Eco-Friendly Influences from a Virtual World

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Abstract

Informed by research on trait empathy and eco-guilt and their impacts on environmental behaviors, this paper explores whether a video game with a pro-environment message can influence players' adoption of environmental behavior and intention to engage in future environmental behavior. Hypotheses were tested through a lab experiment and an online experimental survey. Across both studies, eco-guilt was significantly related to environmental behavioral intention. Further, exposure to a trailer for the video game increased environmental behavioral intention among adult participants who reported less pro-environment attitude. Trait empathy was also a significant predictor of environmental behavioral intention. Results indicate that environmental communication needs to harness the power of guilt, as a moral emotion, to promote environmental behavior. Further, visual communication about environmental issues may be particularly effective among individuals who normally do not pay much attention to these topics.

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Eco-Friendly Influences from a Virtual World

The emergence of “serious games” as a genre has led to a new line of research in entertainment media. Serious games are those with an educational focus where the play experience is structured by specific goals, favors future problem solving, provides immediate feedback for the assessment of errors, offers new opportunities to use previous experience, and allows learning from peers and expert others (Gee, 2009). Such games involve a variety of skills, from collaborative problem solving to systematic thinking and computer literacy. Through use of these skills, players may develop “scientific habits of mind,” such as the ability to argue, counterargue, use evidence to support one’s claims, and develop an evaluative mode of inquiry (Steinkuehler & Duncan, 2008). Players also experience moments of critical reflection, an important part of the learning process that allows us to build upon prior skills and improve upon our mistakes; in fact, many games are designed specifically to include this reflection (Squire, 2005). Games may include other learning techniques as well, such as teamwork, problem-based learning, and using tasks situated in real-world contexts (Evans, Jones, & Biedler, 2014).

Strange Loop Games is currently developing *Eco*, which meets all the criteria for a serious game. *Eco* is a single- and multi-player game that can run on or offline. It aims to establish an environment where players work collaboratively to save the world from an incoming meteor while trying to maintain the ecosystem in the process; a challenge given the industrial and technological development required to destroy the meteor. The main difference between *Eco* and other open-world games is that it allows for the extinction of resources. Where other games require players to hunt for survival and supply endless deer to that end, *Eco* requires players to balance their survival need with possible exhaustion of resources, such as over-hunting that could drive the deer population to extinction. Based on the categorization proposed by Shaffer Squire, Halverson, and Gee (2005), *Eco* would be considered an epistemic game, wherein players inhabit virtual worlds and embody new identities, knowledge, skills, and values under the frame presented by the game. Just as one might learn mathematics from a game about designing buildings as an engineer, *Eco* may help players learn about the importance of protecting Earth’s resources through a game where they are required to save and protect a planet. It is our hope that players will take on this new perspective and carry it into the real world, translating it into environmentally beneficial behaviors and intentions.

Since *Eco* is a novel game that was just released into early access in February 2018, this research aims to test its effectiveness in promoting environmental behaviors by exposing players to the game and then measuring their intentions, behaviors, and beliefs related to the environment. In particular, we expect that individuals who play *Eco* will report more pro-environment behavioral intentions and engage in more environmentally friendly behaviors. In doing so, we also assess whether emotional responses to the game (i.e., guilt) mediate the relationship between game exposure and post-game attitudes and behaviors and whether environmental attitudes and trait empathy moderate these relationships. Below, we will first review literature that evidences a motivational impact of moral emotions, particularly guilt, on environmental behaviors.

Moral Emotions and the Environment

Moral self-licensing occurs when our past moral behavior makes us feel morally secure, allowing us to engage in immoral behavior without feeling guilty (Merritt, Effron, & Monin, 2010). Previous research has shown that moral self-licensing can affect players’ behavior after gameplay depending on the actions they take during gameplay. Specifically, immoral gameplay has led to feelings of guilt, which in

turn leads to increased sensitivity toward other moral violations (Grizzard et al., 2014). Players who make immoral choices during gameplay report feeling more guilt than those who behave morally, which indicates a sincere immersion during gameplay that has real moral consequences (Grizzard et al., 2017; Weaver & Lewis, 2012).

