Application of Social Influence Strategies to Convert Concern into Relevant Action: The Case of Global Warming

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ABSTRACT

This research studied the efficacy of enhancing information-based appeals with social influence strategies in order to encourage environmental activism and efficiency behaviors in response to global warming. A secondary goal was to study the relationship between pro-environment attitudes as measured by the New Ecological Paradigm (NEP) and the activism/efficiency behaviors. After hearing a 15-minute presentation about the threat of global warming, 270 participants were encouraged to take relevant action by (a) signing web-based petitions asking automakers to build more environmentally friendly cars, (b) sending web-based letters to their state senators asking them to pass legislation to curb global warming, and (c) replacing their own inefficient incandescent light bulbs with compact fluorescent light bulbs (CFLs).

The primary independent variable was the intervention technique used to encourage the three behaviors. The Information Only condition received a standard informational presentation, and a Social Influence condition received a presentation enhanced by the social psychological principles of authority, social validation, and consistency. A third group—Social Influence and Commitment—received the social influence manipulations and also signed a commitment statement.

Overall compliance was relatively low, with 30.7% of participants across all conditions completing one or more activism/efficiency behavior. Statistical comparisons of the compliance rates of the three groups were insignificant, and thus failed to support the efficacy of the social influence approach. Participants who held stronger pro-environment attitudes were more likely to complete the tasks. Those who completed at least one of the environmental actions scored significantly higher on a pre-presentation NEP (m = 54.9) than those who completed none (m = 50.3). In addition, political conservatism was negatively related to the NEP and task compliance. Finally, individuals who completed at least one of the requested behaviors showed a significant increase in pro-environment attitude on a second (post intervention) NEP, while the NEP scores of non-compliers remained unchanged.

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Dedication

Dedicated to my family: Elizabeth , Maria, Nate, and Emma

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Human behavior poses threats to the earth's environment with potential consequences ranging in magnitude from aesthetic depreciation to the planet losing the ability to sustain life. Among the most salient threats are global warming, air pollution, water pollution and depletion, the disposal of solid waste, and a loss of green space and species diversity. Each of these problems is directly linked to human behavior and exacerbated by population growth.

Psychologists have responded to environmental problems by studying attitudes toward environmental protection, and to a lesser extent, by designing interventions to increase the frequency of environmentally-responsible behavior (ERB). Although there has been substantial productivity in both of these lines of research, both have been subjected to relevant criticism. Specifically, research on environmental attitudes has been criticized for its limited practical value and the relatively weak correspondence between pro-environment attitudes and ERB (Lehman & Geller, 2004), while the behavioral intervention literature has been criticized for over reliance on rewards, a failure to maintain behavior change, and avoidance of the most relevant targets (Gardner & Stern, 1996; Stern, 2000)

The current study explored methods for motivating large-scale and high-impact behavioral responses to the critical environmental problem of global warming. The efficacy of a standard informational appeal for action was compared to appeals enhanced by the social influence principles of authority, social validation, and consistency/commitment. In addition, the correspondence between pre-existing environmental attitudes as measured by the New Ecological Paradigm (NEP) and behavioral response to the appeal was examined.

The context and rationale for this study is presented through (a) a brief review and critique of psychological research on environmental protection, (b) an overview of the threat and causes of global warming, and (c) an overview of three social-influence principles well-suited for motivating action on the issue of global warming.

Psychologists' Response to Environmental Degradation

The psychological research literature addressing environmental degradation can be roughly divided into two categories—studies which attempt to measure and understand environmental attitudes and their relationship to ERB, and studies which attempt to intervene directly to improve ERB.

Environmental Attitude Research

In recent years, the bulk of psychological research on the environment has focused on environmental attitudes as opposed to environmental behaviors. For example, although the journal *Environment and Behavior* published more research concerning behavioral interventions to preserve the environment than any other journal since 1990 (i.e., 12 articles), research reports focusing on environmental attitudes and demographic characteristics of those involved in environmentally-relevant behavior outnumbered intervention articles at a rate of seven to one. Other journals, such as *The Journal of Environmental Psychology*, are dedicated almost exclusively to environmental attitudes.

In general, environmental attitude research suggests the relationship between pro-environment attitudes and ERB is relatively weak and inconsistent (Fransson & Garling, 1999; Winter, 2004). In an attempt to explain the inconsistent evidence linking pro-environmental attitudes with ERB, Guagnano, Stern, & Dietz, (1995) proposed ERB is determined by a combination of attitudes and contextual (situational) influences. According to their theory, the

correspondence between pro-environment behaviors and attitudes is strongest when the contextual or situational variables are neutral and weakest when the situational factors strongly encourage or discourage pro-environmental behavior. In other words, when ERB is easily accomplished and socially accepted, most everyone will do it (no attitude/behavior correspondence); but when it is somewhat difficult only those who are pro-environment will do it (attitude/behavior correspondence). And when there is a large response cost associated with ERB it is unlikely anyone will do it (no attitude/behavior correspondence).

Few studies have examined the relationship between environmental attitudes and environmental activism. Steel (1996) examined the relationship between environmental attitudes as measured by the New Environmental Paradigm (NEP) and self-reported activism behavior for a random sample of 1,094 American citizens. An index of environmental activism was created by asking respondents if they had participated in a variety of environmental activism behaviors, ranging from signing petitions and writing letters to public officials to participating in demonstrations for environmental causes. Results indicated a positive relationship between self-reported environmental activism behaviors and a pro-environment orientation on the NEP (β = .19, $p < .001$).

Notably, Steel states the results should be interpreted with caution because of reliance on self-reported behavior and the fact that pro-environmental norms could have motivated socially-desirable responding. In addition, it seems likely participants' desire to be consistent played a role in the results. Specifically, after completing a survey endorsing a strong pro-environment orientation, it is possible individuals were compelled to report correspondent behavior.

A second study which used the NEP to examine the correspondence between environmental attitudes and activism behaviors had similar limitations. In a sample of 75

undergraduate business students from an Ohio university, the researcher found a positive correlation ($r = .46$, $p < .01$) between the NEP and a survey of behavioral intentions to engage in environmental activism behaviors such as protests, letter writing, and petition signing (Cordano, Welcomer, & Scherer, 2003).

One objective of the proposed research is to explore the relationship between environmental attitudes and *actual* activism behaviors rather than behavioral intentions and self-reported behaviors. Based on the relationship between environmental attitudes and activism intentions and self reports and Guganago et al.'s (1995) theory, a significant relationship is expected between environmental attitudes and activism behaviors that are relatively effortful. Also, increased social pressure to perform activism behavior is expected attenuate this relationship as individuals without strong pro-environment attitudes become motivated by social influence.

Behavioral Interventions to Protect the Environment

In the 1970's, applied psychologists began to tackle the problem of environmental degradation (Geller, Winett, & Everett, 1982). Behavior analysts were pioneers in the field of psychology and environmental protection, using antecedent strategies such as prompting, and the consequence strategies of rewards and feedback to rearrange the problematic contingencies reducing environmentally responsible behavior (ERB). During that decade, numerous studies demonstrated the effectiveness of behavioral technology to decrease environmentally destructive behaviors such as littering, excessive vehicle use, and wasteful consumption of home energy and water. Other field studies focused on increasing ERB such as carpooling, recycling, litter pick-up, and increasing the use of mass transit (see reviews by Cone & Hayes 1984, and Geller et al., 1982).

Beginning in the 1980s, ERB interventions began to appear in the social psychological literature (e.g., Burn & Oskamp, 1986; Gonzales, Aronson, & Constanzo, 1988; Katzev & Johnson, 1984). These interventions used the social psychological principles of persuasion, social norms, commitment and consistency to increase ERB. Interventions which used the social psychological principles of consistency and commitment proved to be particularly effective, and are discussed further below (Dwyer, Leeming, Cobern, Porter, & Jackson, 1993).

The Lack of Large-Scale Impact

A robust literature illustrates the application of numerous psychological principles can change human behavior in a pro-environmental direction. However, despite what we have learned, the problem of environmental degradation continues. Geller (1990) attributes this to a problem of dissemination. Others have criticized the field of environmental psychology for failing to focus on targets behaviors that would result in the greatest environmental impact. Gardner and Stern (1996) point out that most ERB interventions have focused on individual behaviors which must be repeated indefinitely (e.g., recycling) in order to result in pro-environmental gains. They argue that much greater environmental impact could be accomplished by focusing on one-time efficiency behaviors (e.g., buying a more fuel-efficient car).

In addition, Stern (2000) emphasizes the behavior of individuals makes up only a small portion of the environmental problem. In contrast to individual behaviors, the actions of governments and industry have a far greater impact on environmental quality through the adoption of environmentally-friendly policies and production procedures. In most cases, industry and government are accountable to individuals, and thus can be influenced by individual behaviors. In the case of industry, success is determined by profits, which are affected by individual consumer behaviors. Governments are accountable to those who elect them, and

although the effects may be indirect, government tax and environmental policies have greater implications for the environment than individual behaviors (Stern, 2000).

Stern's critique suggests environmental activism in the form of petitioning government and industry may be the most environmentally-beneficial behavior individuals can perform. Despite the potential for a large pro-environmental impact, to date the literature contains only one published intervention in which activism behaviors were targeted for change. Specifically, Schroeder, Hovell, Kolody, and Elder (2004) used newsletters to inform coastal business owners about the economic consequences of declining ocean-water quality in the area, and to prompt them to contact government officials about the problem. Results indicated that 46% of business owners randomly assigned to receive the newsletter contacted government officials through faxes, letters, or phone calls, compared to 15% in the control group that did not receive the newsletter. A weakness of this study is that it relied on self-reports.

The current research was designed to address some of the criticisms of previous environment-related intervention studies (i.e., failure to focus on important targets, failure to address industry and governments' role in environmental problems, and failure to focus on efficiency behaviors). Specifically, participants were encouraged to perform two activism behaviors (contact authority figures in government and industry to express concern over the problem of global warming) and one efficiency behavior (purchase energy efficient compact fluorescent light bulbs). Rather than relying on self reports, the dependent measure of the study was the completion of these three behaviors addressing the problem of global warming.

Global Warming: An Important and Challenging Target

Global warming is perhaps the most serious threat to the earth's environment. Carbon dioxide (CO_2) and other gas byproducts of burning fossil fuels have formed a blanket around the

earth that allows light to penetrate without allowing heat to escape. The result is a greenhouse effect and a slowly warming planet. It is estimated the levels of CO_2 in the atmosphere are now 31% above pre-industrial levels. Scientists estimate the average global temperature has increased by approximately .6 degrees Celsius over the past 150 years, and project increases between 1.4 and 5.8 degrees Celsius by 2100 if greenhouse gasses are not significantly reduced (Intergovernmental Panel on Climate Change, 2001). Although this seems like a modest increase, very small changes in global temperature can lead to dramatic consequences. A worst-case scenario includes a warming of the oceans that leads to melting polar icecaps and then to the flooding of coastal areas, followed by extreme changes in weather patterns causing droughts and desertification in some areas and floods in others. Consequently, even slight global warming can threaten the earth's ability to sustain life as we know it.

In addition to the potentially catastrophic consequences for the future, the relatively small changes we have already experienced may pose significant threats to human health. The World Health Organization estimates that global warming is already responsible for 154,000 deaths worldwide by creating conditions more favorable for the spread of diseases such as malaria, dengue fever and diarrhea (World Health Organization, 2002).

Interestingly, global warming shares many features common to other environmental problems which serve as barriers to action. These problematic features include: (a) the problem is largely invisible, (b) the negative consequences are perceived as distant and uncertain, and (c) the damage being done is the aggregate result of millions of behaviors rather than a single behavior. The immediate comfort and convenience of driving a personal vehicle, heating and cooling our homes, and consuming the products we want often overpower the distant and uncertain consequences of global warming.

When an individual chooses to make the sacrifices required to reduce global warming, his or her behavior alone is unlikely to make much of difference. An individual's choice to sell a car and rely on public transportation and biking will reduce the amount of greenhouse gas this person produces, but won't cool the planet. To really make a difference, thousands or millions of others would need to make the same choice and sacrifice, leading many to ask: Since others aren't doing it, why should I?

In addition to large-scale behavior change of individuals, addressing the problem of global warming will require significant change by governments and industry. Survey data indicate the public would support these changes. For example, over the past three decades, a majority of Americans has consistently held the opinion that (a) the government is spending too little on environmental protection, (b) environmental protection regulations have not gone far enough, and (c) environmental protection is more important than economic growth (Dunlap, 2002).

Pro-environment values are not limited to the United States. Gallup's Millennium Poll, which sampled 50,000 people from 60 countries, revealed 65% of respondents felt their governments were not doing enough to protect the environment. In addition, a majority of citizens in 57 of the 60 countries surveyed believed protecting the environment was more important than economic growth (Gallup International, 2005).

Although the issue of global warming is often portrayed as controversial by the media, recent polling data suggest public concern regarding the issue is widespread. For example, according to a recent poll conducted by the Pew Research Center (2006), 70% of Americans believe there is solid evidence the planet is warming, and 74% believe global warming to be a serious or somewhat serious problem. Another recent poll suggests most Americans believe the

effects of global warming can be reduced (70%) and are willing to take steps such as turning down the therm ostat two degrees in the winter, weatherproofing their homes, and reducing driving by combining trips (Ayres, McHenry & Associates, 2006).

