Exploring the Effects of Communication Framed by Environmental Concern in Informal Science Education Contexts.

**DISSERTATION**

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Abstract

Informal science education (ISE) venues such as zoos, nature centers, parks, and natural history museums play a critical role in allowing the general public to learn scientific concepts (National Research Council, 2009; 2010). Most adult learning of scientific concepts takes place outside of classrooms and away from work (Rennie and Williams, 2006). It is also true that zoos and natural history museums have stated missions regarding conveying concepts related to the conservation of our natural resources (Krishtalka and Humphrey, 2000; Patrick, Mathews, Ayers, and Tunicliffe, 2007). Theoretically, the successful communication of the desired message of these ISE institutions would inspire a more informed citizenry on the use and conservation of our natural resources. Framing communication is to present a topic in a manner that promote a specific view of the information. Effectively framing information can be an avenue to achieving the goal of ISE institutions (Chong & Druckman, 2007; Nisbet, 2009). Shultz and Zelezny (2003) posit that messages framed by egoistic concerns, concerns which focus on the individual, will be better received by the general public, leading to a greater likelihood for them to become engaged.

This dissertation reports on a series of descriptive mixed methods studies conducted at a zoo, a natural history museum, and a science center, exploring the framing effects of communications framed by environmental concern (Schultz, 2001). In two of
the studies the researcher examined the relationship between individuals’ perceptions of
the overlap between their lives and nature, their levels of environmental concern, and
their preferences for statements designed to align with the types of environmental
concern (i.e. egoistic, social-altruistic, and biospheric). Two studies were conducted
using a quasi-experimental design in which the researcher randomly assigned messages
framed by environmental concern while also taking measurements of prior involvement.
A measure of future intention was taken to allow for comparison between messages.
Lastly, interviews of visitors to a science center were conducted to uncover a deeper
understanding of the results from the previous four studies.

Findings suggest that while there is a relationship between individuals’ feeling of
overlap between nature and their level of environmental concern they are two separate
psychological constructs. Visitors prefer the biospheric framed statement regardless of
their level of concern or feeling of overlap with nature. Shultz and Zelezney’s (2003)
assertion regarding the effectiveness of egoistic framed messages was refuted by the
results of the quasi-experimental studies, in which participants who received the
biospheric framed messages expressed a significantly greater intent to engage in
environmentally friendly behaviors than those who received the egoistic framed
messages.
Implications to theory from these results include that there is little evidence to support visiting a zoo increases one’s feeling of closeness with nature, however it does seem that individuals’ levels of biospheric concern increases, perhaps temporarily, by a form of perspective taking which occurs during the visit. Implications to practice include the need to consider context when developing a message (e.g. a visit to the zoo as opposed to a visit to a botanical garden). Future research suggested includes comparing samples gathered from other venues (e.g. sporting events), the need for research on memory or retention of these messages long term, and the need for studies on repeated exposure to messages over time.
Dedication

This document is dedicated to my children.
Acknowledgments

There are countless people who have made my research and this dissertation possible. It would be impossible for me to list all who I have encountered through this process and have assisted me along the way. Thanks first to my children: Tyler, Maxwell, and Emily Yocco; you have been so supportive and patient with me. I love you. Special thanks to my parents Victor and Evelyn Yocco and my sister Erica who have supported me throughout this journey.

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Fields of Study

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Chapter 1: Introduction

Informal science education (ISE) plays a critical role in educating and motivating the public to become more informed on issues related to the environment (National Research Council, 2010). Air pollution, water pollution, soil pollution, global climate change, habitat destruction and species extinction are some of the environmental problems that we currently face. While many of the problems may occur to some extent naturally, human behavior and impact on the environment do much to exacerbate these problems. Regardless of the specific reasons for each issue people can do much to reduce their impact on the environment and even begin to help undo or avoid some of the negative consequences these environmental problems impose on all inhabitants of the Earth. Environmental education (EE) as a field is charged with creating and implementing programming that is effective in educating people on how to be responsible environmental citizens (North American Association for Environmental Education, 2004) and putting forth the behaviors people can take to reduce their negative environmental impact. Critical to achieving these tasks that EE is charged with is effective communication. Practitioners of EE must communicate effectively and clearly with diverse audiences to promote positive attitudes towards the environment and to empower individuals to make positive choices based on their knowledge.

