hour sessions (with permission of the instructor) to advertise the community programming. Due to low participation, I switched my method of recruitment. I created a Google Form through which students could indicate their interest and availability for participation in the study. Class credit for Introduction to Psychology was contingent upon completing the Google Form. For certain Economic Principles/Problems, alternative credit (in lieu of one weekly homework assignment) was offered contingent upon attendance at the event and completion of a written response to their Professor. These written responses are unavailable to me. My primary subject pool for recruitment was first-year students, but I expanded the pool to all Bucknell students within the last week of the study in order to increase participation. Only one non-first-year student participated in the study.

[8] A copy of the questionnaire (with the post-treatment open-ended addendum) is available in the Appendix.

screen/monitor in the room. After the TED Talk, I facilitated a semi-structured, informal group discussion.

The experimental treatment session also began with a 15-minute period for the pre-treatment questionnaire. I then facilitated the *Graduating Greener* workshop. About 1.5 weeks (11 days) after attending their treatment session, participants received a follow-up email thanking them for their participation in this workshop. Half of the participants from each group received an email with positive, personal messaging which frames the participant as an individual contributing to a collective action issue (nudge treatment); the other half received an email with neutral messaging (non-nudge treatment).[9]

About 1.5 weeks after the follow-up emails (three weeks after the treatment session), participants were asked to complete the post-treatment questionnaire, which consisted of the same questions asked in the pre-treatment questionnaire as well as an additional section for open-ended qualitative questions.

Some participants were offered extra credit for an introductory-level Economics or Psychology class for attending a treatment session, though reception of this credit was not contingent on participation in the study. The Bucknell University Institutional Review Board reviewed and approved the experimental design and materials used in the study.

B. Survey Design

The pre-treatment questionnaire broadly consists of four categories: screening, concern, behavior and hope. In the screening section, participants were asked to indicate their class year and which treatment session they attended (TEDTalk or workshop).

[9] A copy of sample messaging is available in the Appendix.

Level of concern was ascertained by utilizing the question series from the "Six Americas Super Short SurveY (SASSY!)" developed by the Yale Program on Climate Change Communication. The four questions which comprise this survey have previously been employed to measure change of level of concern with regards to the climate crisis in children and parents (Lawson *et al.*, 2019) as well as adolescents (Stevenson *et al.,* 2018). Group designations (e.g. alarmed, concerned, etc) were not computed.

Changes in behavior were measured by questions which ask about engagement, and frequency thereof, with pro-environmental individual behaviors discussed in the *Graduating Greener* workshop. This section of questions was modeled from a questionnaire which measured behavior changes in Girl Scouts following an energy-saving intervention (Boudel *et al.*, 2016).

Level of hope was ascertained through eleven questions which make statements about attitudes about the future of the climate crisis (eg. "I believe people will be able to solve problems caused by climate change.") and ask respondents to rate their degree of agreement on a 5-point Likert scale. This question series was derived from the Climate Change Hope Scale developed by Li (2019).

The post-treatment questionnaire consists of the pre-treatment questionnaire with an additional section of open-ended, qualitative questions which ask participants to elaborate on the social aspect of their treatment experience, feelings of hope, feelings of self- and group efficacy, previous experience in climate discussions/activities, and new learnings from their treatment sessions. The software used to conduct the questionnaire and collect data was Qualtrics.

C. Rationale

This two-by-two design first allows assessment of the standalone intervention comparing questionnaire responses without the nudge and allows assessment of the difference of the nudge

factor within treatment and control groups. Aggregate shifts in the data between pre-treatment and post-treatment questionnaires demonstrate the impacts of each treatment on participants' level of concern, behavior, and level of hope. By comparing and analyzing the differences in shifts between the two treatments and email messaging, we can identify trends which indicate the effects of each treatment.

Control Treatment. I included a comparable educational activity (watching the TED Talk and subsequent group discussion) as the control treatment instead of no treatment to account for the presence of climate-related stimulus. The control was selected as a social event that pertains to climate change generally (as opposed to a particular aspect of the climate crisis), so that any impact of *Graduating Greener* cannot be reduced to be attributed only to its social component. I chose *The Case for Optimism on Climate Change,* a TED Talk given by Al Gore in 2016, because the combined duration of this talk and following group discussion is similar to the duration of the *Graduating Greener* Workshop. Al Gore, who featured in the climate documentaries *An Inconvenient Truth* and *An Inconvenient Sequel: Truth to Power*, is a famous politician and spokesperson within the mainstream media on the topic of climate change. In the TED Talk, Gore presents scientific and anecdotal evidence of climate change and extreme weather and their damaging impacts on ecosystems and human society. However, Gore argues that the recent progress and ramp-up (circa 2016) involving renewable energy, the falling price of renewable energy (and subsequent market response), and the good moral judgment inherent in "who we are as human beings" are enough to warrant a hopeful outlook on the human response to the climate crisis (Gore, 2016). The questions asked in the group discussion following the video are neutral and open-ended in order to prompt critical engagement with Gore's message

and how it compares to current participant perceptions of the climate crisis.[10]

VI. Results

Nine participants were in each treatment group. Each session ranged from two to five participants. A total of five treatment sessions were conducted: three sessions were control groups and two sessions were *Graduating Greener* interventions.[11] During the Spring semester of 2022, sessions were conducted between February 22 and March 8. Pre-treatment surveys were made available to participants via email the day before their invited TEDTalk screening/workshop to which they were invited was scheduled to occur. Treatment sessions were held on Tuesday evenings at 7:30pm and Sunday afternoons at 3:00pm.[12] Post-treatment questionnaires were made available to participants three weeks after their treatment session, between March 15 and March 29.

Out of the nine participants who attended *Graduating Greener* workshops, one declined to participate in the study and did not complete the questionnaires. Although only nine participants attended the control treatment sessions, ten data responses were collected in the pre-treatment questionnaire. One possible explanation for this anomaly is that a student filled out the questionnaire when it was made available to them via email and failed to attend the TEDTalk screening. This anomaly of one additional questionnaire response does not threaten the validity and overall trends of the data because the potential responses which may have included the extra response did not indicate extreme deviation or outliers. For the post-treatment questionnaire, nine

[10] A copy of the discussion questions is available in the Appendix.
[11] Originally, another *Graduating Greener* workshop was scheduled for March 10, but was canceled because only one student attended.
[12] A copy of the treatment session schedule is available in the Appendix.

responses were collected from the control group and eight responses were collected from the experimental group. All of the participants in the experimental group who completed the pre-treatment questionnaire also completed post-treatment questionnaires. For the control group, there was an attrition of one participant (attrition rate of 10.5%) between pre-treatment and post-treatment questionnaires.