Gollwitzer and Melzer (2012) illustrated that an experience in a virtual world can cause a sense of guilt that players carry over into the real world. They found that inexperienced video game players reported heightened moral distress following gameplay that included violence against humans. However, this effect was not seen after playing a game with object-centered violence and was not reported by experienced gamers. Further, those inexperienced players showed a greater desire to physically cleanse themselves after the experience, as seen in their preference for hygiene products taken from a selection of items at the end of the study. This effect, the desire to cleanse oneself physically after experiencing a threat to one's morality, has been dubbed the "Macbeth effect," and adds further support to the idea that in-game behavior can have real world consequences.

Related to environmental contexts, other research has looked at the effects of moral self-licensing on eco-friendly behaviors such as energy consumption (Tiefenbeck, Staake, Roth, & Sachs, 2013) and recycling (Dahab, Gentry, & Su, 1995). These studies also show that good deeds allow individuals to justify worse actions later on, while behaving badly motivates more positive future behaviors.

Similar findings were reported in a meta-analysis conducted by Bamberg and Möser (2007). Their review revealed guilt as a significant predictor of felt obligation to repair environmental damage as a "moral norm," defined as a felt obligation to engage in pro-social behavior. This makes guilt an "important pro-social emotion" because it creates a feeling of obligation to make amends, in other words, creating a moral norm (Bamberg & Möser, 2007). Together with guilt, internal attribution, problem awareness, and social norms accounted for 58% of the variance in this moral norm toward the environment.

Recently, Mallett (2012) posited the concept of eco-guilt, which is derived from an individual's guilty feelings induced by behaviors that are harmful to the environment. Mallett found that this form of guilt can motivate for future efforts to protect the environment, partially mediating the relationship between feelings of responsibility and environmental activism. Harth, Leach, and Kessler (2013) also found guilt to be a motivating factor; those who felt that their in-group was responsible for environmental damage and felt guilty for it were more driven toward repairing the damage than those who felt another party was responsible. This was compared to anger, also resulting from perceived responsibility for environmental harm, which predicted an intent to punish environmental wrongdoers. Interestingly, those who felt pride over their group's past deeds to protect the environment showed an increase in intent to repair the environment as well, but in a way that would exclusively benefit their in-group. In other words, Harth et al. (2013) saw that responsibility for environmental damage increased guilt that uniquely predicted a focused goal to repair environmental damage in an unselfish manner.

In another study, guilt was triggered when participants were faced with human-caused environmental damages, motivating 88.1% of these participants to sign a petition against pollution as compared to 70.9% of participants who were told the effects were naturally occurring (Rees, Klug, & Bamberg, 2015). Thus, guilt over environmental damage can occur when responsibility for the damage is shown to come from one's group or humans in general.

Informed by these studies, it may be possible to induce eco-guilt in participants who play *Eco* such that they become more sensitive to other environmental choices they make. Perhaps the act of destroying natural resources in-game by chopping down trees, hunting deer, or otherwise polluting the environment will induce enough guilt to motivate behavior change outside of the game. Thus, our first hypothesis follows:

Hypothesis 1 (**H1**): Compared to participants who have no exposure to gameplay, participants who play *Eco* will report stronger eco-guilt (**H1a**), be more likely to make pro-environmental choices immediately after gameplay (**H1b**), and report greater intention toward future environmental behavior (**H1c**).

Environmental Attitude

Environmental attitude has persistent influence on environmental behaviors. In their extensive research on environmental behavior, Stern and colleagues (Stern & Dietz, 1994; Stern, Dietz & Guagnano, 1995; Stern et al., 1999) have consistently found links between environmental attitude and behavior. In an early study, Stern and Dietz (1994) demonstrated that behavioral intention was predicted by biospheric orientation (pro-environmental attitude) both directly and indirectly. They posited that this predictive relationship could indicate that environmental attitude sensitizes individuals to the consequences of environmental changes which negatively affect the self, others, and the biosphere as a whole. Individuals who report stronger environmental attitudes may be influenced by them as one is influenced by a personal moral norm. Thus, environmental attitude acts as a filter through which individuals view information, allowing them to accept that damage caused by humans necessitates environmental protection measures, or reject this information in order to avoid compromising their own values. Similar results were replicated when environmental attitude scores were shown to be predictive of willingness to take environmental actions (Stern et al., 1995).