Unfortunately, the consistent concern documented by the polling data reviewed above does not tell the whole story. Although most individuals are *concerned* about environmental protection in general and global warming specifically, polling data also reveal many issues which the public considers to be more *urgent*. For example, on lists of issues considered "very important" by Americans, global warming ranks 19th among Republicans and 13th among Democrats (Pew Research Center, 2006). Ironically, just as environmental protection often takes a back seat to the pressing demands of our personal lives, global warming appears to be a relatively low priority in a national consciousness crowded by pressing issues such as terrorism, education, social security, and the war in Iraq.

Social Influence Strategies Applied to Global Warming

The combination of widespread environmental concern and the nature of the barriers preventing citizens from taking relevant action to address global warming make it a suitable problem for the application of social influence principles. Specifically, the principles of (a) authority, (b) social validation, and (c) consistency hold promise for motivating action. Each principle is reviewed below, along with its application to environmental interventions in the past and specific relevance for the problem of global warming.

Authority

The authority principle states we are likely to obey authority figures and follow the advice of experts. This principle, taught from an early age, gains its power in part from a desire to the gain rewards associated with obeying and avoid penalties associated with disobeying

authority figures. The influence of authority, however, is not limited to cases where there is a power differential. The opinions of experts are often used as heuristics for making correct choices. When the opinions of professionals or authority figures appear prominently in newspapers and on television, public opinion tends to move toward agreement with the designated experts (Jorden, 1993; Page, Shapiro, & Dempsey, 1987). In addition, advertisers frequently employ real or purported experts to endorse their products (Cialdini, 2001).

An intervention study designed to promote energy conservation by New York City residents directly applied the authority principle to increase ERB (Craig & McCann, 1978). The researcher's mailed letters containing lists of conservation tips to two groups of city residents. One group received the letter on power company letterhead, while the other received an identical letter on official government letterhead. Comparisons of kilowatt hours of electricity use for the two groups demonstrated that those receiving the plea from the government used significantly less electricity (7%) than those who received the same letter from the power company. Craig and McCann attributed the observed differences to the credibility of the source, speculating a government authority represented a more credible authority than the local power company.

The application of the authority principle for the purposes of this study also pertains to credibility. Research has demonstrated that environmental issues in general (O'Keefe & Shepard, 2002) and global warming in particular (Bord, O'Connor, & Fischer, 2000) are complex, and often poorly understood by the public. In the case of global warming, a broad consensus exists among climate-change authorities (scientists) that (a) the global temperature has risen during the past 50 years, and (b) human activity, specifically the release of carbon dioxide (CO_2) from burning fossil fuels, is largely to blame. A recent review of 928 peer-reviewed journal articles pertaining to global-climate change found that 75% implicated human activity as a contributor to

climate change, while the remaining 25% did not take a position. Notably, none of the articles contested the role of human activity in warming the planet (Oreskes, 2004). Despite this clear agreement among scientists, the media has a tendency to distort the scientific consensus on the issue by over reporting controversy, perhaps in an effort to achieve balanced reporting (Wilson, 2000 as cited in Corbett & Durfee, 2004).

In addition to the uncertainty fostered by media accounts, political authorities add to the public's confusion by inflating perceptions of discord among scientists. Perhaps due to fears about economic consequences or ideological opposition to the increased regulations that would be necessary to curb global warming, opinions on the seriousness issue are generally split along party lines (Pew Research Center, 2006). Despite this split, even conservative politicians have recently acknowledged the position that the earth's temperature is increasing, but are less likely to advocate responding in ways that might impede economic growth. At the same time, there have been significant bipartisan efforts to address global warming, for example, the Climate Stewardship and Innovation Act, which is sponsored by Senators John McCain and Joe Lieberman.

When faced with an invisible problem with potentially devastating consequences at an enormous and seemingly unmanageable scale, it is not hard to understand how any hint of authoritative uncertainty might lead many to retreat to the comfort of denial and inaction. Interventions designed to motivate behavioral responses to the problem should therefore accurately emphasize the extant consensus among the scientific community.

Furthermore, because of the attribution principles of augmentation and discounting (Kelley, 1973) conservative voices in support of addressing global warming should carry more persuasive weight than liberal voices. While warning messages from politicians perceived as

liberal (e.g., Al Gore's *An Inconvenient Truth*) may be discounted as "typical liberal rhetoric," a message from a conservative politician may be perceived as more credible due to its source. Emphasizing the opinions of conservatives who consider global warming a serious issue deserving immediate attention should result in greater persuasion and motivation for action. A clearly stated and simple message delivered by or attributed to a trusted authority source should lead to higher credibility and increased participation.

Social Validation

Although individuals frequently look to authority figures to guide their actions, they are also influenced by the behaviors and beliefs of peers and societal norms. The principle of social validation states we often rely on the behaviors of others to discern appropriate action, especially in novel or uncertain situations (Cialdini, 2001). The desire to act effectively may explain the tendency to conform in uncertain situations, and for others the need for social approval may be primary (Cialdini & Goldstein, 2004). Cialdini (2001) uses the term "social proof" to describe the compliance technique in which evidence about the behavior of others is provided in order to evoke a conforming response. For example, sales people and advertisers attempt to increase sales by citing the popularity of an item.

One strategy for applying the principle of social validation to improve ERB is to draw attention to pro-environmental norms and behaviors. Research has demonstrated that social validation can directly affect ERB through (a) the use of live modeling of conservation behaviors (Aronson & O'Leary, 1983), (b) signage focusing on pro-environmental norms (Cialdini, 2003), and (c) the delivery of normative feedback about high rates of ERB (Schultz, 1998).

Polling data have consistently revealed environmental concern is normative (Dunlap, 2002), and recent polls suggest a majority of citizens are concerned about global warming and

willing to take action to reduce greenhouse gas emissions (Ayres, McHenry, & Associates, 2006). Based on the principle of social validation, providing individuals with information about widespread concern about environmental issues in general and global warming in particular should support the idea that it is "correct" to be concerned about environmental issues, and has potential to activate action.

Consistency

Widespread pro-environment norms also provide fertile ground for consistency-based intervention. Consistency motivation has served as the basis for some of the most influential theories in social psychology, including cognitive dissonance (Festinger, 1957) and balance theory (Heider, 1946). In addition to the desire for internal consistency as outlined in dissonance and balance theory, additional research has demonstrated individuals have a strong desire to *appear* consistent to others (Cialdini & Trost, 1998). Thus, the consistency principle has implications for maintaining positive self-concepts and managing one's impressions on others.

One consistency-based strategy for improving ERB is to arouse cognitive dissonance by making discrepancies between pro-environment attitudes and environmentally-harmful behavior salient. For example, Aitken, McMahon, Wearing, and Finlayson, (1994) aroused dissonance by providing residents who endorsed water conservation as a value on a survey with feedback demonstrating their water use was significantly higher than that of similar households.

A second application of the consistency principle to improve ERB is to explicitly request a commitment to engage in ERB. When such commitments are obtained, internal and external consistency pressures increase the likelihood of behavior change (Cialdini, 2001). Commitment strategies have been successfully used to reduce home-energy consumption (Pallak &

Cummings, 1976), increase recycling (Wang & Katzev, 1990; Werner et al., 1995) and increase grass cycling (Cobern, Porter, Leeming, & Dwyer, 1995).

An added benefit of commitment strategies is they often seem to result in long-term behavior change (Dwyer et al., 1993), perhaps through changes in self-perception (Bem, 1972). According to Bem's theory, individuals infer their attitudes by observing their own self-directed behaviors. For example, an individual might determine his or her environmental attitude by how often he or she recycles, carpools, or engages in environmental activism. If this theory has merit, individuals who commit to performing a pro-environmental behavior and follow through are likely to increase their pro-environment identity. If attitudes do in fact predict behavior, this bolstered environmental identity may result in increased pro-environment behavior in the future.

Although most individuals value environmental protection and are concerned about global warming, consistently behaving in environmentally-friendly ways is extremely difficult. Daily living requires consumption of resources for food and shelter, and most people in industrialized societies rely upon fossil fuels for transportation. In addition, polling data suggest most individuals believe the government is not doing enough to protect the environment (Gallup International, 2005). Yet it is unlikely a majority of individuals have taken any action to express their concerns to government officials, not even with the convenient sending of a letter or email. Increasing the salience of the inconsistency between pro-environmental attitudes and a lack of action to protect the environment should arouse cognitive dissonance, and increase motivation for action. Combining dissonance with an active public commitment to action is likely to be particularly effective.

Hypotheses

In sum, the social influence principles outlined above (authority, social validation, and consistency) have been successfully applied to ERB interventions in the past, and show particular promise for motivating individuals to take action on the problem of global warming. The primary hypothesis of the current study is that an informational appeal which uses these three social influence principles should be more effective in motivating activism and efficiency behaviors than one based on information alone (H1). Based on previous research, the addition of an explicit commitment to take action to the presentation should result in even greater activism and efficiency behavior (H2).

It is hypothesized that activism and efficiency behaviors will be positively related to environmental attitudes as measured by the NEP (H3). This relationship is expected to weaken when social influence is applied (H4), because the social influence principles are expected to prompt action from individuals regardless of the strength of their environmental attitudes. Based on the polling data described above, it is expected that environmental attitudes and action will be negatively related to political conservatism (H5, H6). Finally, based on the theory of behavioral self-perception (Bem, 1972), it is expected that engaging in environmental activism and efficiency behaviors will result in increases in pro-environment attitudes (H7).

Method

The current study examined the effectiveness of three appeals to promote ERB in response to the problem of global warming. Participants listened to a PowerPoint presentation about the threat of global warming, and later received emailed pleas to take appropriate action. Each presentation made the case that effectively combating global warming requires individual-

behavior change as well as action from government and industry, and requested that participants act to affect change in each of these domains.

Participants

The participants for the study were undergraduate students enrolled in Virginia Tech's Introductory Psychology Recitation course. Introductory psychology is a popular elective course at Virginia Tech, which enrolls a broad cross section of students from a variety of majors and academic years. Introductory Psychology recitation sections are a compliment to the lecture portion of the course. Students in a total of thirteen recitation sections were given the opportunity to stay after class and participate in the study in exchange for one extra-credit point for the course, and the promise of earning a second point of extra credit for completing a follow-up survey. This recruitment strategy yielded 270 participants, 50.4% of whom were female. The mean age for the sample was 19.1, with a range of 18 to 23-years old. Although ethnicity data were not collected, Introductory Psychology students tend to mirror the racial composition of the campus as a whole, which is predominantly Caucasian.

Procedure

A 15-minute presentation about the problem of global warming was given to each of 13 groups. Before beginning the presentation, the presenter explained the purpose of the research was to determine the effects of providing information about global warming on pro-environmental behavior. After signing informed consent documents, (see Appendix A) participants were asked to complete a short survey containing the NEP and demographic items (see Appendix B).

The NEP is a broad measure of pro-environmental orientation which has been established as internally consistent (Dunlap, Van Liere, Mertig, & Jones, 2000). In addition, evidence of the

scale's construct and predictive validity has been gathered through correlations with (a) other environmental attitude measures, (b) self-reported ERB, and (c) behavioral intentions (Dunlap et al, 2000; Cordano et al., 2003).

In order to increase generalizability, the presentations were given by three research assistants (one male, two females, all college graduates). Each had practiced the presentation and delivered it in front of a group to assure fluency and competence, but none was an environmental expert. Each of the female research assistants delivered the presentation to three class groups on one day. The male research assistant delivered three presentations on one day and also completed a second day (four presentations) in order to increase the sample size and balance participants across conditions.

The experimental conditions for the first 12 recitation classes were randomly assigned (with constraints) to one of three presentation conditions in advance: (a) Information Only (IO), (b) Information and Social Influence (SI), and (c) Information, Social influence, and Commitment (SIC). Random assignment was constrained to ensure balance of presentation conditions across presenters. This was achieved with the exception of adding a 13^{th} IO group to balance participants across conditions. This strategy yielded relatively equal-sized groups (88 in IO, 90 in SI, and 92 in SIC).

Independent Variables

Each experimental group received a 15-minute presentation delivered by the research assistant and enhanced with 19 illustrated PowerPoint slides. The presentations delivered to all experimental groups shared the following information: (a) an overview of the basic problem of global warming (i.e., explanation of how greenhouse gasses such as CO_2 accumulate in the atmosphere and trap heat), (b) the human behaviors that produce greenhouse gasses (i.e.,

industrial emissions, vehicle use, use of fossil fuels for heating, cooling, and electricity production), (c) the current consequences of global warming (e.g., shrinking glaciers, increased disease, more powerful hurricanes), (d) the potential future consequences of global warming (i.e., flooding from rising sea levels, drought and desertification, species extinction), (e) graphs of projected increases in CO_2 and average temperatures, (f) a rationale for how to correctly address the problem of global warming (i.e., changes at individual, industrial, and government levels), and (g) a plea for participants to read and respond appropriately to three email appeals they would receive during the next week.