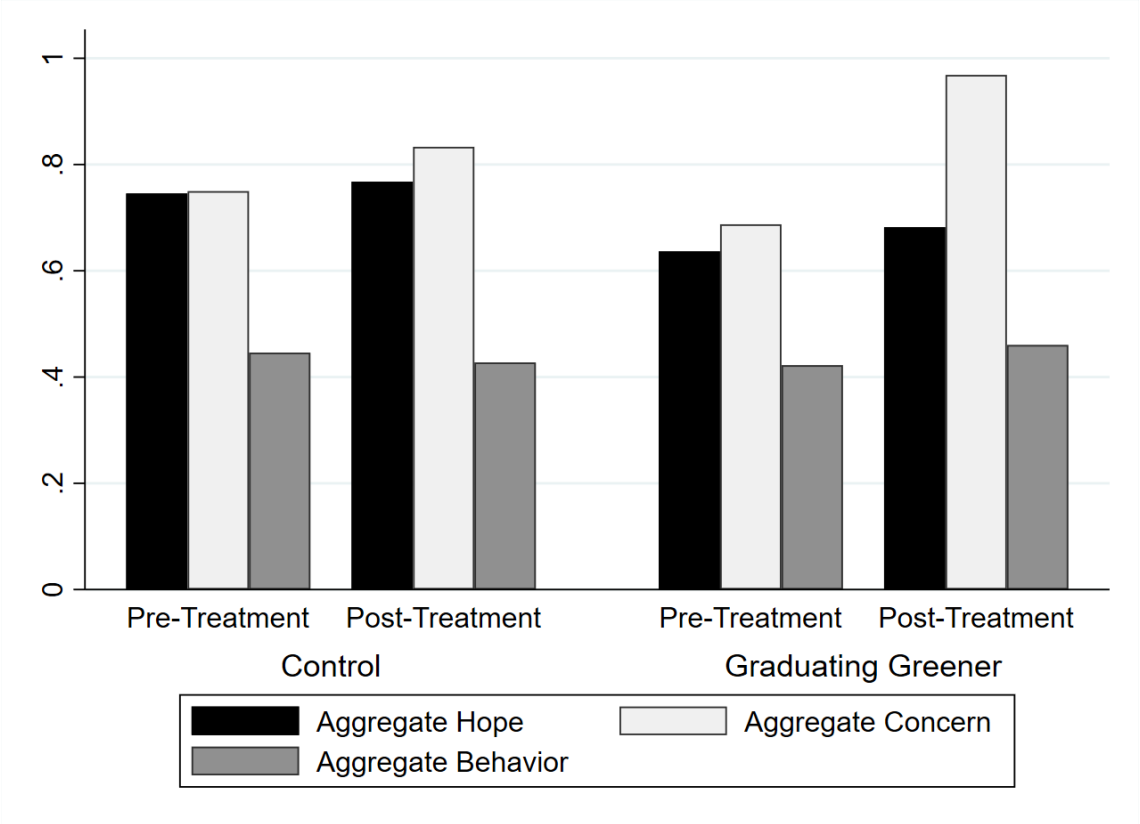

Figure 3: Average (Aggregate) Scores by Treatment Status on Hope, Concern, and Behavior

Concern and hope are measured on a scale from -2 to 2. Values approaching -2 indicate questionnaire responses of low concern and hope and values approaching 2 indicate responses of high concern and hope. Behavior is measured on a scale from 0 to 1. 0 indicates lack of

engagement in pro-environmental behavior and 1 indicates frequent engagement in pro-environmental behavior. *Figure 3* displays the changes in aggregate hope, concern, and behavior between pre- and post-treatment questionnaire responses for the control treatment and the Graduating Greener intervention. The post-treatment aggregate hope (0.68) and behavior (0.46) for the control group only varied slightly (+0.04) from pre-treatment levels (0.64 and 0.42, respectively). There is a slight increase in level of concern between pre- and post-treatment responses. Post-treatment responses for the experimental group (*Graduating Greener)* did not show a notable change in levels of aggregate hope and aggregate behavior also remained. Level of concern for the experimental group exhibited the largest increase compared to other variables and treatment groups.

Table A: Summary Statistics for Hope, Concern, and Behavior

	mean	median	sd	count
Pre-treatment Control				
Aggregate Hope	0.75	0.82	0.39	10.00
Aggregate Concern	0.75	0.88	0.49	10.00
Aggregate Behavior	0.45	0.46	0.09	10.00
Post-treatment Control				
Aggregate Hope	0.77	0.82	0.35	9.00
Aggregate Concern	0.83	0.75	0.50	9.00
Aggregate Behavior	0.43	0.44	0.07	9.00
Pre-treatment *GradGreen*				
Aggregate Hope	0.64	0.59	0.41	8.00
Aggregate Concern	0.69	0.63	0.68	8.00
Aggregate Behavior	0.42	0.41	0.08	8.00
Post-treatment *GradGreen*				
Aggregate Hope	0.68	0.77	0.56	8.00
Aggregate Concern	0.97	1.00	0.63	8.00
Aggregate Behavior	0.46	0.47	0.07	8.00

Aggregate concern is measured on a scale from -2 to 2. The higher the value, the more concerned participant responses are, and vice versa. Each question in the Concern section asks participants to indicate how worried they are about climate change and how much they anticipate climate change will negatively affect themselves, the United States, and future generations (Lawson *et al.*, 2019; Stevenson *et al.*, 2018).[13] The aggregate value is calculated by averaging the values for each of the four question items which comprise the Concern section. The control group exhibited an increase of 0.08 and the experimental group exhibited an increase of 0.28. The difference between changes in aggregate concern levels between the experimental and control groups is 0.20. The data from this pilot study suggest *Graduating Greener* could be a promising intervention for increasing climate concern.[14]

Aggregate hope is measured on a scale from -2 to 2. The higher the value, the more concerned participant responses are, and vice versa. Each question in the Hope section asks participants to rate how strongly they agree or disagree with a proposed statement pertaining to hope on a 5-point Likert scale. The aggregate value is calculated by averaging the values for each of the eleven question items which comprise the Hope section. Each treatment group reported very slight increases in aggregate levels of hope between pre- and post-treatment responses; the control group exhibited a slight increase of 0.02 and the experimental group exhibited a slight increase of 0.04. The difference between changes in aggregate hope levels between the experimental and control groups is 0.02. The data indicate that the intervention did not seem to have a meaningful effect on participants' reported levels of hope.

Aggregate behavior is measured on a scale from 0 to 1. The higher the value, the more frequently participants engage in pro-environmental behavior, and vice versa. Each question in

[13] Assigned point values for questionnaire responses are available in the Appendix.
[14] Tables reporting line-by-line data for each item in the questionnaire are available in the Appendix.

the Behavior section asks participants to report their engagement with various climate actions. The aggregate value is calculated by averaging the values for each of the fifty action items which comprise the Behavior section. Each treatment group reported very slight increases in aggregate levels of hope between pre- and post-treatment responses; the control group exhibited a slight decrease of 0.02 (or, an increase of -0.02) and the experimental group exhibited a slight increase of 0.04. The difference between changes in aggregate hope levels between the experimental and control groups is 0.06. The data indicate that the intervention did not seem to have a meaningful effect on participants' reported levels of pro-environmental behavior.[15]

[15] Tables reporting line-by-line data for each item in the questionnaire are available in the Appendix.

Table B: *Regression Analysis for Aggregate Concern, Behavior, and Hope*

	(1)	(2)	(3)
	Concern	**Behavior**	**Hope**
Post-Treatment Period	0.0833	-0.0185	0.0222
	(0.753)	(0.614)	(0.911)
Graduating Greener	-0.0625	-0.0237	-0.109
	(0.819)	(0.532)	(0.596)
Post-Treatment Period X Graduating Greener	0.198	0.0566	0.0232
	(0.614)	(0.300)	(0.937)
Constant	0.750***	0.446***	0.745***
	(0.000)	(0.000)	(0.000)
Observations	35	35	35

p-values in parentheses

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

As demonstrated by the regression analysis in *Table B*, the treatment effects for the *Graduating Greener* intervention were not statistically significant. It is important to note that the sample size for this pilot study was small - only eighteen students participated in this study. Thus, power was low and it was unlikely that a statistical analysis would be able to identify a treatment effect.

VII. Discussion

Though the effects of intervention are statistically insignificant, important observations can be gleaned from the responses to open-ended, qualitative questions in the post-treatment questionnaire and from the challenges which arose from this pilot study in addition to the data set. The most challenging aspect of carrying out the study was difficulty in recruiting participants. However, this difficulty may be attributed to climate avoidance exhibited by college students who may have a low capacity for anxiety-inducing information as a result of emotional stress from the conditions of the COVID-19 pandemic.

It should be noted that a similar pilot study using *Graduating Greener* materials was conducted over the roughly same time period as this research at the University of Cork in Ireland. This study uses the three domains of concern, behavior and hope to frame outcomes but uses a different control treatment. Additionally, the research focuses on the implementation of particular behaviors to which participants indicated a commitment. In other words, this study measures how many participants followed through on completing the task which they moved to their '*I Will Do This'* pile. Researchers found no significant effect of the *Graduation Greener* on levels of concern and hope. However, results from this study indicate 100% participation in climate commitments from individuals with 92% of participants reporting that they engage

"often" in their behavior (O'Sullivan *et al.*, (2022).