In addition, Stern et al. (1999) found that personal values, including awareness of environmental consequences assessed under the New Environmental Paradigm (NEP) scale (Dunlap, Van Liere, Mertig, & Jones, 2000), were the strongest predictor for environmental behavior and activism. This environmental awareness moderated the relationship between personal values (altruistic, egoistic, and traditional) and environmental personal norms, in accordance with their Value-Belief-Norm theory. In turn, those personal norms were the strongest predictor of various environmental behaviors, including change of personal behaviors, public activism (i.e., participation in demonstrations, involvement in social movements), and acceptance of policy change.

Schultz and Zelezny (1998) also reported a strong correlation between environmental behavior and environmental attitude. Participants with a higher awareness of environmental consequences and a higher sense of responsibility for environmental damage showed a particularly strong intention to engage in environmental behaviors. The sense of responsibility was also an important factor for Guagnano and colleagues (1995). Here, awareness of consequences (environmental attitude) had a significant direct effect on responsibility ascription, which in turn directly affected recycling behavior. This connects well to Mallett's (2012) concept of eco-guilt, which also deals with perceived responsibility for environmental damage as an impetus for behavior change, as previously mentioned.

Diekmann and Preisendoerfer (1992) found the influence of environmental attitude to be strongest when there were low-cost opportunities to participate in environmental behaviors. They note when environmental behavior fits a personal or social norm, it meets the "low-cost" requirement and typically requires minimal effort, such as recycling or turning off the heat during long absences. This idea was also supported by Schultz and Zelezny (1998). Thus, simple behavioral measures such as recycling an

object on the ground or choosing a recyclable cup could be an effective way to measure an individual's environmental behavior. Lee, Kim, Kim, and Choi (2014) also confirmed a direct, positive influence of environmental attitude on "good citizenship behavior" such as recycling and participating in community clean-ups, as well as "green purchase behavior," which is related to product choice.

Environmental attitude may also exert an indirect influence on environmental behaviors. For example, Whitburn, Linklater, and Milfont (2018) found that individuals were more likely to participate in a tree-planting program when they felt a stronger connection to nature. In another study, Tarrant and Green (1999) found that "appreciative outdoor activities," such as bird watching or hiking, were shown to positively mediate the relationship between environmental attitudes and behavior.

Message exposure can also be an important factor in determining the impact of environmental attitude, particularly along political ideologies (Feinberg & Willer, 2013). In a series of studies, Feinberg and Willer (2013) found that environmental issues are viewed as a moral issue by liberals but not by conservatives. However, framing an environmental message within a conservative moral domain (i.e., purity and sanctity) led conservative participants to adopt environmental attitudes comparable to those of liberals. This effect was not seen for messages presented with the harm and care domains, which are typical of most environmental messages in current media. Perhaps a deviation from the typical message, such as the interactive and immersive world presented by *Eco*, can affect participants who might otherwise hold a low regard for environmental issues.

The literature reviewed above indicates that depending on how participants feel about the environment, exposure to *Eco* may lead them to come away with a greater appreciation for the environment that strengthens their intention to perform environmental behaviors in the future and possibly engage in simple actions to help protect the environment immediately after exposure. Thus, our second hypothesis follows:

Hypothesis 2 (**H2**): Environmental attitude will moderate participants' experience with *Eco* such that individuals with more pro-environmental attitude will show greater intention to engage in environmental behavior (**H2a**) and perform pro-environment actions after exposure to *Eco* (**H2b**).

Trait Empathy

In order to test the effects of *Eco* on environmental behaviors, it is important to rule out other factors that may also influence individuals' environmental actions. Specifically, personality traits such as empathy have been linked to environmental concerns (Hirsh, 2010). Trait empathy denotes a person's ability to take the perspective of another and feel his or her pain or joy (Davis, 1980). That is, trait empathy affords people the ability to experience what other people or even animals feel, and shortens the distance between the perceiver and the target (Batson, Turk, Shaw, & Klein, 1995). For instance, Schultz (2000) found that higher levels of trait empathy can promote a feeling of connectedness to nature, which could elevate individuals' concern for the environment. Similar findings were also reported by Czap and Czap (2010), who found that individuals who scored higher on trait empathy also demonstrated heightened environmental concern.