Information and Social Influence. In addition to the components described above, the Information and Social Influence (SI) condition included the social influence manipulations described below.

In the SI condition, the research assistant made the following request at the beginning of the presentation:

> Survey data have consistently demonstrated that most Americans hold environmental protection as an important value, and I suspect that this is also true of Virginia Tech students. I'd like to begin by taking an informal poll. Please raise your hand if you agree with the following statement: "*I believe it is important that individuals and industries behave in environmentally-responsible ways*."

Because of widespread social norms in favor of environmental protection, it was expected a vast majority of students would raise their hands to endorse this statement, and this indeed occurred. Research assistants reported that a total of only two participants failed to raise their hands in response to this question. This show of hands was designed to employ two social influence principles. First, by raising their hands, participants publicly endorsed the value of

environmental protection. Based on the consistency principle, this public commitment was expected to enhance the likelihood of compliance with subsequent requests for action consistent with this position. Second, the strong show of hands was expected to produce salient social validation of pro-environmental norms.

The authority principle was employed in a slide which illustrated the near-unanimous scientific consensus that the globe is warming and human behavior is to blame. Data for this slide were taken from a review in the journal *Science* (Oreskes, 2004) which evaluated 928 peer-reviewed climate-change articles. The review concluded none of the articles contested that global warming was taking place and that human activity (carbon-dioxide production) was a primary contributor. Since the science behind global warming is rather complicated, it was expected participants would readily rely on the expert consensus of climate scientists.

Social validation of the problem of global warming was provided in a slide titled "Americans are Concerned and Willing to Take Action" (See Appendix C, Slide 17). This slide illustrated the results of national polls of citizen concern and their willingness to change their behavior. The slide included pie charts illustrating the following: (a) 65% of Americans feel the government is *not* doing enough to protect the environment (Gallup International, 2005), (b) 74% of Americans believe global warming is a problem (Pew Research Center, 2006), (c) 70% of Americans believe the effects of global warming can be reduced, and (d) 90% of Americans are willing to change their behavior to reduce greenhouse emissions (Ayres, McHenry, & Associates, 2006).

A slide titled "Politicians and Corporations are Concerned and Taking Action" combined the social validation and authority principles by providing quotes and behaviors from political and corporate leaders. This slide contained quotes from John McCain and Arnold

Schwarzenegger, republican politicians who have endorsed powerful legislation to reduce greenhouse gas emissions. In addition, the slide reported that Richard Branson, CEO of Virgin Corporation, pledged three-billion dollars to combat global warming, and listed several other initiatives by major corporations to combat global warming (See Appendix C, slide 16).

In sum, the SI condition applied the principles of authority, social validation, and consistency through PowerPoint slides illustrating (a) the scientific consensus on the problem of global warming, (b) poll data illustrating normative concern about the issue, and (c) quotes and behaviors from government and business leaders which indicate the severity of the problem and the importance of action. A "show of hands" poll attempted to invoke consistency motivation and provide additional social validation.

Information, Social Influence, and Commitment. In light of previous research demonstrating commitment as a powerful behavior-change tool (e.g., Dwyer et al., 1992), individuals in the Information, Social Influence and Commitment condition (SIC) received the social influence manipulations described above, and were also asked to sign the following commitment statement:

I believe protecting the environment is important.

Therefore, I will carefully read the email prompts from STOP GLOBAL WARMING and support them if I can.

The commitment requested was to *read* the email prompts, and "support them if I can" in order to maximize signing compliance. The request for this commitment was made at the end of the presentation, after the post-experiment emails were explained. The research assistant passed out sheets of paper containing two copies of the statement, and asked participants to sign both statements, tear the page in half, turning in one half on their way out of the classroom and

keeping the other half for their records. They also explained the commitment was voluntary, and participants could turn in an unsigned paper if they did not wish make the commitment. Despite this option, all of the participants in this condition signed the commitment sheet.

Information Only. The Information Only (IO) condition received the information described at the beginning of this section, along with supplemental information to make the length of the presentation equivalent to the other conditions. In order to mirror the show of hands poll in the social influence conditions (i.e., SI and SIC), participants in the IO condition were asked to raise their hands to show how many were in the Monday/Wednesday vs. Tuesday/Thursday lecture class. Although this information was unneeded, the question was unlikely to arouse suspicion, and the result was a matching of the hand-raising behavior in the other conditions without the social validation of the environmental poll.

In order to match the length of the social influence presentations, three slides presenting information about the methodology for measuring climate change were added (Appendix D). The first of these slides, entitled “How do we know what the climate was like thousands of years ago?” explained climate data are collected from tree rings, sediment layers, and ice cores, and that ice cores were the most reliable source of information. The remaining two slides contained photographs of ice-core samples and explained (a) layers in the ice correspond to years of snowfall, (b) scientists gather information about average temperatures by studying relative concentration of hydrogen and oxygen isotopes, and (c) in some areas of Antarctica, ice cores are sampled from ice up to two miles in thick, proving a record dating back about 700,000 years. It should be noted the content covered in these slides was not meaningless “filler”, but rather relevant and interesting information which should hold potential for persuasion.

With these three slides the total number of slides in the IO condition matched the total for both social influence conditions (i.e., 19). In addition, the length of presentation scripts was virtually equal for the IO condition and SI condition (within about ten words). The script for the SIC condition was slightly longer to allow for explanation of the commitment statement.

Request for Action

Each presentation concluded by making the case that addressing the problem of global warming requires governmental, industrial, and individual-level behavior change. Participants were informed that over the next five days, they would receive emails informing them of opportunities to affect change in each of these three areas. The research assistants specified that participants would *not* receive additional extra credit for complying with these requests.

Below is the portion of the presentation script which explained the three requested behaviors. Following the explanation of the web-based requests, the research assistants went online and demonstrated the process for logging in to the website to demonstrate the ease of completing the task. (See Appendix E for full request and demonstration script.)

> *The good news is that through this project, you can make a difference. You will have an opportunity to ask for industrial and government change, and to reduce the amount of greenhouse gas you produce.*
>
> *Over the next five days you will receive three emails informing you of opportunities to make a difference in the fight against global warming. The emails will contain links to websites where you can sign an online petition asking automakers to build greener cars and write an online letter to your Senators expressing concern about global warming.*

We have made these tasks very easy to perform, and I want to show you the website.

(RA demonstrates the website)

A third email will provide information about how to buy energy-efficient compact fluorescent light bulbs like this one (RA holds up CFL bulb) *for one dollar.*

Replacing one old-fashioned bulb with this will save about $40 in electricity over the five-year life of the bulb. More importantly, the bulb will prevent about 680 pounds of Carbon Dioxide from being produced! This is equivalent to the average car owner parking her car and not driving for two weeks. These bulbs will be on sale in the Center for Applied Behavior Systems on the second floor of this building.

Participation in these activities is voluntary—you will receive extra credit even if you do not do them. However, I am hopeful that you will choose to take action. Although this is part of a psychology experiment, these actions are real—the letters and petitions will be sent to Senators and CEOs, and using the bulbs will reduce greenhouse gasses.

At this point in the presentation, participants in the IO and SI conditions were thanked for their attention and asked to read the emails and "take action to make a difference." Those in the SIC condition were asked to make the commitment and then dismissed in similar fashion.

Dependent Variables

After hearing the presentation, participants in all conditions received five identical emails sent over the course of eight days. Each email was sent at approximately 5 pm. The first email, sent on the day of the presentation, asked participants to follow a link to sign an electronic petition asking automakers to make "greener" cars. The second, sent two days later, asked participants to follow a link to a website where they could write a letter asking their state

senators to address the problem of global warming. Two days later, the third email provided details about how participants could buy discounted compact fluorescent light bulbs (CFLs). The fourth email (a final plea for action sent three days later) contained links to the automaker and senator websites and informed participants that the sites would close in 24 hours. The final email, sent 24 hours later, thanked participants for their involvement and informed them they could earn an additional point of extra credit by completing a follow-up survey. More details about each request are provided below, and the script for each email is contained in Appendix F.

Email #1: Industrial Behavior Change. The first email asked participants to encourage industrial-behavior change by signing petitions to be sent to car companies asking them to make the production of environmentally-friendly vehicles a priority. The email explained (in bullet form) that (a) the U.S. is the number one producer of greenhouse gases, (b) transportation is one of the primary sources of greenhouse gas pollution, and (c) the fuel efficiency of cars has actually decreased since 1980. The email stated that participants could make a difference by clicking on the link to tell automakers they are concerned about global warming, and want "greener" more fuel-efficient cars.

Clicking on the link took participants to a log on screen requiring their unique university email address and password, and then to an attractive website headed with the title "Stop Global Warming" in a bold font on a background of red fading to green. Below the header, in bold font, was the statement "You can make a difference!" This website provided more information about the role of automobiles in global warming, and contained links to petitions for seven automakers; Ford, General Motors, Toyota, Honda, Chrysler, Nissan, and Volkswagen. Beside each automaker link was information about the models they produced, and the names of the hybrid vehicles they produced (if any). The website explained that by clicking on each link and entering

their name and address on a form, they would be included on a petition endorsing the following statement:

> *As a consumer and global citizen, I am concerned about how (car company) responds to the problem of global warming. I encourage you to develop and use technology in (car company) vehicles to increase fuel economy and reduce carbon emissions.*

The website explained participants could increase the impact of their actions by signing multiple petitions and adding their own comments in a provided text box. Suggestions of what to include in personal comments were outlined in bullet form (e.g., explain your concern about global warming, ask the company to provide more hybrid models, explain that fuel economy will influence your next vehicle purchase). (See Appendix G for content of the website).

The website collected the data for the first independent variable: (a) the number of petitions signed by each participant, and (b) the length of the comments (if any) entered for each petition.

Email #2: Government Behavior Change. The second email (sent 48 hours later) requested participants facilitate government behavior change by writing their state senators to express their concern about global warming and ask them to support legislation to reduce emissions. Reasons to take action were outlined in the email in bullet form and included, (a) a reminder that the U.S. is the number one greenhouse gas polluter, (b) information about the increases in carbon dioxide emissions by the U.S. over the past 15 years, (c) projections for future increases, and (d) that 2006 was the hottest year ever recorded in the U.S.

Emails contained a link to a second website (similar in graphic design to the one above) where participants were asked to select their home state and enter their name and address. Filling

in their name and address on a single form and clicking the submit button produced the following letter addressed to each of their senators:

Dear Senator (Last Name),

As a resident of (selected state), I am concerned about the problem of global warming. I am writing to ask you to support legislation that reduces carbon emissions.

Sincerely,

(Participant Name)

Again, participants were encouraged to increase the impact of their action by personalizing the letter and were given some ideas of things to include (e.g., ask for a cap on global-warming pollution, ask for support of legislation mandating fuel efficiency standards, ask to support research on alternative fuels). The website recorded (a) whether the participant had submitted the letter, and (b) the content and length (in bits) of each response.

Email # 3: Individual Behavior Change. The third email (48 hours later) asked participants to lower their emission of greenhouse gasses by purchasing one or more compact fluorescent light bulbs (CFLs) at a reduced price. The email built a case for using CFLs by explaining they use 30% of the electricity used by standard bulbs. It also explained that if everyone in the U.S. replaced one of their incandescent bulbs with a CFL, the reduction in greenhouse gases would be equal to removing one million cars from the road.

In addition, the email explained (a) when and where to buy the bulbs (Williams 202, on the second floor of the building in which they heard the presentation), (b) they could buy up to three bulbs at a cost of $1 each, (c) the bulbs would make a great “green gift” if they were already using them, and (d) they could sign for the bulbs and pay later if they were short on cash.

The bottom of the email contained a reminder about the automaker petitions and senator websites, along with links to the relevant sites.

The bulbs were sold in the Center for Applied Behavior Systems (Room 202, Williams Hall). An 8.5" by 11" sign posted by the door announced the sale of CFLs to experiment participants. The Center coordinators recorded the name of each person buying bulbs, the number of bulbs purchased (1-3) and whether participants paid for the bulbs or signed for them.

Follow-up Survey. Three days after the CFL email described above, participants received an email encouraging them once again to take action and explaining the websites would close in 24 hours. Twenty-four hours later the websites were closed, and an email was sent thanking participants for involvement in the research and informing them they could earn an additional point of extra credit by completing an online follow-up survey (see Appendix H). Up to three follow-up emails were sent to participants who did not complete the survey upon the first request.

The survey contained a second NEP (NEP-2) and 15 additional questions designed to evaluate reactions to the PowerPoint presentation, test social-influence manipulations, and explore participants' reasons for not taking action. The presentation evaluation questions asked participants to use five-point Likert scales to report; (a) how concerned they were about the problem of global warming before and after the presentation, (b) how concerned others who heard the presentation would likely be, (c) the extent to which they found the presentation interesting, (d) the extent to which they found the presentation informative, and (e) the extent to which they found the presentation persuasive.

The social-influence manipulation checks asked participants to use five-point Likert scales to note the extent to which they agreed with the following statements: (a) Most scientists

agree that global warming is real and caused by human activity, (b) Most Americans are concerned about the problem of global warming, and (c) Lately, politicians and companies are doing more to address the problem of global warming.