A. Concern, Hope, and Behavior

The data does not indicate that the control treatment had an impact on levels of aggregate concern, aggregate behavior, and aggregate hope. Participants in the experimental group experienced very slight increases (comparable to those experienced by participants in the control group) in levels of aggregate behavior and aggregate hope. The domain of Concern in the treatment group saw the largest effect of the *Graduating Greener* intervention. As expressed in the data, the *Graduating Greener* workshop shows more promise for increasing aggregate levels of climate concern than the control treatment. An increase in level of concern is a favorable outcome because deeper concern can result in deeper engagement with problem-/meaning-focused coping and climate action. This treatment effect suggests a successful disruption in climate avoidance, a barrier to engagement in pro-environmental behavior, for participants in the study.

Participants in the control group did not express increased self-efficacy. One participant wrote, "I can do little things like a reusable water bottle, but overall, if the large corporations don't change, if government doesn't make change, then what I am doing is useless." Another participant expressed feeling a sense of personal responsibility and moral imperative to combat climate change, writing, "Honestly, I feel like I do not have the individual ability to make an impact on climate change. However, if everyone were to say this, no one would work towards combating climate change and nothing would change. For that reason, even though I can not make a personal impact, I will still take individual efforts in the hopes that others are doing the same." This reasoning deviates from the rational actor model which is based solely in self-interest.

The largest increases in hope for the treatment group occurred for the following three statements: *Even when some people give up, I know there will be others who will continue to try to solve problems caused by climate change*; *I know what to do to help solve problems caused by climate change*; *the actions I can take are too small to help solve problems caused by climate change*. The increased agreement of the treatment group with the first statement indicates more hopeful beliefs pertaining to collective efficacy. The responses to the latter two statements demonstrate that the knowledge of discrete action strategies provided by the *Graduating Greener* workshop bolster one's perception of their potential personal impact. One workshop participant reported, "I realize that there are a lot more strategies for combatting [sic] climate change that I realized, at least on a personal, microscopic level. This does give me more hope than I had before, because the fact that there are so many strategies means that people bothered to find out these strategies." The participant notes that they are more hopeful not because of both an increased level of self-efficacy through realizing additional action strategies which can be taken at an individual level and an increased level of collective efficacy through the appreciation of the collective to discover these strategies. This quote illustrates the reinforcing interaction between collective efficacy and self-efficacy as posited by participative efficacy, which claims that collective efficacy improves self-efficacy and promotes the notion that individual impacts are part of a larger, collective impact. Some participants expressed that they believed that their personal ability to make an impact was directly related to educating others about climate change.

In response to an open-ended question inquiring about new things learned from the treatment, many participants in the experimental group listed that they learned a particular climate action strategy. Though this response does not guarantee engagement with this behavior, it certainly indicates retention of actions. Participants who listed an action strategy (with the

exception of one participant who recalled that eating less meat was a pro-environmental behavior, though reported consumption at the highest level in the post-treatment questionnaire) generally reported non-zero values for these particular actions, indicating at least some engagement. If this behavior was part of a participant's personal climate commitment goal, which would explain the high retention of specific and particular behaviors, the intervention presumably positively promoted engagement with that action. If, however, these actions were categorized into the *Things I'm Already Doing*, which would imply a non-zero pre-treatment value for these actions, these responses indicate that participants are maintaining these pro-environmental activities. One participant noted, "I feel like I can make an impact in the small things like taking shorter showers, using reusable bags, carpooling more often, and using public transportation." This response indicates that this participant has retained several pro-environmental behaviors from the *Graduating Greener* workshop.

B. Other notable considerations from open-ended responses

Social aspects of the treatments. Many participants in both groups reported that they enjoyed the social setting of treatment sessions. Overall, participants seemed to find value in hearing the perspectives, ideas, opinions, and experiences of their peers. This may have contributed to heightened feelings of collective efficacy. Additionally, one participant in the control group reported, "Being in a social setting put more pressure on me to agree with taking action against climate change." The social component may have elicited normative comparison between participants.

Grounding descriptive norms. For some participants, the initial descriptive statistics which illustrate nationwide levels of worry about climate change and demonstrate a climate avoidance habit, seemed to be surprising and noteworthy.[16] One participant wrote, "I think the biggest new idea I learned was the fact that over half of Americans are concerned about climate change. That is really significant, and it makes me wonder why certain candidates have been elected as president in the past. But what I can say is that it gives me a lot more hope, as before I had assumed that at least half of Americans were climate deniers." These statistics may provide increased levels of hope and collective efficacy, as demonstrated in this response, to participants with higher levels of dissonance between the perceived and actual proportions of the climate-denying population in the United States.

C. Limitations

COVID-19. Because of uncertain conditions caused by the COVID-19 pandemic at the beginning of 2022, I alternated several times between holding treatment sessions remotely over Zoom and conducting treatments in-person. Ultimately, Zoom treatment sessions did not yield high rates of participation and, with consideration of the severity of the threat of COVID-19 on Bucknell's campus, I switched to in-person sessions. The low rates of participation may also be explained by climate avoidance, which argues that potential participants may have elected not to attend sessions in order to avoid anxiety-inducing information about the state of the climate crisis. This 'false start' of Zoom sessions delayed my period of data collection. Additionally, the very structured and scientific standards to which I held myself in carrying out this study undermined the social and personal aspects of the workshop which contribute to its effectiveness.

[16] These descriptive statistics are available in the Workshop Design section.

In trying to maintain balance and neutrality between treatment groups, my ability to meaningfully connect with participants was inhibited. In order to foster a more natural and robust social environment within workshops, I recommend finding existing community groups (e.g. students who share a weekly common hour, fraternities/sororities, etc.) to participate in treatments.

Sensitivity of domains of inquiry. It is possible that the measures which I used are not designed to register change over a short period of time. For example, the section of the questionnaire which focuses on hope asks about long-term predictions of climate solutions but does not pick up on short-term changes of emotional response. In other words, the hope measurement reflects the prognoses of participants, which may not fluctuate easily, but ignores that a participant might feel more hopeful following the *Graduating Greener* intervention. A more iterative mode of data collection over a longer period of time may be able to provide further clarification on this possibility. If I were to redesign this study, I would focus more on measures which register emotional feelings of hope and concern, which are more likely to fluctuate.

Nudges. Although the nudge and non-nudge messaging treatment was carried out, no data was collected on its effects. The small sample size would have rendered even smaller sub-groups which were unlikely to yield information with any statistical significance. Because the nudge/non-nudge messaging was administered by randomizing from participants within treatment groups instead of between groups (i.e. half of each group got each treatment), there would not be any notable impact on either the aggregate control or treatment results.

VIII. Conclusion

The *Graduating Greener* workshop aims to increase levels of climate concern, hope that humans will be able to solve issues caused by climate change, and engagement in pro-environmental behaviors. This intervention deviates from mainstream economic theory insofar as the foundational assumptions for this behavioral, non-price intervention are that humans do not always make rational decisions in the market and that self-interested market behaviors are insufficient to combat climate change. The results of this pilot study suggest the validity of the theories and concepts which undergird the design of the workshop. Though no statistical significance can be attributed to observed treatment effects, likely due to small sample size, numeric data suggest that participation in the workshop may be associated with an increased level of concern. Although the data from intervention did not indicate meaningful increases in the other measures, increased concern is independently beneficial. An increased level of concern about climate change does not need to be exclusively associated with negative emotion. Through problem- and meaning-focused coping, a deepened concern can be channeled into pro-environmental action. Qualitative data (i.e. open-ended responses) suggest that the behavioral intervention positively impacted levels of efficacy and retention of climate action strategies. For future research, I recommend that this study be replicated at a larger scale with an expanded amount of participants. Furthermore, this workshop should be conducted for existing student groups or established social communities as opposed to groups of students with no previous connection to each other. However, I also believe this workshop to be useful in community building and establishing norms amongst individuals. Thus, this intervention could be more appropriate for First-year Orientation or programming for Residential Education than conducted as an environmental event for which workshop individual participants sign-up

separately. Additionally, this workshop could benefit from a more iterative structure which allows participants to check-in with their progress or each other on a more frequent basis and increase commitment engagement in pro-environmental behavior.