It is important to note that the effect of trait empathy does carry over to virtual environments. In a study on immersive virtual environments, Gillath, McCall, Shaver, and Blascovich (2008) found that trait empathy was correlated with prosocial responses in a virtual world. Participants who reported higher levels of empathy and compassion were more likely to express a desire to help a virtual blind person or stay near a virtual beggar. These results suggest that persuasive messages delivered through a virtual

environment may be effective to foster prosocial behaviors. For *Eco*, this may mean that particularly empathetic individuals may be more aware of the resources they are using and the impact it has on their virtual environment. Thus, our third hypothesis follows:

Hypothesis 3 (**H3**): Trait empathy will moderate players' experience with *Eco* such that individuals with higher levels of trait empathy will show greater intention to engage in environmental behavior (**H3a**) and perform pro-environment actions after exposure to *Eco* (**H3b**).

To summarize, this research aims to demonstrate the effectiveness of *Eco*, a serious game designed to promote environmentally friendly behaviors. The main objective is to examine whether eco-guilt moderates the effect of exposure to *Eco* on environmental behaviors and behavioral intentions, and whether environmental attitude and trait empathy moderate these relationships. To test the hypotheses, two studies were conducted with an undergraduate sample in a lab experiment and an adult sample recruited through Amazon's Mechanical Turk in an online experimental survey.

Study 1

Method

Procedure.

This study featured a one-way experimental design conducted in a research lab. The procedure included four phases: pre-test, experimental treatment, post-test, and behavioral measures. Two direct behavioral measures were taken. The first occurred during a "break" in the experiment, where participants were allowed to step away from the computer and have a cup of water. Participants' choice between two types of cup (plastic or Styrofoam) was recorded, such that participants who chose the plastic cup were coded as making a relatively more environmentally friendly choice (given the recyclability of the material) compared to those who chose Styrofoam.[1] Participants' knowledge of recyclable materials was checked during the pre-test to confirm that they knew plastics were more likely to be recyclable than Styrofoam, which creates solid waste. The second behavioral measure involved a Research Assistant (RA1) placing a bottle in the hallway after participants entered the lab. RA1 took note of whether participants recycled the bottle on their way out, thereby making what we considered an environmentally friendly decision (similar to Cialdini, Reno & Kallgren, 1990).

Participants registered online, and upon arrival signed in outside of the lab with RA1, creating a respondent identification number (RIN) to track individual progress throughout the study. These steps provided a reason for RA1 to be in the hall for later observational measures without arousing suspicion. Participants were then directed to sit at a computer inside the lab. Informed consent and random assignment were facilitated electronically through Qualtrics. Participants were placed in one of three conditions: Control, Trailer, or Gameplay. Participants in the Control condition had no exposure to the game and only participated in the direct and indirect measures. Participants in the Trailer condition completed the baseline survey and then watched a video about *Eco* produced by the developers. The

[1] We fully acknowledge that plastic cups are by no means environmentally friendly, but this choice was determined by the need to include a non-obtrusive behavioural measure that also minimize participants' concern about hygiene.

Gameplay condition included everything from the previous two conditions and also had participants play *Eco* for twenty minutes.

In deciding the length of game time, we considered how long participants would be in the lab and how we could maximize possible data collection. Establishing the necessary amount of time for exposure to serious games is a trade-off of time and resources (Mayer et al., 2014). Ultimately, setting each session to an hour helped us maximize participants while minimizing their fatigue. This limited game time to twenty minutes, which was enough for players to explore and interact with the environment.

All participants first completed pre-test measures, the experimental treatment (or control), and were then given a brief break during which the first behavioral measure (cup choice) was assessed. This was followed by post-test measures and the second behavioral measure (bottle pick-up) in the hallway as they exited. All research procedure was approved by the IRB.

Participants.

A total of 62 undergraduates were recruited to participate in the study in exchange for research credit. One participant was excluded from analysis because she guessed the manipulation, resulting in a final sample of 61 (n_{male} = 25, 41%, n_{female} = 36, 59%; n_{White} = 25, 41.0%, $n_{Asian/Pacific\ Islander}$ = 21, 34.4%, $n_{Black/African\ American}$ = 7, 11.5%, $n_{Hispanic/Latino}$ = 5, 8.2%, all other races < 3%; M_{Age} = 20.28, SD_{Age} = 1.72).

Measures.