Finally, participants were asked whether they complied with the requests for action, and if not, why. They were given several choices for answers, including; (a) I meant to, but didn't get around to it, (b) I don't think global warming is a serious problem, (c) I didn't think it would make a difference, and (c) I was uncomfortable putting my name on the petition/letter. They were asked to select all that applied, and invited to add their own additional reasons if they wished.

Pilot Study

The procedures outlined above were refined by a pilot study involving volunteers from two psychology classes. One class received the IO intervention and the other received the SIC intervention. Although the number of participants involved in the pilot did not allow for meaningful statistical comparisons between the groups, the pilot revealed: (a) means in the expected direction for most dependent variables, and (b) relatively low rates of compliance with the tasks, especially for the purchase of the CFLs. Based on these findings and the results of a follow-up survey similar to the one described above, the original intervention plan was altered to match the methods described above. Changes implemented as a result of the pilot study are highlighted below.

- The commitment statement was strengthened. The commitment for the pilot study was to read the emails from Stop Global Warming and "carefully consider" supporting them.

- The pilot follow-up survey revealed the top reason for not purchasing the CFLs was a lack of cash. In light of this, participants were informed they could sign for the bulbs and pay later if they did not have cash.
- CFLs were brought to the presentations and additional script lines about the benefits of CFLs were added. In addition, the presentation script suggested CFLs would make a great "green gift" for the friends and family of participants who were already using them.
- In an effort to increase overall compliance, a website demonstration was added to all presentations. Modeling logging on and navigating the website was expected to favorably impact compliance because it illustrated the user-friendliness of the website and emphasized the tasks could be completed in a few minutes.
- In the pilot follow-up survey, most participants who did not sign the petitions or write their senators stated they "meant to, but did not get around to it." The website demonstration described above was thought to address this in part. In addition, an effort was made to make the time limit for responding more salient in the emails, and a final email containing links to car petition and senator letter sites was added. This email announced the websites would only be open for 24 more hours, an application of the scarcity principle of social influence (Cialdini, 2001).

Results

Overall Compliance

Of the 270 participants, 70 (25.9%) signed at least one automaker petition. The mean number of petitions signed by those who signed at least one was 2.94 (sd = 2.58). This mean was strongly influenced by 18 individuals who signed all seven petitions, while most (n = 38) signed only one. The majority of participants who signed petitions did not add comments (n = 45). For

those who added comments (n = 25), the length of comments on individual petitions ranged from 33 bits to 1186 bits. Bits are defined as the total number of characters, spaces, and punctuation marks in a given comment (i.e., the total number of keystrokes) and can be translated into a rough word count by dividing by six. Thus, the length of comments ranged from 6 to 198 words. Nineteen of the 25 individuals who commented only made comments on one petition, and the six individuals who commented on more than one used the same comments on multiple petitions, likely through the "copy and paste" option on their computers.

Overall compliance with the letters to state senators was lower than the automaker petitions, with only 28 of 270 participants (10.4%) completing the task. The majority of those who complied with the request chose to send the 156-bit form letter unaltered (20 of 28; 71%). The mean letter bits for those who altered the letter was 603 (range: 160-1873 bits).

Finally, very few participants purchased the discounted CFLs. Specifically, a total of only seven individuals across all conditions (2.6% of all participants) purchased bulbs. The majority of these individuals (n = 5) purchased three bulbs, with one individual purchasing one bulb, and another purchasing two. All except one participant paid for the bulbs when picking them up. The individual who "signed" for the bulbs did not return to pay for the three bulbs he took.

< Insert Figure 1. about here>

In sum, a total of 83 of 270 participants (30.7%) complied with at least one request. Sixty-four participants completed only one task, 16 completed two, and three completed three. It should be noted the low rates of compliance restricted statistical analysis. Because a majority of individuals completed none of the tasks, the outcome data were not normally distributed, and most analyses were limited to non-parametric tests (i.e., Chi Square). Additionally, although the study was designed to result in varying degrees of compliance (e.g., numbers of petitions signed,

length of comments) these data were not normal in distribution either. For example, most individuals signed one (n = 38) or all (n = 18) of the petitions, and a majority (64%) did not add comments.

Compliance by Condition

For the automaker petitions, 27 of 88 (30.7%) in the Information Only (IO) condition completed at least one petition, compared to 22 of 90 (24.4%) in the Information and Social Influence (SI) condition, and 21 of 92 (22.8%) in the Information, Social Influence, and Commitment (SIC) condition. A Chi Square test of independence revealed no statistically significant differences among the groups: χ^2 (2, N = 270) = 1.6, $p > .05$.

Also of interest was the total number of petitions signed by condition. Participants in the IO condition signed a total of 79 petitions (m = .90, sd = 1.96) compared to 62 total petitions in the SI condition (m = .69, sd = 1.75), and 65 in the SIC condition (m = .71, sd = 1.82). A one-way ANOVA comparing the mean total petitions signed by condition revealed no significant differences: F (2, 267) = .351; $p > .05$. Because the large number of non-compliers made the use of an overall ANOVA questionable, an ANOVA limited to the mean number of petitions signed by those who signed at least one was also conducted. This analysis did not reveal any significant differences among condition means (IO m = 2.93, SI m = 2.82, SIC m = 3.1) F (2, 67) = .061, $p > .05$.

Very few individuals made comments on their petitions. Among those who signed at least one petition, 6 of 27 (22.2%) in the IO condition made comments compared to 11 of 22 (50%) in the SI condition, and 8 of 21 (38.1%) in the SIC condition. A Chi Square analysis revealed no difference among conditions in the percentage of petition signers making comments: χ^2 (2, N = 70) = 4.15, $p > .05$.

As noted above, many of the comments were repeated on multiple petitions, inflating the total number of bits and suggesting some individuals "pasted" the same comments for each automaker. With this caveat in mind, the mean petition bits for the 27 signers in the IO condition was 71 (sd = 215.5) compared to 197.2 (sd = 346.9) for the 22 signers in the SI condition and 90.4 (sd = 204.3) for the 21 signers in the SIC condition. These differences were not statistically significant: F (2, 67) = 1.6; $p > .05$).

For the senator letters, 12 of 88 (13.6%) complied in the IO condition, compared to 9 of 90 (10%) in the SI condition, and 7 of 92 (7.6%) in the SIC condition. A Chi Square test of independence revealed no statistically significant differences in compliance among the conditions: χ^2 (2, N = 270) = 1.78, $p > .05$. Relatively few of the letter writers added original material to their letters i.e., 3 of 12 (25%) in the IO condition, 4 of 9 (44%) in SI, and 1 of 7 (14%) in SIC. Because the number of original letter writers was so small, no comparisons of the length of letters (number of bits) across conditions were made.

Finally, although the low rate of compliance makes statistical analysis meaningless, it is noted that three individuals in the information only group purchased bulbs (two participants purchased three bulbs and one purchased one), two individuals in the Social Influence condition purchased CFLs (three each), and two individuals in the Commitment condition purchased bulbs (one purchased three, the other two).

Figure 2 summarizes the percentage of compliance with the three tasks by condition. As can be seen in the histogram, the highest percentage of compliance with each of the three tasks occurred in the Information only condition.

< Insert Figure 2 about here>

Although none of the individual task comparisons revealed significant differences among the conditions, the percentage of individuals who complied with at least one request in the IO condition (35 of 88, 39.8%) was significantly higher than the percent complying in the combined SI and SIC conditions (48 of 182, 26.4%) χ^2 (2, N = 270) = 5, $p < .05$.

Relationship between NEP-1, Political Orientation, and Compliance

The NEP is a survey of 15 items answered on five-point Likert scales ranging from strongly disagree to strongly agree. Thus, scores can range from a minimum of 15 (extremely negative environmental attitude) to a maximum of 70 (extremely positive environmental attitude). The mean NEP score for the pre-presentation survey (NEP-1) was 51.7 (SD = 8.2). Since few (i.e., 19) participants completed more than one of the requested actions, the mean NEP-1 scores of those who had completed at least one of the requested actions was compared to the mean NEP-1 of those who had completed none. The mean NEP-1 of the 83 participants who complied with one or more of the requests (m = 54.9, sd = 7.98) was significantly higher than those who did not comply with any of the requests (m = 50.3, sd = 7.94), F (1, 267) = 18.8, $p < .001$. The effect size for this difference (d = .57) is considered medium in size.

Participants were asked to rate their political orientations on a seven-point scale where 1 = Very Liberal and 7 = Very Conservative. The mean political orientation score for all participants leaned slightly toward the conservative side (M = 4.25, SD = 1.31). Political orientation scores were negatively correlated with the NEP (r = -.253, $p < .001$), and those who completed at least one of the requested actions were significantly less conservative (m = 4.01, sd = 1.37) than those who did none (m = 4.36, sd = 1.28) F (1, 267) = 4.02, $p < .05$. The effect size for this difference is considered small by Cohen's standard (d = .26).

Follow-up Survey Results

A total of 222 of the 270 participants (82%) completed the follow-up survey. This survey was made available after the websites were closed and CFL sales were complete (eight days after PowerPoint presentation). Of particular interest in the follow-up survey were (a) participants' reaction to the PowerPoint presentation about global warming, (b) manipulation check results, and (c) participants' scores on the second administration of the NEP (NEP-2).

Participant Reaction to the Presentation. The follow-up survey asked participants to rate their concern about global warming before and after hearing the presentation on a five-point Likert scale where 1 = not at all concerned, 2 = slightly concerned, 3 = concerned, 4 = very concerned, and 5 = extremely concerned. A paired-sample *t*-test revealed the mean score for concern after hearing the presentation (m = 3.27, sd = .97) was significantly higher than the score before hearing the presentation (m = 2.68, sd = 1.0) t (221) = 12.6, $p < .001$. This effect is considered medium by Cohen's standard ($d = .6$). Figure 3 shows the frequency of responses to this question before and after the presentation, and a change in the mode response from "slightly concerned" before hearing the presentation to "concerned" after hearing the presentation.

<Insert Figure 3 about here>

A second group of questions gauged participants' evaluation of the presentation by asking them to respond to the following statements on five-point Likert scales (1 = strongly disagree, 3= neutral, 5 = strongly agree): (a) The presentation was interesting, (b) The presentation was informative, and (c) The presentation was persuasive. The mode response for each of these items was 4, with most respondents rating the presentation interesting (M = 3.71, SD = .8), informative (M = 4.06, SD = .7), and persuasive (M = 3.62, SD = .78).

These presentation evaluation questions also provided opportunity to test for differences across conditions and presenters. These comparisons yielded similar means across conditions and presenters, with no statistically significant differences (all *p*s > .05).

Manipulation Test Items. Three items were designed to test for the manipulations in the SI and SIC conditions: (a) Most scientists agree that global warming is real and caused by human activity, (b) Most Americans are concerned about the problem of global warming, and (c) Lately, politicians and companies are doing more to address the problem of global warming. Each item was answered on a five-point Likert scale where 1 = strongly disagree and 5 = strongly agree. Comparisons of the means for the IO condition vs. the SI and SIC conditions revealed virtually identical means for the scientific consensus question (IO m = 4.0, sd = .77 vs. SI and SIC m = 4.1, sd = .85) and the politician/corporation question (IO m = 3.56, sd = .87 vs. SI and SIC m = 3.57, sd = .79).

Participants in the IO group were less likely to agree with the statement that most Americans are concerned about global warming (m = 2.6, sd = .84) compared to participants in the SI and SIC conditions (m = 3.1, sd = .94), F (1, 220) = 14.5, $p < .001$.

Changes in NEP Based on Compliance. The mean NEP-2 score for the 220 participants completing the follow-up survey was 52.5 (sd = 8.9). NEP-2 scores were highly correlated with scores on NEP-1, which was taken before the PowerPoint presentation ($r = .8$, $p < .001$). A paired-sample *t*-test revealed the mean NEP-2 score was not significantly different than the mean NEP-1 score (m = 51.9, sd = 8.2), t (219) = -1.62, $p > .05$.

In order to test for changes in the NEP of those who completed at least one action, a paired-sample *t*-test was performed. Seventy-five of the 83 individuals who completed at least one action completed the follow-up survey. The mean NEP-1 for these individuals was 54.7 (sd

= 8) compared to a mean NEP-2 of 55.9. This difference was statistically significant t (74) = -2.34, $p < .05$, but small in effect size ($d = .15$). The mean NEP-2 for the 145 individuals who completed no action (m = 50.8, sd = 8.8) was not significantly different from their NEP-1 (m = 50.5, sd = 8.1), t (144) = -.6, $p > .05$.

Reasons for non compliance. Finally, the follow-up survey results were evaluated to gain some insight into the relatively low rate of compliance across conditions. Participants who did not sign automaker petitions or send senator letters were asked why. They were given four choices of explanations: (a) I meant to, but didn't get around to it, (b) I don' think global warming is a serious problem, (c) I didn't think signing the petitions (letters) would make a difference, and (d) I was uncomfortable putting my name and address on the petition (letter). Participants were asked to select as many explanations as applied, and were also given an opportunity to answer "other" and write in their own explanation.