IX. References

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X. Appendix

A. Recruitment Materials

GROWING GREENER

Graduating Greener Workshop

March 1 @ 7:30pm in the Traditional Reading Room

Be a part of the study!

This program is being offered as a part of research for an honors thesis. We'd love for you to participate in the research study but you are welcome to attend the workshop without being in the study.

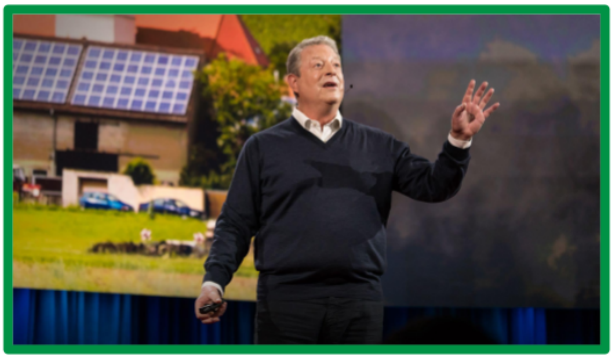
For more information:

Questions? Contact Jillie Santos at jrs100@bucknell.edu

GROWING GREENER

TedTalk Screening + Discussion!

March 8 @ 7:30pm in the Traditional Reading Room



Be a part of the study!

This program is being offered as a part of research for an honors thesis. We'd love for you to participate in the research study but you are welcome to watch the movie without being in the study.

For more information:

Questions? Contact Jillie Santos at jrs100@bucknell.edu

B. Treatment Session Schedule

Date	**Session Time**	**Treatment**	**Location**
2/22	7:30pm	Control (TEDTalk)	Center Room
2/27	3:00pm	*Graduating Greener*	Center Room
3/1	7:30pm	*Graduating Greener*	Traditional Reading Room
3/6	3:00pm	Control (TEDTalk)	Traditional Reading Room
3/8	7:30pm	Control (TEDTalk)	Traditional Reading Room

C. *Pre-treatment Questionnaire*

What is your expected graduation year?

a. 2022
b. 2023
c. 2024
d. 2025
e. 2026

Which event are you attending?

a. *The Case for Optimism on Climate Change* TED Talk
b. *Graduating Greener* workshop

Concern

1. How worried are you about climate change?
    a. Not at all worried (-2)
    b. A little worried (-1)
    c. Moderately worried (0)
    d. Very worried (1)
    e. Extremely worried (2)
2. How much do you think climate change will negatively affect you personally?
    a. Not at all (-2)
    b. A little (-1)
    c. Somewhat (0)
    d. A lot (1)
    e. A great deal (2)
3. How much do you think climate change will negatively affect people in the United States?
    a. Not at all (-2)
    b. A little (-1)
    c. Somewhat (0)
    d. A lot (1)
    e. A great deal (2)
4. How much do you think climate change will negatively affect future generations of people?
    a. Not at all (-2)
    b. A little (-1)
    c. Somewhat (0)
    d. A lot (1)

e. A great deal (2)

Behavior

1. How often do you appreciate nature?
    a. Never (0)
    b. Sometimes (0.33)
    c. Usually (0.66)
    d. Always (1)
2. How often do you bring personal silverware?
    a. Never (0)
    b. Sometimes (0.33)
    c. Usually (0.66)
    d. Always (1)
3. How often do you bring reusable bags to the store?
    a. Never (0)
    b. Sometimes (0.33)
    c. Usually (0.66)
    d. Always (1)
4. Do you have a fuel efficient car?
    a. Yes (1)
    b. No (0)
    c. Don't know (0)
5. How often do you buy clothes from thrift stores?
    a. Never (0)
    b. Sometimes (0.33)
    c. Usually (0.66)
    d. Always (1)
6. Do you buy energy efficient appliances?
    a. Yes (1)
    b. No (0)
    c. Don't know (0)
7. How often do you buy locally-sourced goods?
    a. Never (0)
    b. Sometimes (0.33)
    c. Usually (0.66)
    d. Always (1)
8. How often do you carpool?
    a. Never (0)
    b. Sometimes (0.33)

    c. Usually (0.66)
    d. Always (1)
9. How often do you compost?
    a. Never (0)
    b. Sometimes (0.33)
    c. Usually (0.66)
    d. Always (1)
10. How often do you litter?
    a. Never (1)
    b. Sometimes (0.66)
    c. Usually (0.33)
    d. Always (0)
11. Do you donate old electronic devices?
    a. Yes (1)
    b. No (0)
12. During the past week, how often did you use your car?
    a. Don't have a car (1)
    b. 0 trips (1)
    c. 1 to 5 trips (.66)
    d. 6 to 10 trips (.33)
    e. 10 or more trips (0)
13. How often do you dry your clothes without a dryer?
    a. Never (0)
    b. Sometimes (0.33)
    c. Usually (0.66)
    d. Always (1)
14. How many times do you eat meat each week?
    a. 0 times (1)
    b. 1-3 times (0.66)
    c. 4-6 times (0.33)
    d. 7 or more times (0)
15. During the past year, how many plane trips have you taken?
    a. 0 trips (1)
    b. 1-2 trips (.66)
    c. 3-4 trips (.33)
    d. 5 or more trips (0)
16. Has your place of residence had an energy audit in the last five years?
    a. Yes (1)
    b. No (0)
    c. Don't know (0)

17. Do you have a car that you use often?
    a. Yes (0)
    b. No (1)
18. How often do you help out at a community garden?
    a. Never (0)
    b. Sometimes (0.33)
    c. Usually (0.66)
    d. Always (1)
19. Do you have a programmable thermostat?
    a. Yes (1)
    b. No (0)
    c. Don’t know (0)
20. Do you have double-glazed windows?
    a. Yes (1)
    b. No (0)
    c. Don’t know (0)
21. Do you have an insulated water heater?
    a. Yes (1)
    b. No (0)
    c. Don’t know (0)
22. Are you a part of a climate organization?
    a. Yes (1)
    b. No (0)
23. How often do you pick up litter?
    a. Never (0)
    b. Sometimes (0.33)
    c. Usually (0.66)
    d. Always (1)
24. How often do you plant trees?
    a. Never (0)
    b. Sometimes (0.33)
    c. Usually (0.66)
    d. Always (1)
25. How often do you read assignments online or print them double-sided?
    a. Never (0)
    b. Sometimes (0.33)
    c. Usually (0.66)
    d. Always (1)
26. How often do you recycle?
    a. Never (0)

b. Sometimes (0.33)
c. Usually (0.66)
d. Always (1)

27. How often do you try to reduce your plastic use?
    a. Never (0)
    b. Sometimes (0.33)
    c. Usually (0.66)
    d. Always (1)
28. How often do you refuse plastic straws?
    a. Never (0)
    b. Sometimes (0.33)
    c. Usually (0.66)
    d. Always (1)
29. Do you replace your air filters regularly?
    a. Never (0)
    b. Sometimes (0.33)
    c. Usually (0.66)
    d. Always (1)
30. How often do you do homework in a public place?
    a. Never (0)
    b. Sometimes (0.33)
    c. Usually (0.66)
    d. Always (1)
31. How often do you take notes digitally?
    a. Never (0)
    b. Sometimes (0.33)
    c. Usually (0.66)
    d. Always (1)
32. How often do you take part in or support climate demonstrations?
    a. Never (0)
    b. Sometimes (0.33)
    c. Usually (0.66)
    d. Always (1)
33. How often do you talk about climate change with friends or family?
    a. Never (0)
    b. Sometimes (0.33)
    c. Usually (0.66)
    d. Always (1)
34. Do you use solar energy?
    a. Yes (1)

   b. No (0)
   c. Don't know (0)