Pre-test. After signing in with RA1 in the hall and creating a RIN, participants were directed to a computer in the lab by RA2 for consent and pre-test measures. The New Ecological Paradigm Scale (NEP; Dunlap et al., 2000) was used to measure environmental attitude. Based on past research (Feldman & Hart, 2018), we employed a shortened version of the NEP. Responses to seven items such as “The balance of nature is very delicate and easily upset by human activities” were scored on a 5-point Likert scale ranging from 1 (Strongly disagree) to 5 (Strongly agree) (M = 3.71; SD = 0.87, α = .86).

Trait empathy was measured using the Basic Empathy Scale (BES-A; Carré et al., 2013). Responses to nine cognitive items (M = 3.49; SD = 0.91, α = .72) and 11 affective items (M = 3.85; SD = 0.46, α = .71) were assessed on a scale of 1 (Strongly disagree) to 5 (Strongly agree). Sample items include “My friends’ emotions don’t affect me much,” and “I often get swept up in my friends’ feelings.”

A check of participants’ recycling knowledge was included to assess whether cup choice was based on knowledge of recyclable materials. Participants were able to correctly identify that most plastics are recyclable (96.7%), while Styrofoam is not (73.8%).

The pre-test closed with demographic variables including age, gender, ethnicity, and class year. Political ideology was also assessed to control for possible differences based on political beliefs.[2] All

[2] Research has shown a political divide over environmental issues in the US. For instance, Hamilton and Saito (2015) found that Democrats, Independents, Republicans, and Tea Party members all differ significantly in their perceptions of science, the environment, and climate—though it should be noted that Tea Party affiliation was not mutually exclusive to other parties and thus was not included as a party in the current study.

participants were asked to identify with a point on a 7-point scale ranging from 1 (Extremely liberal) to 7 (Extremely conservative) (M = 3.25, SD = 1.34).

Next, Qualtrics randomly assigned each participant to one of the three conditions. Those in the control group (n = 21) moved to the first behavioral measure, while others went on to view the trailer (n = 19) or play *Eco* (n = 21) before the behavioral measure. Here, participants were offered a drink as a "token of appreciation" during a break from their computer tasks. They had the choice of a plastic cup or a Styrofoam cup. The assumption was that those who chose the plastic cup were making a decision toward environmental conservation due to the recyclability of the material.

Post-test. The first posttest measure was eco-guilt, using the scale developed by Mallett (2012). Participants reported the extent to which they felt guilty on five issues, including their consumption of natural resources and failure to recycle. Responses were recorded on a scale of 1 (Not at all guilty) to 6 (Extremely guilty) (M = 4.15; SD = 1.17, α = .90).

Environmental behavioral intention was measured with nine items created by Brügger, Morton and Dessai (2015) and a tenth item adapted from Yang, Seo, Rickard and Harrison (2015), which were found to be highly reliable together (α = .83). Participants stated their likelihood of engaging in environmentally friendly behaviors such as "eat less meat" and "car sharing or carpool whenever possible" on a 5-point scale ranging from 1 (Much less frequently) to 5 (Much more frequently) (M = 3.14; SD = 0.83).

After the post-test measures, participants were directed to sign out with RA1 in the hallway. As they exited the lab, participants saw an empty plastic bottle on the floor. We expected that participants would take this bottle and place it in the recycling bin out in the main hallway (in view of RA1). This measure was coded on an ordinal scale, with those who ignored the bottle coded as 0, those who put it in the trash can as 1, and those who put it in the recycle bin as 2. Moving the bottle to the bin was considered an eco-friendly action. The same bottle was used across the entire experiment to control for possible difference in responses (see Cialdini et al., 1990). RA1 then debriefed the participant and replaced the bottle as needed for the next participant.

Results

Initial analysis showed that random assignment was successful across race, gender, class level, and political orientation. Eco-guilt was highest in the gameplay condition (M = 4.40, SD = 0.91) and lowest in the trailer condition (M = 3.91, SD = 1.44) with the control condition between the two (M = 4.12, SD = 1.15), though these differences were not statistically significant, $F(2, 58) = 0.89$, $p < .42$. Consistent with Mallett (2012), eco-guilt was significantly related to environmental behavioral intention (r = .62, $p < .001$). We further tested whether eco-guilt mediated the experimental effects and found no significant indirect effect.