The reasons for failing to send the petitions and letters are summarized in Figure 4. In both cases, the most frequently-cited reason for noncompliance was "I meant to, but didn't get around to it." This well-intentioned response was also the mode reason for noncompliance for the CFL task (73 responses), followed by "I didn't have cash on the days when the bulbs were on sale" (53 responses), and "other" (44 responses). The majority of "other" responses explained that they did not need bulbs or they were already using them.

< Insert Figure 4 about here>

Discussion

The primary hypothesis of the current study was that an informational appeal which uses the social influence principles of authority, social validation, and consistency would be more effective in motivating activism and efficiency behaviors than one based on information alone

(H1). In addition, signing a commitment statement to read email appeals for action and complete them if possible was expected to result in even greater activism/efficiency behaviors (H2). Neither of these hypotheses was supported, as there were no significant differences in compliance among the three experimental conditions.

The hypothesis that environmental attitudes would be positively associated with activism and efficiency behaviors (H3) was supported, as the mean NEP-1 score for those who complied with at least one of the requests for action was significantly higher than the mean NEP-1 of those who took no action.

A fourth hypothesis stated that the relationship between the NEP-1 and environmental activism/efficiency behaviors would be weaker in the social influence conditions. This hypothesis was dependent on increased participation in the social influence conditions, and since this did not occur, statistical testing was inappropriate.

H5 and H6, which predicted political orientation would be related to environmental attitudes and activism/efficiency behavior, were both supported. Finally, the hypothesis that pro-environmental attitudes would strengthen for those who engage in activism/efficiency behaviors (H7) was supported by significant increases in the NEP for those who performed at least one of the requested behaviors. The results related to these hypotheses are discussed in greater detail below.

Compliance in Social Influence vs. Information Only Conditions

Although Chi Square analyses revealed no significant differences in activism behaviors when comparing the three conditions, it is interesting that the rate of compliance in the IO group was higher for each of the three tasks. In fact, examined another way, the data seem to suggest the IO condition was superior to the two Social Influence conditions. As noted in the results

section, the percentage of participants completing at least one action in the IO condition (39.8%) was significantly greater than the percentage completing at least one action in the combined SI and SIC conditions (26.4%).

Although it is difficult to explain this unexpected result, two potential factors warrant consideration (a) follow-up survey evidence of the ineffectiveness of the social influence manipulations, and (b) potential persuasive effects of the ice core information.

The follow-up survey items provide some insight into possible reasons for the failure of the social influence manipulations present in the SI and SIC conditions. The primary authority manipulation in these conditions consisted of a slide which documented the scientific consensus that global warming is occurring and caused by human behavior. The follow-survey results indicated that most participants in the IO condition were already aware of this (mode response = 4 agree; mean 4.0) and the mean response for individuals in the two social influence conditions was virtually identical (i.e., SI and SIC m = 4.1).

A second slide combined the authority and social validation principles by documenting quotes and calls to action by concerned politicians and corporate leaders. The follow-up survey suggests this manipulation also may not have had its intended effect. The mode response to the statement; “Lately politicians and companies are doing more to address the problem of global warming” was “agree” in all three conditions, and the means for the IO vs. SI and SIC conditions were virtually identical (IO m = 3.56 vs. SI and SIC m = 3.57).

Responses to a third manipulation-check statement (“Most Americans are concerned about the problem of global warming”) did reveal a significant difference between the IO (m = 2.6) and Social Influence conditions (m = 3.1). Regardless of the significant difference between the means, it is important to note that despite being presented with data from several polls

demonstrating a majority of Americans are concerned about the problem of global warming, the mean response in the social influence conditions was 3.1, the Likert value corresponding with "unsure."

Thus, two of the social influence slides (i.e., scientific consensus, and politicians and corporations are concerned and taking action) appear to have informed participants of information they already knew, while the third (Americans are concerned and taking action) was less than convincing. A caveat regarding the manipulation checks is that they were recorded at follow-up (at least eight days after hearing the presentation). Therefore it is possible the social influence slides had a short-term effect which weakened over time.

With the apparent weak effect of the social influence slides in mind, it is possible the information about documenting climate change through ice-core analyses was more persuasive than the social influence slides and the show of hands poll, and thus had an unexpected impact on compliance. While the analysis of air bubbles in ice cores may seem dull, it did provide a simple explanation of the objective methodology used to document changes in CO_2 and average annual temperature across millennia. Follow-up items evaluating participant reactions to these slides would have provided more insight into the effectiveness of this information.

Commitment Failure

Although it is understandable that a few social influence principles embedded in a presentation would not yield significant results, the failure of the SIC condition to even match the compliance rate of the other two conditions is surprising. A possible explanation for this lack of intervention impact may be that the commitment requested was to "…read the emails from Stop Global Warming, and support them if I can" rather than a specific commitment to perform the actions. As explained above, the wording of the statement was designed to maximize

participation in the commitment, and this goal was achieved (100% of participants in the condition signed the statement). Although a more specific commitment to perform the requested actions might result in less than 100% participation in signing the commitment, it is possible the compliance of those who did sign the strengthened statement would result in significantly higher compliance in the condition.

Positive Association between Environmental activism and NEP

A comparison of NEP-1 scores revealed those who completed at least one environmental activism or efficiency behavior scored significantly higher on this scale (m = 54.9) than those who completed none (m = 50.3). This finding may be the most important in the present study, as it is the first behavioral evidence of criterion validity for the NEP. The previous studies demonstrating criterion validity relied on self-reported behaviors. The medium-sized effect for the difference (d = .57) was impressive in light of the fact that the NEP is a broad measure of general attitudes toward the environment, and does not specifically address global warming.

Political Orientation

The hypothesis that political orientation would be related to NEP scores was supported by a small but statistically significant negative correlation between political conservatism and the NEP-1 (r = -.253). In addition, those who completed at least one activism/efficiency behavior were significantly lower in conservatism (m = 4.01) than those who did not complete any of the behaviors (m = 4.36). Notably, this effect was small (d = .26) and narrowly reached statistical significance (p = .046).

Changing Attitudes through Behavior

The final hypothesis for the study was based on Bem's (1972) theory of behavioral self perception, which posits individuals infer their attitudes by evaluating their relevant behavior. As

predicted, the NEP scores of individuals who engaged in at least one activism/efficiency behavior showed significant increases at follow-up (m NEP-1 = 54.7 vs. m NEP-2 = 55.9), while the mean NEP scores of those who did not engage in activism/efficiency behaviors remained virtually identical (m NEP-1 = 50.5 vs. m NEP-2 = 50.8). Although the increase in NEP score was small, this finding, along with the finding that the NEP predicted environmental activism, illustrates the dynamic relationship between attitudes and behaviors. Pro-environment attitudes predict behavior, and behavior strengthens pro-environmental attitudes, perhaps increasing the probability of future pro-environment behavior.

Limitations and Practical Implications

A primary aim of this study was to explore effective means of motivating meaningful pro-environment behavior. Although the social influence manipulations did not result in increased compliance with the requests for action, any conclusions about the ineffectiveness of this approach should be limited to college student populations. It is possible, if not probable, that college students are more informed about the problem of global warming than the rest of the population. While this may have increased the overall probability of responding, it may have also weakened the effect of the social influence manipulations. For example, the data about the scientific consensus on global warming would likely have a greater impact on individuals who are not aware of this fact.

A second limitation of the study is that the design did not allow for comparisons of the compliance rates for the three tasks. Overall compliance was highest for the task requested first (automaker petitions, 25.9%), and decreased for each of the subsequent tasks (Senator letters 10.4% and purchase of CFLs, 2.6%). While this decrease may have been related to the nature of the tasks, it could also be related to the timing of the requests.

Third, the case can be made that the purchase of CFLs may not have been an appropriate dependent variable. As indicated by the follow-up survey, many individuals may have already been using the bulbs and have a replacement supply. Others lived in dormitories or apartments where tube fluorescents or other bulbs are supplied. Although a case was made that participants who already owned bulbs should buy more for future use or "green gifts," buying extra bulbs before they were needed or could be used would not qualify as "efficiency" behavior, nor result in reducing greenhouse gases.

Finally, and perhaps most importantly, the commitment statement used in the study appears to have been too weak to have an effect. Although full participation in signing the commitment statement was achieved, a commitment to read the emails and act if able does not equal a concrete commitment to perform the actions requested. Additional manipulation-check items could have clarified whether more individuals in the SIC condition (a) remembered the nature of the commitment, and (b) were more likely to report reading the emails.

When considering the practical implications of the study, it is important to remember the participants were students who agreed to participate in a research study being conducted at the end of one of their college classes. They were not selected for their interest in environmental issues or their concern about global warming. If an environmental group were to adopt a similar strategy to promote activism among its members, the compliance rates would likely be higher because the target audience would be more concerned and committed to environmental issues.

"Getting Around" to Addressing Global Warming: Future Research

Given the weakness of the commitment statement used in this study, the low response rate in the SIC condition does not amount to a refutation of the utility of commitment statements for encouraging environmental activism and efficiency behaviors. Future research examining the

effectiveness of a specific commitment to engage in environmental activism would be useful. Although it would likely result in fewer participants signing the commitment, overall compliance with the requested behaviors would likely increase. Indeed, it seems intervention agents using commitment strategies need to attend to the trade-off of strength of commitment and the willingness of participants to make the commitment. Optimal commitments should be strong enough to evoke action while maximizing compliance with the request to sign the commitment.

In addition, reminders of the commitment could improve compliance with requested actions. For example, Geller, Kalsher, Rudd, and Lehman (1989) asked students to sign a pledge card indicating their commitment to always use their safety belt. A perforated card design allowed half of the card to be returned to researchers and the other half to be hung from the rear-view mirror of participants' vehicles as a prompt to fulfill the commitment. This innovative approach led to a 20% increase in safety-belt use among pledge signers.

In addition to highlighting the relationship between environmental attitudes and behavior, the current study documents that this relationship is far from perfect. The follow-up survey results document the presentations about the threats of global warming were effective in changing attitudes about global warming (i.e., persuasive). While 48% of respondents reported being either "not at all" or "slightly" concerned about the problem of global warming before hearing the presentation, this number dropped to 20% after hearing the presentation. Eighty percent of the respondents reported they were either "concerned" (43%), "very concerned" (25%) or "extremely concerned" (10%) after hearing the presentation. Despite this expression of concern, most individuals (69.3%) failed to complete even one of three relatively simple tasks.

Interestingly, when participants were asked why they did not complete the tasks, most did not question their potential effectiveness in combating global warming. The mode explanation

for failure to complete each task was; “I meant to, but didn’t get around to it.” In contrast to the 29.7% compliance rate with one or more of the activism/efficiency behaviors, 82% of participants completed the 30-item follow-up questionnaire which was much more time consuming than either of the web-based activism tasks. Although it is impossible to be certain about why this large difference existed, it seems likely the additional point of extra credit played a major role. Although offering extra credit for writing a letter to one’s senator seems inappropriate, it would be interesting to test the effect of offering a contingent point of extra credit for participating in the tasks.

The practice of offering incentives or rewards for pro-environment behaviors is a strategy used in past research, and currently used by environmental action groups. In the Geller et al. (1989) study mentioned above, participants signing the safety-belt pledge were entered in raffles to win prizes donated by community merchants. In addition, while writing this document, I received an email plea to sign a web-based commitment to use reusable bags while shopping for groceries. The email specified that signing the commitment would result in a chance to win an all-expense-paid trip to an exotic locale. This interesting combination of incentive and commitment strategy could be a fruitful area for further research.

Reciprocity-based commitment strategies may be also be effective. Reciprocity is the sense of obligation individuals feel to “return a favor” for someone who does something for them. Instead of offering an incentive for completing a behavior, individuals could be given a small gift before the request is made. A small gift (e.g., a CFL) might increase individuals’ willingness to sign a commitment statement and increase the likelihood of fulfilling the commitment.

At the time when this study was being developed, global warming was a significantly more controversial issue than it is today. Since that time, Al Gore's *An Inconvenient Truth* has won an Oscar for best documentary film, and Mr. Gore has won the Nobel Peace Prize. Polling research suggests there has been rapid movement toward the acceptance of global warming as an important issue in the past two years (Nisbet & Myers, 2007). Automakers are producing more hybrid models, and recent legislation promises to compel automakers to raise fuel efficiency. Global warming activists may have played a role in motivating these changes, and increases in activism behaviors would almost certainly influence additional changes that are desperately needed. Although it is a challenge, psychologists should continue to develop ways to encourage individuals to "get around to" voicing their concerns about global warming.