35. How often do you turn off lights when you leave?
   a. Never (0)
   b. Sometimes (0.33)
   c. Usually (0.66)
   d. Always (1)
36. How often do you use a reusable water bottle?
   a. Never (0)
   b. Sometimes (0.33)
   c. Usually (0.66)
   d. Always (1)
37. How often do you use a travel mug for hot drinks?
   a. Never (0)
   b. Sometimes (0.33)
   c. Usually (0.66)
   d. Always (1)
38. How often do you use both sides of paper and recycle old schoolwork?
   a. Never (0)
   b. Sometimes (0.33)
   c. Usually (0.66)
   d. Always (1)
39. Do you use LED lightbulbs?
   a. Yes (1)
   b. No (0)
   c. Don't know (0)
40. How often do you take shorter showers?
   a. Never (0)
   b. Sometimes (0.33)
   c. Usually (0.66)
   d. Always (1)
41. How often do you use public transportation?
   a. Never (0)
   b. Sometimes (0.33)
   c. Usually (0.66)
   d. Always (1)
42. How often do you vote for candidates supporting sustainable policy actions?
   a. Never (0)
   b. Sometimes (0.33)
   c. Usually (0.66)

    d. Always (1)

43. How often do you walk or bike to nearby places?
    a. Never (0)
    b. Sometimes (0.33)
    c. Usually (0.66)
    d. Always (1)
44. How often do you wash your clothes in cold water?
    a. Never (0)
    b. Sometimes (0.33)
    c. Usually (0.66)
    d. Always (1)
45. How often do you write or lobby elected officials?
    a. Never (0)
    b. Sometimes (0.33)
    c. Usually (0.66)
    d. Always (1)
46. How often do you write to administrators?
    a. Never (0)
    b. Sometimes (0.33)
    c. Usually (0.66)
    d. Always (1)
47. How often do you reduce your food waste?
    a. Never (0)
    b. Sometimes (0.33)
    c. Usually (0.66)
    d. Always (1)
48. How often do you consolidate and reduce your deliveries?
    a. Never (0)
    b. Sometimes (0.33)
    c. Usually (0.66)
    d. Always (1)
49. How often do you encourage your university to invest in energy conservation?
    a. Never (0)
    b. Sometimes (0.33)
    c. Usually (0.66)
    d. Always (1)
50. Do you seal your doors and windows?
    a. Yes (1)
    b. No (0)
    c. Don’t know (0)

Hope

1. I believe people will be able to solve problems caused by climate change.
    a. Strongly agree (2)
    b. Agree (1)
    c. Neither agree nor disagree (0)
    d. Disagree (-1)
    e. Strongly disagree (-2)
2. I believe scientists will be able to find ways to solve problems caused by climate change.
    a. Strongly agree (2)
    b. Agree (1)
    c. Neither agree nor disagree (0)
    d. Disagree (-1)
    e. Strongly disagree (-2)
3. Even when some people give up, I know there will be others who will continue to try to solve problems caused by climate change.
    a. Strongly agree (2)
    b. Agree (1)
    c. Neither agree nor disagree (0)
    d. Disagree (-1)
    e. Strongly disagree (-2)
4. If everyone works together, we can solve problems caused by climate change.
    a. Strongly agree (2)
    b. Agree (1)
    c. Neither agree nor disagree (0)
    d. Disagree (-1)
    e. Strongly disagree (-2)
5. I am willing to take actions to help solve problems caused by climate change.
    a. Strongly agree (2)
    b. Agree (1)
    c. Neither agree nor disagree (0)
    d. Disagree (-1)
    e. Strongly disagree (-2)
6. I believe more people are willing to take actions to help solve problems caused by climate change.
    a. Strongly agree (2)
    b. Agree (1)
    c. Neither agree nor disagree (0)
    d. Disagree (-1)

    e. Strongly disagree (-2)
7. I know that there are things that I can do to help solve problems caused by climate change.
    a. Strongly agree (2)
    b. Agree (1)
    c. Neither agree nor disagree (0)
    d. Disagree (-1)
    e. Strongly disagree (-2)
8. I know what to do to help solve problems caused by climate change.
    a. Strongly agree (2)
    b. Agree (1)
    c. Neither agree nor disagree (0)
    d. Disagree (-1)
    e. Strongly disagree (-2)
9. Climate change is beyond my control, so I won't even bother trying to solve problems caused by climate change.
    a. Strongly agree (-2)
    b. Agree (-1)
    c. Neither agree nor disagree (0)
    d. Disagree (1)
    e. Strongly disagree (2)
10. Climate change is so complex we will not be able to solve problems that it causes.
    a. Strongly agree (-2)
    b. Agree (-1)
    c. Neither agree nor disagree (0)
    d. Disagree (1)
    e. Strongly disagree (2)
11. The actions I can take are too small to help solve problems caused by climate change.
    a. Strongly agree (-2)
    b. Agree (-1)
    c. Neither agree nor disagree (0)
    d. Disagree (1)
    e. Strongly disagree (2)

D. Post-treatment Questionnaire Open-Ended Section

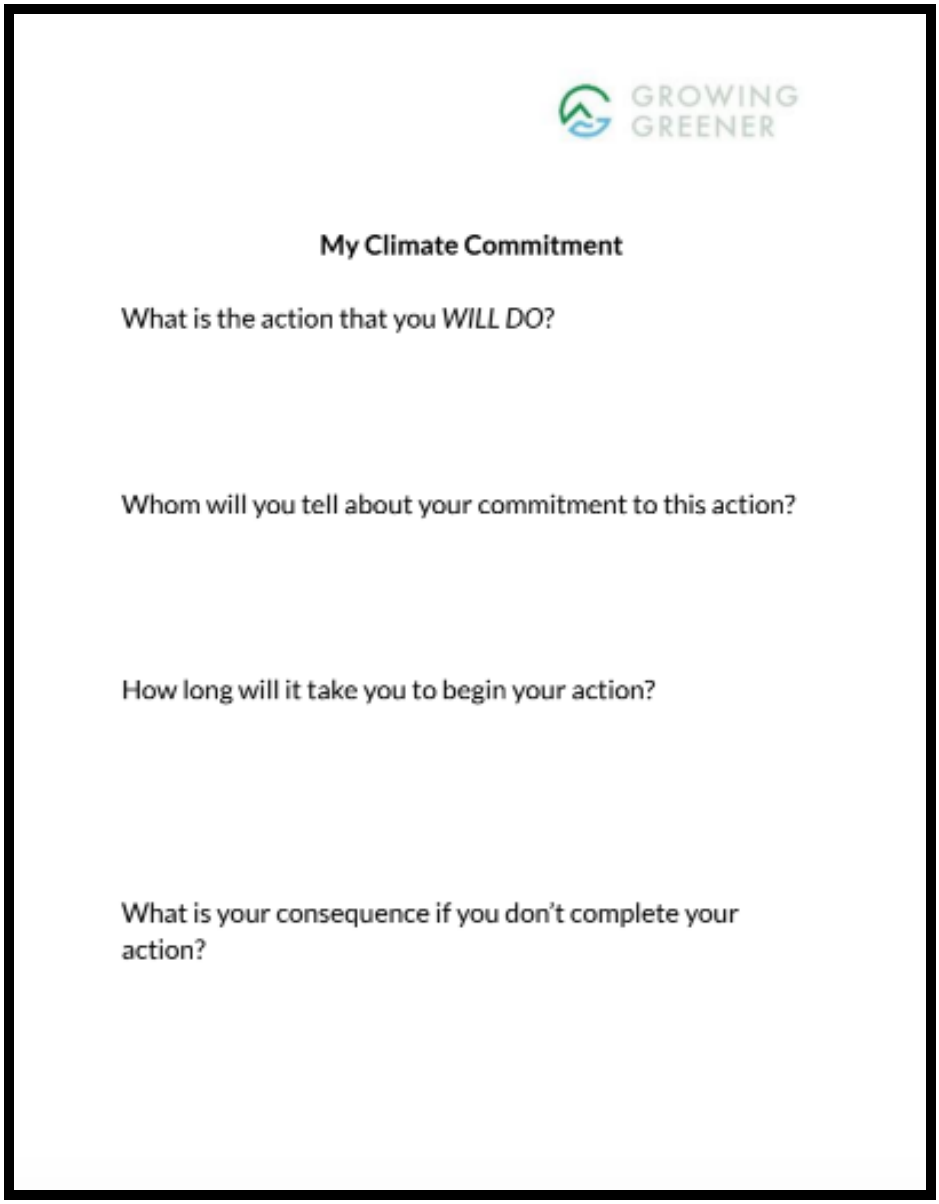
1. How did the social aspect of the group activity affect your experience?
2. Have your feelings about hope for the future changed after watching the TED Talk/participating in the workshop? If so, how?
3. Do you feel like you have the personal ability to make an impact in combating climate change?
4. Do you trust your community to combat climate change any more or less?
5. Have you had experiences with climate discussions/activities before this? If so, please describe.
6. What, if any, new ideas did you learn?