Regarding the behavioral measures, there was no significant difference in cup choice across conditions based on a chi-square test ($p < .75$, two-sided), nor was there any correlation with recycling knowledge. However, when cup choice was collapsed with the number of participants who refused a drink, a surprising result emerged. Those in the trailer condition were significantly more likely to refuse a drink (n = 13, $p < .03$, two-sided) than participants in either the control (n = 8) or gameplay (n = 6) conditions. No participant in the trailer condition selected a Styrofoam cup either, while four participants in each of the other conditions did, though this difference was not statistically significant ($p < .08$, two-sided). Only four participants (6.6%) recycled the bottle in the hallway, so we excluded this variable from further

analysis. Environmental behavioral intention did not vary significantly across conditions ($p < .70$). Thus, **H1** was not supported.

Regarding **H2**, we found that environmental attitude was not significantly related to either behavioral intention nor the direct behavioral measures. Environmental attitude also did not moderate the relationship between experimental condition and behavioral intention. Thus, **H2** was not supported. Additionally, trait empathy had neither a direct or indirect relationship with environmental behavioral intention or behavioral measures. Therefore, **H3** was also not supported. In viewing these results, statistical power was a major concern, which lead us to simplify the research design and recruit additional participants in a follow-up study. In light of the finding that the trailer condition seems to outperform the gameplay condition, we have decided to use the trailer as the main experimental stimuli in Study 2. Further, given the difficulty of recruiting sufficient participants for a lengthy study, we decided to opt for recruiting adult participants online, which also enhances the external validity of this research.

Study 2

Method

Procedure.

Study 2 was conducted online with participants recruited from Amazon's Mechanical Turk (MTurk) using a survey hosted on Qualtrics. MTurk offers a more diverse and representative sample than the typical undergraduate research pool. It is a recruitment platform that is inexpensive compared to other alternatives, and users respond to stimuli in ways that are consistent with other subject pools (Berinsky, Huber, & Lenz, 2012). Despite MTurk users typically being younger and more liberal, research conducted with this pool typically maintains internal and external validity (Buhrmester, Kwang, & Gosling, 2011).

Participants completed pre-test measures, were randomly assigned to either watch the *Eco* trailer or not, and then filled out post-test measures and demographics. Due to limitations of the platform, we were not able to keep a gameplay condition or observe direct behavioral measures. The research procedure was approved by the IRB.

Participants.

All participants were recruited online and compensated at $0.75. No individuals who fully completed the survey were dropped, resulting in a sample of 293 (n_{male} = 165, 56.3%, n_{female} = 128, 43.7%; n_{White} = 175, 59.3%, $n_{Asian/Pacific\ Islander}$ = 88, 29.8%, $n_{Black/African\ American}$ = 15, 5.1%, $n_{Hispanic/Latino}$ = 10, 3.4%, all other races < 3%; M_{Age} = 38.83, SD_{Age} = 11.19).

Measures.

All scales from study 1 were used in study 2. These were the BES-A for both cognitive empathy (M = 3.95, SD = 0.60, α = .83) and affective empathy (M = 3.42, SD = 0.76. α = .88), the NEP (M = 3.77, SD = 0.91, α = .88). Post-test measures were eco-guilt (M = 3.78, SD = 1.34, α = .91) and the combined scale on environmental behavioral intention to engage in ten eco-friendly actions (M = 3.36, SD = 0.88, α = .83). The survey concluded with demographic variables and political orientation.

Results

Independent-samples t-tests and chi-square results indicated that random assignment was successful across age, race, gender, and political orientation. Eco-guilt was higher in the treatment condition (M = 3.84, SD = 1.28) than the control condition (M = 3.70, SD = 1.40). Behavioral intention was also higher in the treatment condition (M = 3.41, SD = 0.90) than the control condition (M = 3.31, SD = 0.87), although these differences were not statistically significant. Consistent with study 1, eco-guilt was significantly correlated with environmental behavioral intention (r = .50, p < .001). However, eco-guilt did not mediate the relationship between experimental condition and behavioral intention. Thus, **H1** was not supported.

To test **H2**, which posited that environmental attitude would moderate the relationship between exposure to *Eco* trailer and environmental behavioral intention, univariate analysis was conducted with environmental attitude as a covariate. An interesting crossover effect was found, though it did not support the hypothesis in the predicted direction. Participants with lower environmental attitude actually reported stronger intention to change their future behavior after watching the *Eco* video than those who were not exposed to it. Figure 1 illustrates this effect. It seems this method of exposure to environmental issues may be an effective means for reaching individuals who do not care about the environment as much.