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Figure 1: Percent of Overall Task Compliance

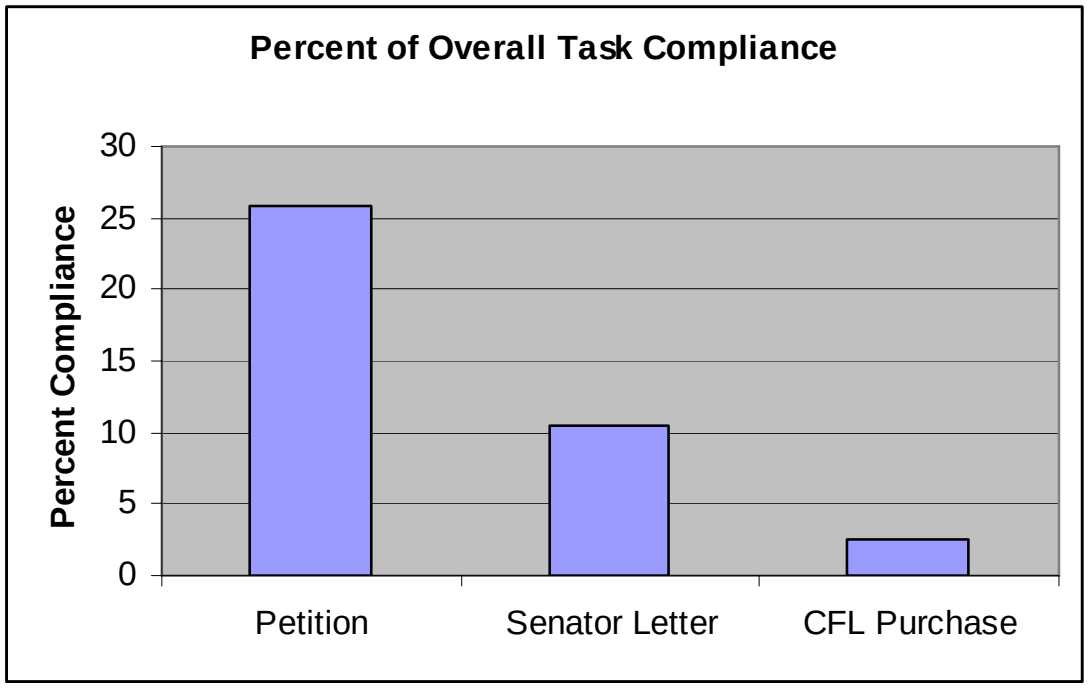


Figure 2: Percent Compliance by Condition

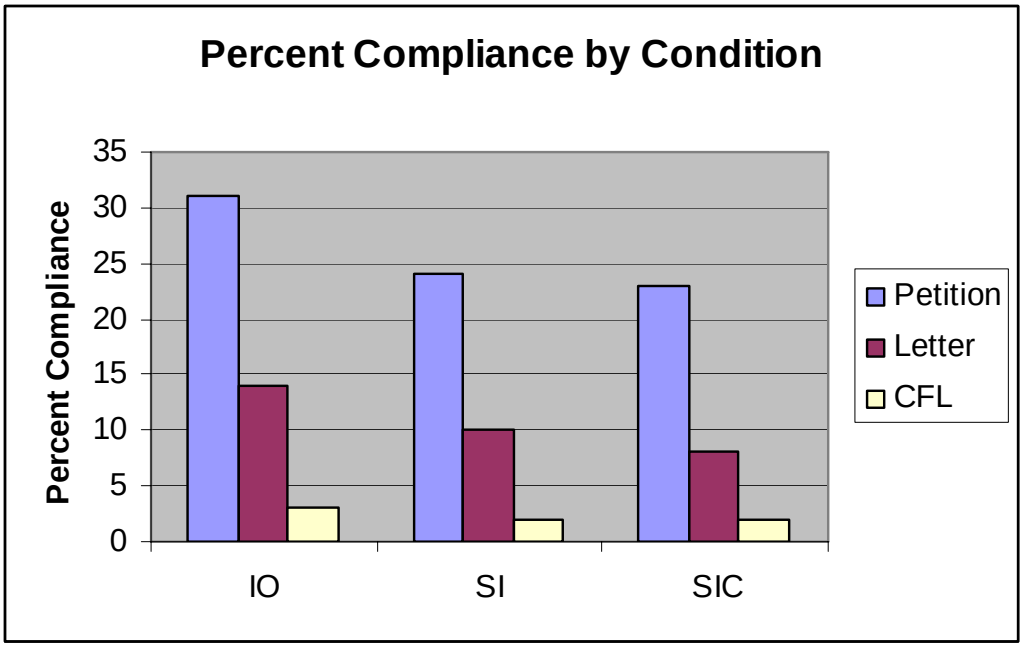


Figure 3: Concern about Global Warming before and after Presentation

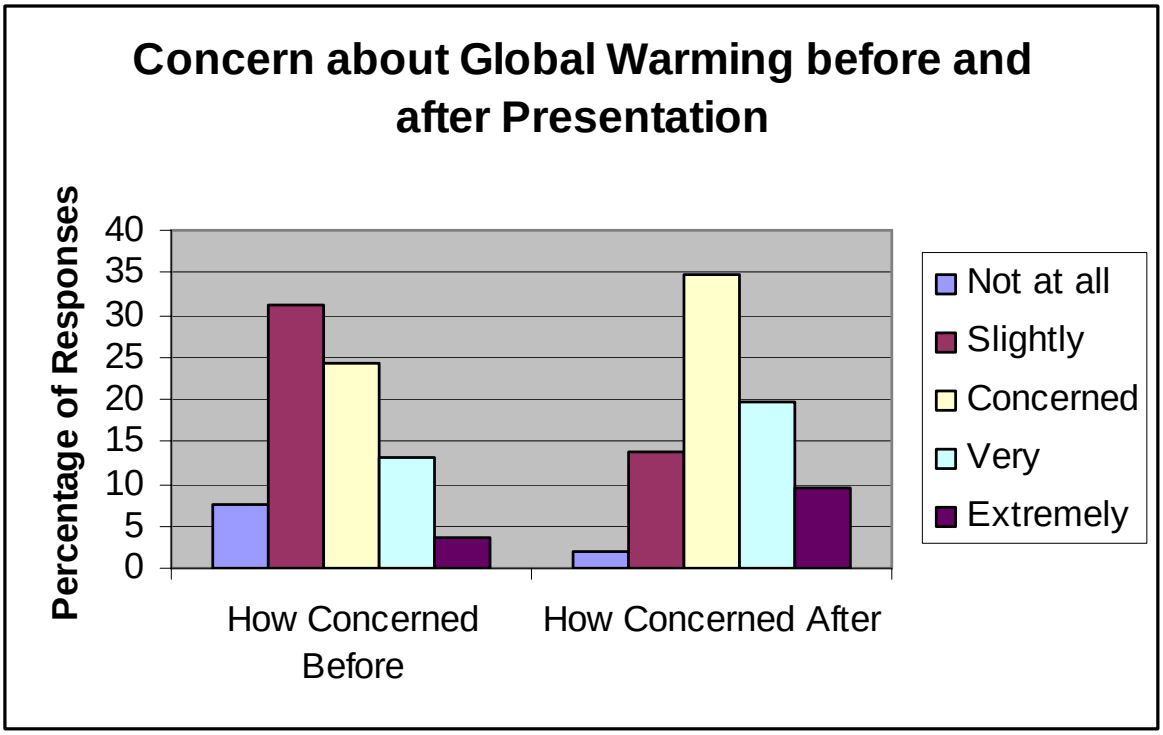
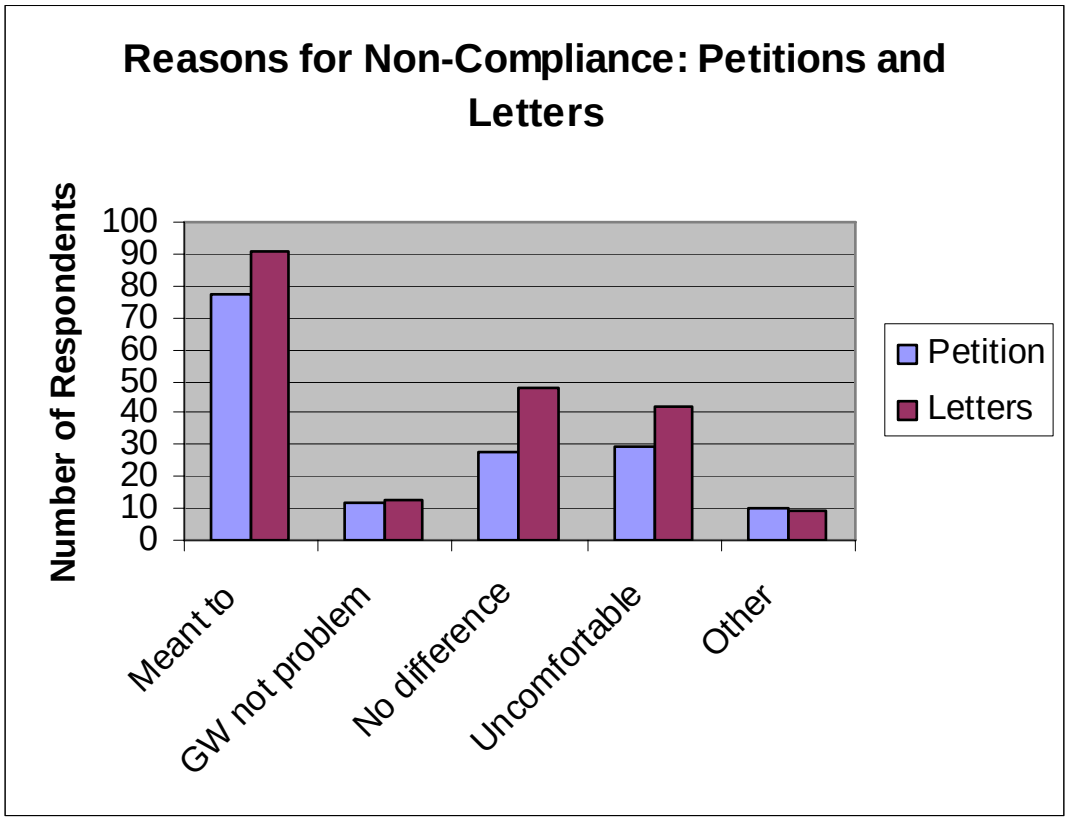


Figure 4: Reasons for Non-compliance: Petitions and Letters



Appendix A

Informed Consent Document

VIRGINIA POLYTECHNIC INSTITUTE AND STATE UNIVERSITY
INFORMED CONSENT FORM

PURPOSE: You are invited to participate in research related to motivating pro-environment behavior.

PROCEDURES: After reading and signing this document (making sure to sign two copies and keep one for yourself) you should complete the survey form and return it to the data collection coordinator who is supervising this session. Your PID will be used to send you emails related to this study, and will be kept confidential. As a participant, you have the right not to provide this information if you feel uncomfortable doing so. You will then be asked to listen to a 15-minute presentation about the problem of global warming and behaviors that could help address the problem. During the week following the presentation, you will receive three emails asking you to take action to address the problem of global warming by; (a) signing petitions asking car companies to produce "greener" vehicles, (b) writing government representatives, and (c) purchasing discounted energy-efficient light bulbs. Completion of these tasks is completely voluntary and you will receive one point of extra credit regardless of your choice to complete them. After the two-week period, you will receive a short email survey. If you complete the survey you will receive an additional point of extra credit.

RISKS: There are no known discomforts or risks associated with this research.

BENEFITS: The benefits associated with this research include the opportunity to gain extra credit points for a psychology course and positive feelings that may arise as a result of taking action to address an environmental problem.

CONFIDENTIALITY OF PARTICIPANTS: The data collected on surveys during this study will be kept confidential. Surveys containing personal information will be securely kept in the Center for Applied Behavior Systems (202 Williams Hall). Only trained research assistants will enter data and individuals will be assigned participant numbers when the data is entered. No personal identifying information will be used in the reporting of the research. If you chose to write government officials or sign the automaker petitions, we will ask that you to include your name and address to increase the impact of these behaviors. If you chose to complete in this portion of the project, your participation would cease to be anonymous.

COMPENSATION: You will receive one extra-credit point for a psychology class for your participation in the presentation. Completing a short email survey in two weeks will result in an additional point of extra credit. Should you choose not to participate an alternative means of obtaining extra credit will be provided to you.

FREEDOM TO WITHDRAW: You have the right to withdraw from this study at any time for any reason, without incurring any penalties of any type. Your participation is to be totally voluntary.

USE OF RESEARCH DATA: The information gained from this research project may be reported for scientific or educational purposes. It may be presented at professional meetings, published/reproduced in professional journals or books, or used for any other relevant purposes that the Virginia Tech Department of Psychology considers to be in the interest of education, knowledge, and/or research.

APPROVAL OF RESEARCH: This research project has been approved by the Human Subjects Committee of the Department of Psychology and by the Institutional Review Board of Virginia Tech.

PARTICIPANT'S RESPONSIBILITIES AND PERMISSION: I have read this entire informed consent form and I understand the conditions of this project. I have had all of my questions answered. I hereby agree to the above and give my voluntary consent for my participation in this study. I understand that if I participate, I may withdraw at any time without penalty. By signing this form I am also confirming that I am 18 years of age or older.