E. Control Treatment Discussion Question Schedule

1. Are you familiar at all with Al Gore? What do you know about Al Gore?
2. What were some of your big takeaways from the TedTalk?
3. The title of this talk is *A Case for Optimism* - do you think he made the case? Why or why not?
4. What do you think has changed in the years since this TedTalk was presented (2016)?
5. What is something that you learned that you didn't know before?
6. Anything else you want to add?

Note: These questions were used to guide discussion following the screening of the TedTalk titled A Case for Optimism on Climate Change. These discussions were semi-structured in that the same questions were asked in the same order but there was no obligation to ask all of the questions in the schedule. If discussion was robust, we did not get through all of the questions before the allotted time elapsed. These questions are intended to be neutral and most are open-ended.

F. Workshop Handout


GROWING
GREENER
My Climate Commitment
What is the action that you *WILL DO*?
Whom will you tell about your commitment to this action?
How long will it take you to begin your action?
What is your consequence if you don't complete your action?

G. Nudge/Non-nudge Messaging

Nudge - Positive Messaging

Hi [insert participant's name here]!

Thank you for participating in the *The case for optimism on climate change* group discussion from Growing Greener on 2/22 and thank you for doing your part to help create change! It takes all of us to make an impact and your action matters!

All the best,

Jillie from Growing Greener

Hi [insert participant's name here]!

Thank you for participating in the *Graduating Greener* workshop from Growing Greener on 2/27 and thank you for doing your part to help create change! We hope that you have been keeping up with your big, easy climate action. It takes all of us to make an impact and your action matters!

All the best,

Jillie from Growing Greener

Non-nudge - Neutral Messaging

Hello,

Thank you for participating in the *The case for optimism on climate change* group discussion from Growing Greener on 2/22.

All the best,

Jillie from Growing Greener

Hello,

Thank you for participating in the *Graduating Greener* workshop from Growing Greener on 2/27.

All the best,

Jillie from Growing Greener

H. Line-by-Line Data Tables for Concern, Hope, and Behavior

Table C: *Line-by-line Data Analysis of Concern Measures*

	mean	median	sd	count
Pre-treatment Control				
How worried are you about climate change?	0.80	1.00	0.79	10.00
How much do you think climate change will negatively affect you personally?	-0.40	0.00	0.52	10.00
How much do you think climate change will negatively affect people in the United States?	1.00	1.00	0.67	10.00
How much do you think climate change will negatively affect future generations of people?	1.60	2.00	0.52	10.00
Post-treatment Control				
How worried are you about climate change?	0.67	1.00	0.71	9.00
How much do you think climate change will negatively affect you personally?	0.00	0.00	0.50	9.00
How much do you think climate change will negatively affect people in the United States?	0.89	1.00	0.93	9.00
How much do you think climate change will negatively affect future generations of people?	1.78	2.00	0.44	9.00
Pre-treatment *GradGreen*				
How worried are you about climate change?	0.50	0.50	1.20	8.00

How much do you think climate change will negatively affect you personally?	-0.13	0.00	0.83	8.00
How much do you think climate change will negatively affect people in the United States?	1.00	1.00	0.53	8.00
How much do you think climate change will negatively affect future generations of people?	1.38	1.00	0.52	8.00
Post-treatment *GradGreen*				
How worried are you about climate change?	0.75	1.00	0.71	8.00
How much do you think climate change will negatively affect you personally?	0.38	0.00	0.92	8.00
How much do you think climate change will negatively affect people in the United States?	1.13	1.00	0.64	8.00
How much do you think climate change will negatively affect future generations of people?	1.63	2.00	0.52	8.00

Table D: Line-by-line Data Analysis of Hope Measures

	mean	median	sd	count
Pre-treatment Control				
I believe people will be able to solve problems caused by climate change.	0.30	0.50	0.82	10.00
I believe scientists will be able to find ways to solve problems caused by climate change.	0.80	1.00	0.79	10.00
Even when some people give up, I know there will be others who will continue to try to solve problems caused by climate change.	1.40	1.00	0.52	10.00
If everyone works together, we can solve problems caused by climate change.	1.10	1.00	0.57	10.00
I am willing to take actions to help solve problems caused by climate change.	1.40	1.00	0.52	10.00
I believe more people are willing to take actions to help solve problems caused by climate change.	0.60	1.00	0.84	10.00
I know that there are things that I can do to help solve problems caused by climate change.	1.10	1.00	0.99	10.00
I know what to do to help solve problems caused by climate change.	0.30	1.00	0.95	10.00
Climate change is beyond my control, so I won't even bother trying to solve problems caused by climate change.	1.30	1.50	0.82	10.00
Climate change is so complex we will not be able to solve problems that it causes.	0.20	0.50	1.03	10.00

The actions I can take are too small to help solve problems caused by climate change.	-0.30	-1.00	1.42	10.00
Post-treatment Control				
I believe people will be able to solve problems caused by climate change.	0.44	1.00	0.73	9.00
I believe scientists will be able to find ways to solve problems caused by climate change.	1.00	1.00	0.50	9.00
Even when some people give up, I know there will be others who will continue to try to solve problems caused by climate change.	1.00	1.00	0.50	9.00
If everyone works together, we can solve problems caused by climate change.	1.22	1.00	0.67	9.00
I am willing to take actions to help solve problems caused by climate change.	1.44	2.00	0.73	9.00
I believe more people are willing to take actions to help solve problems caused by climate change.	0.89	1.00	0.60	9.00
I know that there are things that I can do to help solve problems caused by climate change.	0.89	1.00	0.93	9.00
I know what to do to help solve problems caused by climate change.	0.33	1.00	0.87	9.00
Climate change is beyond my control, so I won't even bother trying to solve problems caused by climate change.	1.00	1.00	0.87	9.00
Climate change is so complex we will not be able to solve problems that it causes.	0.11	0.00	0.78	9.00
The actions I can take are too small to help solve problems caused by climate	0.11	0.00	1.27	9.00

change.

Pre-treatment *GradGreen*				
I believe people will be able to solve problems caused by climate change.	0.50	1.00	0.76	8.00
I believe scientists will be able to find ways to solve problems caused by climate change.	0.88	1.00	0.64	8.00
Even when some people give up, I know there will be others who will continue to try to solve problems caused by climate change.	0.38	1.00	0.92	8.00
If everyone works together, we can solve problems caused by climate change.	1.38	1.00	0.52	8.00
I am willing to take actions to help solve problems caused by climate change.	1.25	1.00	0.71	8.00
I believe more people are willing to take actions to help solve problems caused by climate change.	0.88	1.00	0.83	8.00
I know that there are things that I can do to help solve problems caused by climate change.	0.88	1.00	0.83	8.00
I know what to do to help solve problems caused by climate change.	0.13	0.00	0.83	8.00
Climate change is beyond my control, so I won't even bother trying to solve problems caused by climate change.	0.38	0.50	0.74	8.00
Climate change is so complex we will not be able to solve problems that it causes.	0.50	0.50	0.93	8.00
The actions I can take are too small to help solve problems caused by climate change.	-0.13	0.00	0.83	8.00