H3 suggested that trait empathy would moderate the relationship between exposure to *Eco* and environmental behavioral intention. Similar univariate analyses were conducted with affective and cognitive empathy as covariates respectively. We did not find any significant interaction, but both cognitive empathy (r = .13, p < .05) and affective empathy (r = .25, p < .01) were significantly correlated with behavioral intention.

Finally, multiple regression analysis was conducted to assess the relationship among all key variables across the two studies (Table 1). The overall regression model accounted for about 30% of the variance in environmental behavioral intention across both studies. Eco-guilt was a strong predictor of behavioral intention in both studies. In study 2, we also found that female participants, minority participants, as well as more liberal-leaning participants were more likely to express pro-environmental behavioral intentions.

Discussion

The most notable contribution of this research was the strong correlation between eco-guilt and environmental behavioral intention observed both in the laboratory and online. Our analysis further investigated how behavioral intention was related to eco-guilt, environmental attitude, and both cognitive and affective empathy. As study 2 revealed, contrary to our expectation, it was actually individuals with a lower regard for the environment who were exposed to the *Eco* trailer that showed a greater intention to engage in future environmental behaviors. Additionally, those who reported greater trait empathy, especially affective empathy, show a greater intention to take steps toward environmental protection in the future.

As an interesting point in study 1, recoding the cup choice to compare participants who took a drink to those who refused the drink revealed a significant difference in behavior by condition. Participants in the trailer condition were significantly more likely to have refused a drink than those in either the control or gameplay condition. Perhaps these individuals considered environmental friendliness in a different way than the others. If these individuals refused a drink because they felt that single-use cups were not

environmentally friendly regardless of material, this could have interesting implications. Even a recyclable plastic cup may still find itself in a landfill, after all. This finding suggests that vicarious learning through watching the trailer video may be effective in fostering environmental behaviors, a result that is consistent with social cognitive theory (Bandura, 2001). Results from study 2, which was focused on exposure to the trailer video, further attests to this conclusion. That is, participants who saw the trailer video to *Eco* seemed to become more aware of the environmental consequences of their actions, experienced more eco-guilt and reported greater intention to engage in environmental behaviors in the future, although these relationships did not reach statistical significance.

In line with recent research on eco-guilt (Harth et al., 2013; Mallett, 2012; Rees et al., 2015), both studies illustrate that guilt, as a moral emotion, can be an effective trigger for future environmental behaviors. When participants in both studies experienced higher levels of eco-guilt, they also reported greater intention to improve future environmental behaviors. In other words, we can see that exposure to a message promoting careful use of environmental resources created a sense of insecurity over participants' past relationship with the environment, which activated guilty feelings. Although eco-guilt did not differ significantly across the experimental conditions, it was the strongest and most consistent predictor of environmental behavioral intention in both studies, controlling for all the other individual characteristics. Based on these results, we conclude that while moral self-licensing helps us feel secure in our past behavior and thus allows us to act immorally without guilt (Merritt et al., 2010), promoting insecurity and perhaps guilt for lack of action may have the opposite effect, creating a desire to strengthen our moral behavior in the future. Perhaps as audiences feel guilty over their past failures to protect the environment, they become more willing to take action.

With increased statistical power, we did find an interesting moderation effect related to environmental attitude in study 2. Consistent with past research (Schultz & Zelezny, 1998; Stern & Dietz, 1994; Stern, Dietz & Guagnano, 1995; Stern et al., 1999), participants with more eco-centric environmental attitudes were more likely to express pro-environment behavioral intentions. However, this relationship differed between the control condition and the treatment condition only among participants who reported relatively lower environmental attitude. Results indicate that among individuals with less eco-centric environmental attitude, exposure to the trailer video of *Eco* led them to express greater intention to engage in environmentally friendly behaviors. The trailer video of *Eco* alerts the viewer of typical environmental problems (i.e., extinction, pollution) in a way that links these problems directly to the viewer, rather than showing them as a result of human activity on a larger scale. Perhaps *Eco*'s message created a greater sense of responsibility among participants who have previously disregarded the impact of their actions on the environment. Being transported into the virtual world to experience these problems probably helped them see the effect that a single individual can have on an ecosystem. This finding also has important practical implications for environmental communication, which is to use visual messages, such as well-crafted videos, to promote environmental behaviors among individuals who typically pay less attention to environmental issues. Videos are effective because they can attract viewers' attention and offer emotional appeals (such as elevated eco-guilt) more readily than text-based messages. The positive relationship between both cognitive and affective empathy and environmental behavioral intention also suggest that affective appeals delivered through visual messages may be particularly effective for environmental communication.