Printed Name	**Signature**	**Date**

Should you have any questions about this research or its conduction, you may contact:

Principal Investigator:	Phil K. Lehman, MS	231-8145
Faculty Advisor:	E. Scott Geller, PhD	231-6223
Chair of Human Subjects Committee:	David W. Harrison, PhD	231-4422
Chair of Institutional Review Board:	David Moore, DVM	231-4991

To ensure we give you appropriate credit please PRINT your Student ID Number and Virginia Tech PID CLEARLY:
ID Number __ __ __ - __ __ - __ __ __ __ PID: _____

Appendix B

Pre-Study Questionnaire: New Ecological Paradigm and Demographic Items

SD= Strongly Disagree **MD**=Mildly Disagree **U**=Unsure **MA**=Mildly Agree **SA**=Strongly Agree

Do you agree or disagree that:

1. We are approaching the limit of the number of people the earth can support.
   SD MD U MA SA

2. Humans have the right to modify the natural environment to suit their needs.
   SD MD U MA SA

3. When humans interfere with nature it often produces disastrous consequences.
   SD MD U MA SA

4. Human ingenuity will insure that we do NOT make the earth unlivable.
   SD MD U MA SA

5. Humans are severely abusing the environment.
   SD MD U MA SA

6. The earth has plenty of natural resources if we just learn how to develop them.
   SD MD U MA SA

7. Plants and animals have as much right as humans to exist.
   SD MD U MA SA

8. The balance of nature is strong enough to cope with the impacts of modern industrial nations.
   SD MD U MA SA

9. Despite our special abilities, humans are still subject to the laws of nature.
   SD MD U MA SA

10. The so-called "ecological crisis" facing humankind has been greatly exaggerated.
    SD MD U MA SA

11. The earth is like a spaceship with very limited room and resources.
    SD MD U MA SA

12. Humans were meant to rule over the rest of nature.
    SD MD U MA SA

13. The balance of nature is very delicate and easily upset.
    SD MD U MA SA

14. Humans will eventually learn enough about how nature works to be able to control it.
    SD MD U MA SA

15. If things continue on their present course, we will soon experience a major ecological catastrophe.
    SD MD U MA SA

16. Please describe your political orientation on the following scale, where 1= very liberal and 7=very conservative

    1 2 3 4 5 6 7

    Very Liberal **Very Conservative**

17. Are you registered to vote? (circle one): Yes No
18. I am (circle one): Male Female
19. What is your Age?_____

Appendix C

Presentation Slides for SI and SIC Conditions

Global Warming
Problems and Solutions

A project of the
Center for Applied Behavior Systems
Virginia Tech

Slide 1.

What Is Global Warming?

Global warming is the term used to describe the increase in the earth's average temperature caused by rising concentrations of gases in the atmosphere.

These gases are known as **greenhouse gases** because they form a heat-trapping barrier around the earth.

Slide 2.

Carbon Dioxide

Carbon Dioxide (CO_2) is the greenhouse gas which is the primary cause of global warming.

- CO_2 is produced by burning fossil fuels such as gasoline and coal.
- CO_2 levels in the atmosphere have increased by 35% since the industrial revolution, making the heat-trapping blanket around the earth much thicker.
- CO_2 levels are projected to increase radically in the future and the global temperature will increase as a result.
- CO_2 which is produced today may take hundreds years to dissipate from the atmosphere

Slide 3.

Global Warming is Real

Although the media sometimes reports controversy over global warming, there is **consensus** among scientists that global warming is occurring and caused by human-produced greenhouse gases.

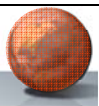
A recent article in the prestigious journal ***Science*** reviewed 928 peer reviewed articles about global climate change:

Zero articles disputed global warming was occurring

Zero articles disputed global warming is caused by humans

Slide 4. **SI and SIC only**

Our Planet is Getting Hotter



•This slide shows changes in the temperature of the northern hemisphere over the past 1,000 years.

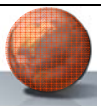
•I will talk more about this data later in the presentation, but the important thing to note is that we are experiencing a warming trend over the past century.

•And, although this chart stops at the year 2000, the warming trend has been accelerating over the past six years.

**Graph based on IPCC data shown*

Slide 5.

Our Planet is Getting Hotter



According to Scientists, the earth has warmed 1 degree Fahrenheit over the past century and will rise between 4 and 11 degrees during the next century unless we make some serious changes.

The ten hottest years on record have all occurred since 1990.

2005 &1998 Hottest years ever recorded (tie)

2002 Second hottest year

2003 Third hottest year

Slide 6.

Consequence: Melting Glaciers

- We are also losing glacial ice at an alarming rate: In addition to losing the natural beauty of the glaciers, many communities rely on glaciers for drinking water.
- I am going to show you just two of the glaciers that have radically retreated over the past 100 years

**Before and after photos of Pasterze Glacier (Austria) and Portage Glacier (Alaska) shown*

Slide 9.

Consequence: Increased Droughts and Wildfires

- Global warming may have already caused severe droughts in many regions
- The ongoing drought in the Western US is the worst in the last 500 years, and is thought to be caused by warming waters in the Western Pacific
- Increased drought and infestations of tree-killing insects create ideal conditions for forest fires, which cause devastating economic and ecological damage.

Slide 10.

Consequence: More Intense Hurricanes

- Warmer ocean temperatures mean more intense hurricanes
  - •The number of category 4 and 5 hurricanes has doubled over the past 35 years
  - •Hurricane Wilma (2005) was the strongest hurricane ever recorded with winds of 150mph

Slide 11.

Consequence: Health Problems

- The World Health Organization estimates that global warming has already caused 154,000 deaths by increasing the range of mosquito-borne diseases such as malaria and dengue fever.
- During 2003, the worst heat waves ever recorded in Europe killed 27,000 people.
- Air quality declines with higher temperatures, exacerbating and in some cases causing respiratory illnesses.

Slide 12.

We Must Act Now to Prevent Irreversible Consequences

Although we have already experienced significant negative consequences from global warming **future consequences could be devastating**:

- The worst-case scenario involves total melting of ice sheets in Greenland and Antarctica, sea level rises of 20-40 feet, and the displacement of up to 200 million people by a combination of flooding and drought.
- Many plant and animal species could become extinct, and many areas on the globe could become uninhabitable.

Slide 13.

CO_2 and Global Temperature Past and Future

- This graph shows the atmospheric concentration of carbon dioxide over the past 1,000 years and projects the atmospheric concentrations of CO2 for the next 100 years. The different colored lines represent different scenarios based on the amount of Carbon Dioxide we produce from burning greenhouse gases.
- The second graph shows the same data and projections for global temperature.

**Graphs based on IPCC projections shown*

Slide 14.

We Can Stop Global Warming

We can slow, and eventually stop global warming by reducing our consumption of the fossil fuels which produce carbon dioxide.

- Most of the fossil fuels we burn are used to:
  - Generate electricity
  - Provide transportation
- Because time is of the essence, it will be important for individuals, industries, and government to work together.

Side 15.

Politicians and Corporations are Concerned and Taking Action

"The overwhelming scientific evidence indicates that climate change is taking place and human activities play a very large role."
-John McCain (Republican Senator AZ)

"I say the debate is over. We know the science, we see the threat and we know the time for action is now."
-Arnold Schwarzenegger (Republican Governor, CA)

In 2006, Richard Branson, the CEO of Virgin Corp. pledged **3 Billion** dollars to combat Global Warming.

Corporations such as Wal-Mart, Xerox, General Electric and FedEx are all starting major initiatives to decrease their Greenhouse gas emissions.

Slide 16. **SI and SIC only**

Americans are Concerned and Willing to Take Action

65% of Americans feel the government is *not* doing enough to protect the environment (Gallup International, 2005).

74% of Americans believe global warming is a problem (Pew Research Center, 2006).

70% of Americans believe the effects of global warming can be reduced (Ayres, McHenry & Associates, 2006).

90% of Americans are willing to reduce their greenhouse gas emissions by combining driving trips when running errands, turning down the thermostat in the winter, and recycling (Ayres, McHenry & Associates, 2006).

Slide 17. **SI and SIC only**

YOU Can Make a Difference

Over the next **five days** you will receive **three emails** informing you of opportunities to make a difference in the fight against global warming.

- Sign an online petition asking automakers to build greener cars
- Write a letter (online) to your Senators expressing concern about global warming
- Buy energy-efficient compact fluorescent light bulbs for one dollar

Participation in these activities is voluntary (you will receive extra credit even if you do not do them).

Although this is part of a psychology experiment, these actions are real- the letters and petitions will be sent to Senators and CEOs, and using the bulbs will reduce greenhouse gasses.

Slide 18.

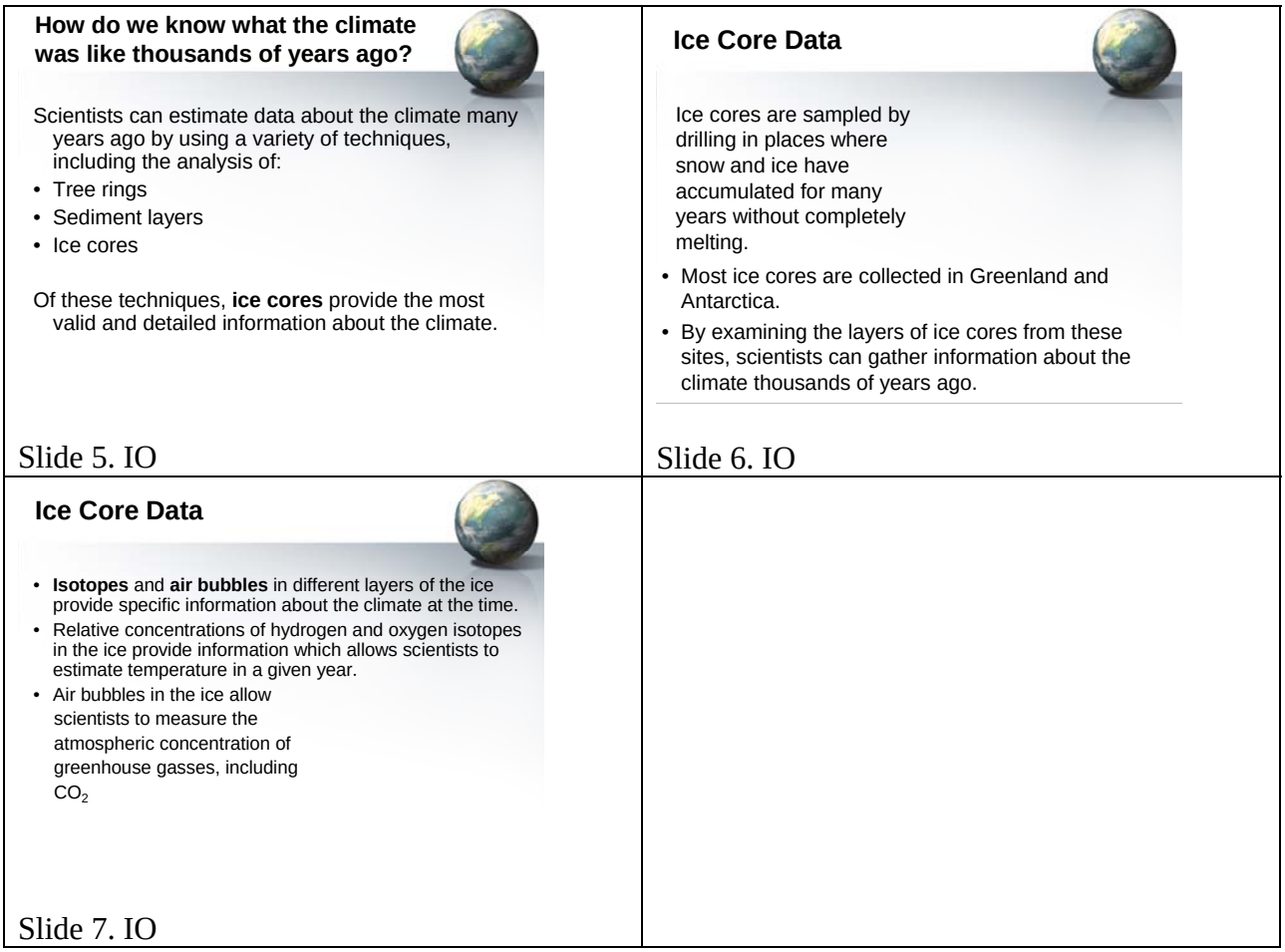
Thanks for reading the emails you receive from
Stop Global Warming.

Take Action to Make a Difference!

Slide 19

Appendix D

Presentation Slides for Information Only Condition



Note: For the Information Only condition, these three slides were inserted after Slide 5 of Appendix C "Our Planet is Getting Warmer." Slides 4, 16, and 17 from Appendix C were not included in the IO condition.

Appendix E

Website Demonstration Script

The good news is that through this project, you can make a difference. You will have an opportunity to ask for industrial and government change, and to reduce the amount of greenhouse gas you produce.

Over the next five days you will receive three emails informing you of opportunities to make a difference in the fight against global warming.

The emails will contain links to websites where you can:
Sign an online petition asking automakers to build greener cars and
Write an online letter to your Senators expressing concern about global warming

We have made these tasks very easy to perform, and I want to show you the website.
(Escape from PowerPoint and go to Website).
The emails you receive will be from STOP GLOBAL WARMING and will have information about the task, and a link to the site. When you click on the link, some browsers may show a security message, but our site is secure, so please click on the option to ignore these warnings for the current session.
You will then be asked to enter your PID and Password—just like you do when you log in to Webmail.