Post-treatment *GradGreen*				
I believe people will be able to solve problems caused by climate change.	0.50	1.00	1.07	8.00
I believe scientists will be able to find ways to solve problems caused by climate change.	0.63	1.00	1.06	8.00
Even when some people give up, I know there will be others who will continue to try to solve problems caused by climate change.	0.75	1.00	0.71	8.00
If everyone works together, we can solve problems caused by climate change.	0.75	1.00	1.16	8.00
I am willing to take actions to help solve problems caused by climate change.	1.38	1.00	0.52	8.00
I believe more people are willing to take actions to help solve problems caused by climate change.	0.50	1.00	0.76	8.00
I know that there are things that I can do to help solve problems caused by climate change.	1.00	1.00	0.93	8.00
I know what to do to help solve problems caused by climate change.	0.88	1.00	0.83	8.00
Climate change is beyond my control, so I won't even bother trying to solve problems caused by climate change.	0.50	1.00	0.93	8.00
Climate change is so complex we will not be able to solve problems that it causes.	0.25	0.00	0.71	8.00
The actions I can take are too small to help solve problems caused by climate change.	0.38	0.50	1.19	8.00

Table E: Line-by-Line Data Analysis of Behavior Measures

	mean	median	sd	count
Pre-treatment Control				
How often do you appreciate nature?	0.73	0.66	0.14	10.00
How often do you bring personal silverware?	0.17	0.17	0.17	10.00
How often do you bring reusable bags to the store?	0.73	0.33	1.17	10.00
Do you have a fuel efficient car?	0.30	0.00	0.48	10.00
How often do you buy clothes from thrift stores?	0.33	0.33	0.35	10.00
Do you buy energy efficient appliances?	0.30	0.00	0.48	10.00
How often do you buy locally-sourced goods?	0.33	0.33	0.16	10.00
How often do you carpool?	0.50	0.49	0.28	10.00
How often do you compost?	0.60	0.17	1.23	10.00
How often do you litter?	0.97	1.00	0.11	10.00
Do you donate old electronic devices?	0.40	0.00	0.52	10.00
During the past week, how often did you use your car?	0.93	1.00	0.14	10.00
How often do you dry your clothes without a dryer?	0.30	0.17	0.40	10.00
How many times do you eat meat each week?	1.93	0.83	1.79	10.00
During the past year, how many plane trips have you taken?	0.53	0.66	0.42	10.00

Has your place of residence had an energy audit in the last five years?	0.00	0.00	0.00	10.00
Do you have a car that you use often?	0.50	0.50	0.53	10.00
How often do you help out at a community garden?	0.13	0.00	0.17	10.00
Do you have a programmable thermostat?	0.60	1.00	0.52	10.00
Do you have double-glazed windows?	0.00	0.00	0.00	10.00
Do you have an insulated water heater?	0.00	0.00	0.00	10.00
Are you a part of a climate organization?	0.10	0.00	0.32	10.00
How often do you pick up litter?	0.36	0.33	0.19	10.00
How often do you plant trees?	0.13	0.00	0.17	10.00
How often do you read assignments online or print them double-sided?	0.90	1.00	0.16	10.00
How often do you recycle?	0.70	0.66	0.25	10.00
How often do you try to reduce your plastic use?	0.49	0.66	0.23	10.00
How often do you refuse plastic straws?	0.40	0.33	0.26	10.00
Do you replace your air filters regularly?	0.36	0.33	0.33	10.00
How often do you do homework in a public place?	0.36	0.33	0.19	10.00
How often do you take notes digitally?	0.26	0.33	0.14	10.00
How often do you take part in or support climate demonstrations?	0.17	0.17	0.17	10.00
How often do you talk about climate change with friends or family?	0.33	0.33	0.16	10.00
Do you use solar energy?	0.00	0.00	0.00	10.00

How often do you turn off lights when you leave?	0.86	1.00	0.24	10.00
How often do you use a reusable water bottle?	0.86	1.00	0.24	10.00
How often do you use a travel mug for hot drinks?	0.63	0.66	0.40	10.00
How often do you use both sides of paper and recycle old schoolwork?	0.70	0.83	0.40	10.00
Do you use LED lightbulbs?	0.60	1.00	0.52	10.00
How often do you take shorter showers?	0.53	0.49	0.23	10.00
How often do you use public transportation?	0.20	0.33	0.17	10.00
How often do you vote for candidates supporting sustainable policy actions?	0.66	0.66	0.22	10.00
How often do you walk or bike to nearby places?	0.53	0.66	0.23	10.00
How often do you wash your clothes in cold water?	0.43	0.33	0.32	10.00
How often do you write or lobby elected officials?	0.03	0.00	0.10	10.00
How often do you write to administrators?	0.03	0.00	0.10	10.00
How often do you reduce your food waste?	0.46	0.33	0.28	10.00
How often do you consolidate and reduce your deliveries?	0.40	0.33	0.26	10.00
How often do you encourage your university to invest in energy conservation?	0.13	0.00	0.23	10.00
Do you seal your doors and windows?	0.40	0.00	0.52	10.00

Post-treatment Control				
How often do you appreciate nature?	0.66	0.66	0.17	9.00
How often do you bring personal silverware?	0.11	0.00	0.17	9.00
How often do you bring reusable bags to the store?	0.40	0.33	0.28	9.00
Do you have a fuel efficient car?	0.33	0.00	0.50	9.00
How often do you buy clothes from thrift stores?	0.29	0.33	0.31	9.00
Do you buy energy efficient appliances?	0.11	0.00	0.33	9.00
How often do you buy locally-sourced goods?	0.37	0.33	0.11	9.00
How often do you carpool?	0.51	0.66	0.17	9.00
How often do you compost?	0.26	0.00	0.32	9.00
How often do you litter?	0.96	1.00	0.11	9.00
Do you donate old electronic devices?	0.56	1.00	0.53	9.00
During the past week, how often did you use your car?	0.92	1.00	0.15	9.00
How often do you dry your clothes without a dryer?	0.18	0.33	0.17	9.00
How many times do you eat meat each week?	0.29	0.33	0.31	9.00
During the past year, how many plane trips have you taken?	0.59	0.66	0.32	9.00
Has your place of residence had an energy audit in the last five years?	0.00	0.00	0.00	9.00
Do you have a car that you use often?	0.67	1.00	0.50	9.00
How often do you help out at a	0.18	0.33	0.17	9.00

community garden?				
Do you have a programmable thermostat?	1.78	1.00	1.20	9.00
Do you have double-glazed windows?	0.11	0.00	0.33	9.00
Do you have an insulated water heater?	0.11	0.00	0.33	9.00
Are you a part of a climate organization?	0.11	0.00	0.33	9.00
How often do you pick up litter?	0.44	0.33	0.17	9.00
How often do you plant trees?	0.18	0.33	0.17	9.00
How often do you read assignments online or print them double-sided?	0.85	1.00	0.24	9.00
How often do you recycle?	0.74	0.66	0.28	9.00
How often do you try to reduce your plastic use?	0.51	0.66	0.24	9.00
How often do you refuse plastic straws?	0.44	0.33	0.33	9.00
Do you replace your air filters regularly?	0.37	0.33	0.26	9.00
How often do you do homework in a public place?	0.40	0.33	0.15	9.00
How often do you take notes digitally?	0.26	0.33	0.15	9.00
How often do you take part in or support climate demonstrations?	0.15	0.00	0.17	9.00
How often do you talk about climate change with friends or family?	0.29	0.33	0.20	9.00
Do you use solar energy?	0.11	0.00	0.33	9.00
How often do you turn off lights when you leave?	0.77	0.66	0.24	9.00
How often do you use a reusable water bottle?	0.85	1.00	0.18	9.00

How often do you use a travel mug for hot drinks?	0.66	0.66	0.33	9.00
How often do you use both sides of paper and recycle old schoolwork?	0.70	0.66	0.35	9.00
Do you use LED lightbulbs?	0.44	0.00	0.53	9.00
How often do you take shorter showers?	0.48	0.66	0.24	9.00
How often do you use public transportation?	0.22	0.33	0.17	9.00
How often do you vote for candidates supporting sustainable policy actions?	0.59	0.66	0.36	9.00
How often do you walk or bike to nearby places?	0.55	0.66	0.24	9.00
How often do you wash your clothes in cold water?	0.40	0.33	0.36	9.00
How often do you write or lobby elected officials?	0.07	0.00	0.15	9.00
How often do you write to administrators?	0.04	0.00	0.11	9.00
How often do you reduce your food waste?	0.52	0.33	0.34	9.00
How often do you consolidate and reduce your deliveries?	0.33	0.33	0.29	9.00
How often do you encourage your university to invest in energy conservation?	0.15	0.00	0.29	9.00
Do you seal your doors and windows?	0.33	0.00	0.50	9.00
Pre-treatment *GradGreen*				
How often do you appreciate nature?	0.83	1.00	0.25	8.00
How often do you bring personal silverware?	0.29	0.33	0.33	8.00