While reviewing these findings, it is also important to acknowledge limitations. Participants in study 1 were all undergraduate students, most of whom partake in research as a class requirement. It is possible that a preoccupation with getting credit distracted them from picking up the bottle in the hallway. This preoccupation could also be inferred from the decision by many to skip the break between

sessions and thus refuse a drink for the first behavioral measure, though an alternative interpretation of this has been discussed. Perhaps the best solution is to use a different behavioral measure in the future, as many participants asked about their cup choice reported personal preferences (e.g., “I like to see the liquid in the cup” or “Styrofoam is for hot water”). As mentioned, single-use cups are not particularly environmentally friendly even if made from recyclable materials and thus may not be the best assessment of environmental behavior.

Unfortunately, due to the limitations of an online sample, it was not possible to include gameplay in study 2. However, even in study 1, individual preference and experience with video games were not measured, both of which may limit the ability of any one player to fully experience the game. Studies of serious games often include such measures, which have been shown to correlate with increased spatial skills, enhanced problem-solving, and inductive reasoning among other skills (Blumberg, Almonte, Barkhardori, & Leno, 2014), making this an unfortunate oversight. Further, with only 20 minutes allocated to gameplay, participants might have felt pressured to navigate the game quickly and learn the specific controls and thus diverted their attention from the overall narrative in the game. This might explain why the trailer condition seemed marginally more effective in influencing environmental behaviors. Future work could do better by extending the amount of time for gameplay.

Conclusion

The effectiveness of eco-guilt as a trigger for change in behavioral intention is an interesting observation. By creating insecurity over past environmental behaviors, we may create a sense of guilt and responsibility that can be resolved through improved behavior in the future.

It is noteworthy that, in contrast to previous research, those with the lowest environmental attitude showed the greatest change in behavioral intention after exposure to *Eco*’s unique message of environmental protection. Perhaps the perspective-taking that *Eco* employs made the difference. We hope that future work will continue to explore these effects on environmental attitude, behavior, and the role that eco-guilt can play in reaching those who may not otherwise be concerned with environmental issues.

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Appendix

Table and Figure

Table 1

Regression model predicting behavioral intention

	Behavioral Intention (ß)	
Block 1	Study 1	Study 2
Age	-.03	-.05
Female	.04	**.11***
White	-.15	**-.10*****
Political Orientation	-.04	**-.06***
R^2	.10	.17
Block 2		
Environmental Attitude	-.04	**.20*****
Cognitive Empathy	-.13	**.05***
Affective Empathy	.02	**.18****
ΔR^2	.01	.09
Block 3		
Eco Guilt	**.60*****	**.38*****
ΔR^2	.33	.11
Adjusted R^2	.34	.36
ANOVA	$F(8, 52) = 4.90$***	$F(8, 287) = 20.93$***

Note: * $p < .05$, ** $p < .01$, *** $p < .001$

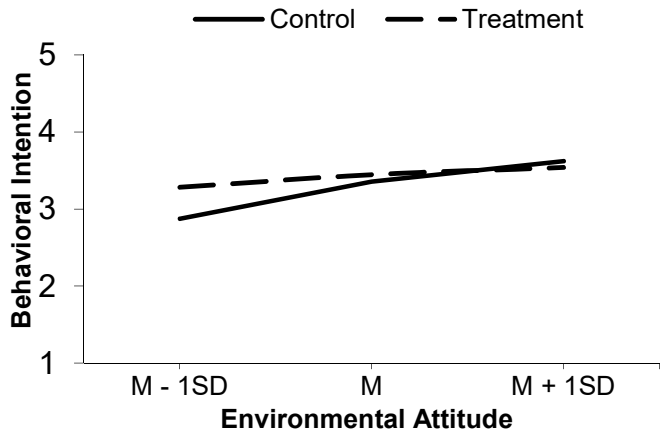

Figure 1. Environmental attitude moderates the relationship between experimental condition and behavioral intention.