This is the site for the online petition to automakers.

The information above describes the project and gives you some ideas of what to write on the petition. We ask that you sign at least one petition, but the more you sign the greater the impact.

Click on the petition you want to sign—(*click on Ford*)

(Point to Comments box) Comments are optional, but writing a comment should also increase the impact. If I were to write a comment for the Ford Petition I might say something about my concern about the problem of global warming, tell them that my family has owned Fords in the past, and ask them to increase fuel efficiency and production of hybrid vehicles.

I would type in my name and address below, and then submit. (*don't actually submit*).
We require your name and address so the petition we send has credibility. We will keep your personal information secure, and the only place it will appear is on the paper copy of the petition we send to the company CEOs
As you can see, this process is very quick and easy. The Senator site is very similar. You can sign a form letter in a matter of seconds, or edit the form letter or write your own to increase the impact.

The links will only be open for a few days, so it would be great if you take action right away. (*return to PowerPoint*)

A third email will provide information about how to buy energy-efficient compact fluorescent light bulbs like this one (hold up bulb) for one dollar.

Replacing one old-fashioned bulb with *this* will save about $40 in electricity over the five year life of the bulb. More importantly, the bulb will prevent about 680 pounds of Carbon Dioxide from being produced!

This is equivalent to the average car owner parking her car and not driving for two weeks. These bulbs will be on sale in the center for applied behavior systems on the second floor of this building.

Participation in these activities is voluntary (you will receive extra credit even if you do not do them). However, I am hopeful that you will choose to take action. Although this is part of a psychology experiment, these actions are real- the letters and petitions will be sent to Senators and CEOs, and using the bulbs will reduce greenhouse gasses.

Appendix F

Email Scripts

Email 1:

Dear Participant,

Did you know?

- The US is the number one producer of greenhouse gases
- Transportation is one of the primary sources of greenhouse gas pollution in the US
- The fuel efficiency of cars has actually DECREASED since 1980

You can make a difference! Please click on the link below to tell automakers you are concerned about global warming and you want greener, more fuel-efficient cars.

You will need to enter your VT PID and password to access the site.

Questions or problems? Don't hit reply, instead email pkl@vt.edu

https://www.psyc.vt.edu/private/plehman/web/pselect.php?group_id=40821e9c0a198e71b3991fb574c30d37

Email 2:

Dear Participant,

If you believe protecting the environment is important, I strongly urge you to express your concern about global warming to your representatives in Washington. Here are some reasons to take action:

- The United States produces more global warming pollution than any other nation on earth
- US carbon dioxide emissions have increased 20% since 1990
- US carbon dioxide emissions are projected to increase another 15% by 2010
- 2006 was the hottest year ever recorded in the continental United States

Addressing the problem of global warming requires government action, and elected officials will respond if enough voters speak up. Please click on the link below to tell your senators you are concerned about global warming. You can make a difference!

You will need to enter your VT PID (first part of your email address) and password to access the site. Please remember that you will see a security message when you click on the link. Our site is secure, so please choose the option to proceed.

Questions or problems? Don't hit reply, instead email pkl@vt.edu

https://www.psyc.vt.edu/private/plehman/web/eselect.php?group_id=aec5bc0fa3a9619cf6cedf0d74e1695d

Email 3:

Dear Participant,

An easy way to lower your contribution to the problem of global warming is to replace a standard light bulb with a compact fluorescent bulb (CFL). If everyone in the US exchanged one standard bulb with a CFL the greenhouse gas pollution reduction would be equal to removing ONE MILLION cars from the road!

During the next three days the Center for Applied Behavior Systems will be selling 15 Watt CFLs to study participants for the discount price of $1. These bulbs produce the same amount of light as a 60-Watt incandescent bulb, but only use 30% of the energy, thus producing much less greenhouse gas.

Over the life of the bulb (average life = 12,000 hours), the CFL will save an average of $40 in electricity. More importantly, the bulb will prevent about 680 pounds of Carbon Dioxide from being produced!

- Buy bulbs at 202 Williams Hall (just upstairs from your recitation room)
- Bulbs on sale 9am-5pm from Monday 4/9 through Weds 4/11
- Buy up to 3 bulbs for $1 each and prevent production of 2,000 pounds of CO2
- If you already use CFLs they make a great green gift!
- No cash? You can sign for the bulbs and pay later (before the end of the semester).

Finally, if you have not already signed an automaker petition or sent a letter to your senator, I encourage you to do so now. Each task can take as little as 2 minutes.

Thanks for making a difference!

Automaker Petition Link
https://www.psyc.vt.edu/private/plehman/web/pselect.php?group_id=aec5bc0fa3a9619cf6cedf0d74e1695d

Write Your Senator Link
https://www.psyc.vt.edu/private/plehman/web/eselect.php?group_id=aec5bc0fa3a9619cf6cedf0d74e1695d

Questions or problems? Don’t hit reply, instead email pkl@vt.edu

Email 4:

Last Chance to Take Action in Global Warming Study: Please Act Now

Dear Participant,

The Stop Global Warming websites will close tomorrow (Thursday) at 5pm. If you have been meaning to sign the automaker petitions or write your senators and have not yet done so, please act now by clicking on the links below:

Automaker Petitions
https://www.psyc.vt.edu/private/plehman/web/pselect.php?group_id=40821e9c0a198e71b3991fb574c30d37

Write Your Senators
https://www.psyc.vt.edu/private/plehman/web/eselect.php?group_id=40821e9c0a198e71b3991fb574c30d37

You will need to enter your VT PID (first part of your email address) and password to access the sites. Please remember that you will see a security message when you click on the link. Our site is secure, so please choose the option to proceed.

On Thursday evening you will receive an email containing a link to a follow-up survey which can be completed for an additional point of extra credit.

Thanks for making a difference!

Questions or problems? Don't hit reply, instead email pkl@vt.edu

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Email 5:

Dear Participant,

Thanks for being a part of the Stop Global Warming study.

The online follow-up survey is now available at the following link:

https://survey.vt.edu/survey/entry.jsp?id=1175891744935

You will need to enter your VT PID (First part of your email address) and password to complete the survey. The survey will only take a few minutes to complete (only 30 questions), and you will receive another point of extra credit for completing it.

Please answer all of the questions on the survey.

Thanks!

Appendix G

Website Content

YOU can make a difference!

Welcome **plehman**

Tell Automakers to Make "Greener" Cars

Transportation is one of the largest sources of the greenhouse gases which cause global warming. Despite the technological advances of the last decades, the average fuel efficiency of today's vehicles is lower than the average of vehicles built 20 years ago! You can make a difference by signing our petition asking automakers to build "greener" cars.

Click on the links below to "sign" a petition which affirms the following statement:

As a consumer and global citizen, I am concerned about how (car company) responds to the problem of global warming. I encourage you to develop and use technology in (car company) vehicles to increase fuel economy and reduce carbon emissions.

Make a Greater Impact: Sign Multiple Petitions and Add Comments

Although signing your name and including your address will make an impact, we also invite you to say a few words about *why* greener cars are important to you.

Here are some examples of things you may wish to address:

- Explain why you are concerned about the problem of global warming
- Ask the company to develop (more) hybrid cars
- Let them know if you are interested in purchasing one of their vehicles in the future
- Let them know if you, your friends, or your parents currently own one of their vehicles
- Let them know if fuel economy and environmental impact are factors that will influence your next vehicle purchase

Please sign as many petitions as you like. The more petitions you sign, the greater the impact!

The completed petitions will be sent to the CEO of each company.

Ford

Ford is the parent company of Range Rover, Jaguar, Lincoln, and Mercury. In addition Ford owns a large portion of Mazda. Ford produces several hybrid vehicles, including the Ford Escape and Mercury Mariner.

General Motors

GM is the parent company of several car brands, including Chevrolet, Cadillac, Pontiac, Buick, Saab, Hummer, and Saturn.

Toyota

Toyota offers three hybrid models (Prius, Highlander, and Camry). Toyota also produces Lexus vehicles.

Honda

Honda produces three hybrid models (Civic, Accord, and Insight). Honda promotes itself as a company committed to environmental protection. Honda also produces Acura vehicles.

Chrysler

Chrysler is the parent company of Mercedes Benz, Dodge, Jeep, and Plymouth.

Nissan

In 2007 Nissan began producing a hybrid version of the Altima. Nissan also produces Infiniti brand vehicles.

Volkswagen

Volkswagen has several models that are relatively fuel efficient (e.g., The New Beetle and Jetta), but does not offer any hybrid vehicles. Volkswagen also produces Audi, Bentley, and Lamborghini vehicles.

Stop Global Warming is a project sponsored by the Center for Applied Behavior Systems at Virginia Tech


STOP Global Warming
YOU can make a difference!
Welcome plehman | Back To Petitions
Sign Chrysler Petition
As a consumer, and global citizen, I am concerned about how Chrysler responds to the problem of global warming. I encourage you to develop and use technology in Chrysler vehicles to increase fuel economy and reduce carbon emissions.
Sign Petition
Sign the petition by completing the following form. Your name and address will appear on the printed petition mailed to the automaker.
Although comments are not required, telling automakers why green cars are important to you should increase the impact of the petition.
Comment
Name
Address
City
State
Zip
Submit


STOP Global Warming
YOU can make a difference!
Welcome plehman
Write Your Senators
The United States has the unfortunate distinction of being the biggest global warming polluter in the world. Tell your Senators you are concerned about the problem of global warming, and you want them to take action.
Select your state from the list below to send the following form letter to your senators:
As a resident of (selected state), I am concerned about the problem of global warming. I am writing to ask you to support legislation that reduces carbon emissions.
Make a Greater Impact: Personalize Your Letter
Sending the form letter above "as is" will make a difference, but you can increase the impact of your action by adding to the letter, or writing your own from scratch.
Here are some specific ideas about what you may want to add to the letter:
Elaborate on your concern about global warming and its consequences
Ask for cap on global warming pollution
Ask senators to support legislation mandating increased fuel-efficiency standards for cars
Ask senators to support research of alternate fuels
Ask senators to support the development of green energy sources (e.g., wind and solar power)
Explain that reducing energy consumption and greenhouse gasses is not only good for the environment, but also good for the economy and nation, because it will reduce dependence on foreign oil
If you are a registered voter, inform your senators that you are a registered voter in their state
Thanks for making a difference. Your letter will be printed and mailed to your senators.
Select Officials by State
Select your state of residence from the list below and press the "Next" button, which will take you to a page containing a form letter pre-addressed to the senators from that state.
State
VA
Next

Appendix H

Follow-up Survey

STOP GLOBAL WARMING
Please answer all questions honestly.

Please enter your PID so we can give you credit for this survey. Your PID is the first part of your email address.

How concerned were you about the problem of global warming BEFORE hearing the presentation?

Not at all concerned

Slightly concerned

Concerned

Very concerned

Extremely Concerned

How concerned were you about the problem of global warming AFTER hearing the presentation?

Not at all concerned

Slightly concerned

Concerned

Very concerned

Extremely Concerned

The presentation about global warming given at the beginning of the study was interesting.

Strongly Disagree

Disagree

Neutral

Agree

Strongly Agree

The presentation about global warming given at the beginning of the study was informative.

Strongly Disagree

Disagree

Neutral

Agree

Strongly Agree

The presentation about global warming given at the beginning of the study was persuasive.

Strongly Disagree

Disagree

Neutral

Agree

Strongly Agree

After hearing the presentation about global warming, most people would probably be _____ about global warming.

not at all concerned

slightly concerned

concerned

very concerned

extremely concerned

Most scientists agree that global warming is real and caused by human activity.

Strongly Disagree

Disagree

Unsure

Agree

Strongly Agree

Most Americans are concerned about the problem of global warming.

Strongly Disagree

Disagree

Unsure

Agree

Strongly Agree

Lately, politicians and companies are doing more to address the problem of global warming.

Strongly Disagree

Disagree

Unsure

Agree

Strongly Agree

Did you follow the email link and sign at least one petition for an automaker?

Yes

No

If you did NOT sign the car petitions please choose the reason(s) that best explain(s) why.

I meant to, but did not get around to it.

I don't think global warming is a serious problem.

I didn't think signing petitions would make a difference.

I was uncomfortable with putting my name and address on the petition.

other (please explain):

Did you follow the email link and write a letter to your Senators?

Yes

No

If you did NOT write a letter to your senator please choose the reason(s) that best explain(s) why. Please select all that apply.

I meant to, but did not get around to it.

I don't think global warming is a serious problem.

I didn't think writing letters would make a difference.

I was uncomfortable with putting my name and address on the letter.

other (please explain):

Did you purchase any discounted compact fluorescent light bulbs in Williams Hall?

Yes

No

If you did NOT buy any of the light bulbs, please choose the reason(s) that best explain(s) why. Please select all that apply.

I meant to, but did not get around to it.

I don't think global warming is a serious problem.

I didn't think the bulbs would make a difference.

I didn't have cash on the days the bulbs were on sale.

I didn't know where Williams 202 is.

other (please explain):

Note: NEP (15 additional questions) followed the questions above (See Appendix B for content).