How often do you bring reusable bags to the store?	1.25	0.33	1.71	8.00
Do you have a fuel efficient car?	0.38	0.00	0.52	8.00
How often do you buy clothes from thrift stores?	0.21	0.33	0.17	8.00
Do you buy energy efficient appliances?	0.00	0.00	0.00	8.00
How often do you buy locally-sourced goods?	0.33	0.33	0.00	8.00
How often do you carpool?	0.37	0.33	0.12	8.00
How often do you compost?	0.21	0.17	0.25	8.00
How often do you litter?	0.92	1.00	0.16	8.00
Do you donate old electronic devices?	0.38	0.00	0.52	8.00
During the past week, how often did you use your car?	1.00	1.00	0.00	8.00
How often do you dry your clothes without a dryer?	0.12	0.00	0.25	8.00
How many times do you eat meat each week?	1.46	0.83	1.59	8.00
During the past year, how many plane trips have you taken?	0.12	0.00	0.17	8.00
Has your place of residence had an energy audit in the last five years?	0.00	0.00	0.00	8.00
Do you have a car that you use often?	0.25	0.00	0.46	8.00
How often do you help out at a community garden?	0.25	0.33	0.23	8.00
Do you have a programmable thermostat?	0.75	1.00	0.46	8.00
Do you have double-glazed windows?	0.00	0.00	0.00	8.00
Do you have an insulated water heater?	0.50	0.50	0.53	8.00

Are you a part of a climate organization?	0.13	0.00	0.35	8.00
How often do you pick up litter?	0.50	0.33	0.25	8.00
How often do you plant trees?	0.12	0.00	0.17	8.00
How often do you read assignments online or print them double-sided?	0.79	0.83	0.25	8.00
How often do you recycle?	0.71	0.66	0.28	8.00
How often do you try to reduce your plastic use?	0.58	0.66	0.35	8.00
How often do you refuse plastic straws?	0.37	0.33	0.33	8.00
Do you replace your air filters regularly?	0.33	0.33	0.18	8.00
How often do you do homework in a public place?	0.41	0.33	0.30	8.00
How often do you take notes digitally?	0.46	0.33	0.30	8.00
How often do you take part in or support climate demonstrations?	0.17	0.17	0.18	8.00
How often do you talk about climate change with friends or family?	0.33	0.33	0.00	8.00
Do you use solar energy?	0.13	0.00	0.35	8.00
How often do you turn off lights when you leave?	0.79	1.00	0.31	8.00
How often do you use a reusable water bottle?	0.79	1.00	0.31	8.00
How often do you use a travel mug for hot drinks?	0.46	0.33	0.30	8.00
How often do you use both sides of paper and recycle old schoolwork?	0.75	0.83	0.30	8.00
Do you use LED lightbulbs?	0.38	0.00	0.52	8.00

How often do you take shorter showers?	0.58	0.66	0.15	8.00
How often do you use public transportation?	0.25	0.33	0.15	8.00
How often do you vote for candidates supporting sustainable policy actions?	0.33	0.17	0.40	8.00
How often do you walk or bike to nearby places?	0.66	0.66	0.18	8.00
How often do you wash your clothes in cold water?	0.33	0.33	0.25	8.00
How often do you write or lobby elected officials?	0.04	0.00	0.12	8.00
How often do you write to administrators?	0.00	0.00	0.00	8.00
How often do you reduce your food waste?	0.50	0.33	0.36	8.00
How often do you consolidate and reduce your deliveries?	0.33	0.33	0.25	8.00
How often do you encourage your university to invest in energy conservation?	0.08	0.00	0.15	8.00
Do you seal your doors and windows?	0.25	0.00	0.46	8.00
Post-treatment *GradGreen*				
How often do you appreciate nature?	0.81	1.00	0.26	7.00
How often do you bring personal silverware?	0.33	0.33	0.33	7.00
How often do you bring reusable bags to the store?	0.62	0.66	0.41	7.00
Do you have a fuel efficient car?	0.14	0.00	0.38	7.00
How often do you buy clothes from thrift stores?	0.33	0.33	0.19	7.00

Do you buy energy efficient appliances?	0.57	1.00	0.53	7.00
How often do you buy locally-sourced goods?	0.42	0.33	0.16	7.00
How often do you carpool?	0.52	0.66	0.18	7.00
How often do you compost?	0.28	0.33	0.23	7.00
How often do you litter?	0.95	1.00	0.13	7.00
Do you donate old electronic devices?	0.71	1.00	0.49	7.00
During the past week, how often did you use your car?	0.81	1.00	0.26	7.00
How often do you dry your clothes without a dryer?	0.33	0.33	0.19	7.00
How many times do you eat meat each week?	0.43	0.33	0.37	7.00
During the past year, how many plane trips have you taken?	0.24	0.00	0.31	7.00
Has your place of residence had an energy audit in the last five years?	0.14	0.00	0.38	7.00
Do you have a car that you use often?	0.57	1.00	0.53	7.00
How often do you help out at a community garden?	0.28	0.33	0.36	7.00
Do you have a programmable thermostat?	1.43	1.00	1.13	7.00
Do you have double-glazed windows?	0.14	0.00	0.38	7.00
Do you have an insulated water heater?	0.29	0.00	0.49	7.00
Are you a part of a climate organization?	0.14	0.00	0.38	7.00
How often do you pick up litter?	0.57	0.33	0.32	7.00
How often do you plant trees?	0.19	0.33	0.18	7.00
How often do you read assignments online	0.76	0.66	0.25	7.00

or print them double-sided?				
How often do you recycle?	0.81	0.66	0.18	7.00
How often do you try to reduce your plastic use?	0.71	0.66	0.30	7.00
How often do you refuse plastic straws?	0.43	0.33	0.32	7.00
Do you replace your air filters regularly?	0.42	0.33	0.16	7.00
How often do you do homework in a public place?	0.47	0.33	0.32	7.00
How often do you take notes digitally?	0.28	0.33	0.23	7.00
How often do you take part in or support climate demonstrations?	0.24	0.33	0.16	7.00
How often do you talk about climate change with friends or family?	0.38	0.33	0.12	7.00
Do you use solar energy?	0.00	0.00	0.00	7.00
How often do you turn off lights when you leave?	0.81	1.00	0.26	7.00
How often do you use a reusable water bottle?	0.81	1.00	0.33	7.00
How often do you use a travel mug for hot drinks?	0.66	0.66	0.34	7.00
How often do you use both sides of paper and recycle old schoolwork?	0.76	1.00	0.32	7.00
Do you use LED lightbulbs?	0.57	1.00	0.53	7.00
How often do you take shorter showers?	0.61	0.66	0.23	7.00
How often do you use public transportation?	0.38	0.33	0.12	7.00
How often do you vote for candidates	0.52	0.66	0.32	7.00

supporting sustainable policy actions?				
How often do you walk or bike to nearby places?	0.57	0.66	0.25	7.00
How often do you wash your clothes in cold water?	0.38	0.33	0.23	7.00
How often do you write or lobby elected officials?	0.00	0.00	0.00	7.00
How often do you write to administrators?	0.05	0.00	0.12	7.00
How often do you reduce your food waste?	0.66	0.66	0.27	7.00
How often do you consolidate and reduce your deliveries?	0.61	0.66	0.12	7.00
How often do you encourage your university to invest in energy conservation?	0.14	0.00	0.18	7.00
Do you seal your doors and windows?	0.57	1.00	0.53	7.00