Researchers in the field of Conservation Psychology operate under the basic premise that many of our environmental troubles are related to human activity (Ellison,
Driving cars, a distinctly human activity, increases air pollution from the fine particulates that are created by internal combustion engines. Water and soil pollution are increased through the run off of gasoline, oil, and fluids that help cars function properly yet are often improperly disposed of or released into the environment by poorly maintained vehicles. Smoke from coal burning power plants is another culprit in the human led assault on our environment. This smoke not only increases air, soil, and water pollution, but is also a contributor to greenhouse gasses which have been shown to increase the rate of global climate change (Hoegh-Guldberg et al., 2007; Nixon, 1995; Pope et al., 2002; Schwarzenbach et al., 2006; Thomas et al., 2004). While acknowledging human behavior can be detrimental, Conservation Psychology is a field full of hope; hope that researchers and practitioners can develop better tools to facilitate environmentally responsible behaviors, hope that humans can and will change their behaviors or adopt new ones based on appropriate information, and hope that we can all be stewards of the Earth if we are given the opportunity and knowledge. Conservation psychology is complementary to EE in that the theories and applied knowledge gained through this research can inform decisions made by researchers and practitioners of EE (Saunders & Myers, 2003).

It is with hope for human contribution to improving environmental issues that Saunders’ (2003) seminal article sets the course for research conducted in the field of Conservation Psychology. Rather than putting forth problems and not offering solutions, the field has set an agenda that includes research to unravel the mystery of communicating with individuals on a level they can relate to, in order to facilitate behavioral changes. Specifically Saunders (pg. 144) asserts that a critical challenge for
applied research in Conservation Psychology is to “find ways to reframe debates and strategically communicate to the existing values people have.” Much work has already been conducted identifying these existing values. Environmental concerns (EC), which are based on individuals’ value orientations, have been identified by researchers (Schultz, 2000; 2001; Stern, 2000) utilizing prior work on cross-cultural values by Schwartz (1994) and Kohl (1984). An important finding is that values seem to transcend geography and culture, suggesting that a method of effectively communicating to concerns in one culture could potentially be effective at multiple other cultures (Oishi, Schimmack, Diener, & Suh, 1998; Schwartz, 1992, 1994; Spini, 2003).

A theory that has not been satisfactorily field tested in Conservation Psychology is that individuals will be more likely to respond to messages that are framed to their underlying values. It is assumed that this is true and the guides that have been published (e.g. Biodiversity Project 2004; Earth Justice, 2008; Globalchange.gov, 2009; Maibach, Roser-Renouf, & Leserowitz; Pike, Dopplet, Herr 2010) identify various groups and ways of framing messages regarding biodiversity and environmental issues based on different value orientations or demographic and psychographic characteristics. However, there has not been adequate follow up research to see if these messages are effective at creating behavioral change. Schultz and Zelezny in 2003 posited that Americans in particular would respond best to communication framed using a frame that speaks to the self-interest of the individual. Again, this hypothesis has yet to be tested in published research.

It is important to move beyond identifying potentially effective frames of communication. Research is needed that examines the framing effects and factors that
influence individuals’ behavior in response to the framing of messages regarding environmental conservation issues. Such findings inform conservation focused ISE providers and programming, helping practitioners effectively communicate to visitors the consequences of different choices one has available in situations that may impact environmental issues.

Advances in theory, which identified specific EC (Stern and Dietz, 1994; Schultz, 2000; 2001) held by individuals, has allowed researchers to incorporate these concerns into measurements as part of studies on the relationship between concern and engagement in pro-environmental behaviors (Schultz, 2001; Stern, 2000; Stern and Dietz, 1994; Stern, Dietz, and Kalof, 1993). The findings from these studies suggest that there is a relationship between pro-environmental behavior and environmental concern. Being that conservation psychology is an applied field, there is a need to move forward with designing, testing, and implementing effective communication based on these concerns. The studies described in the following sections of Chapter 1 and reported on in the following chapters address the critical task of filling this gap in our knowledge.

1.1 Setting

The research reported in this dissertation was conducted onsite at three types of organizations that offer informal science learning experiences: a zoo, a natural history museum, and a science center. It is widely acknowledged that individuals will encounter most of what they may learn about science through experiences with informal science education (Falk, Dierking, & Foutz 2007; National Research Council, 2009). Zoos, natural history museums, and science centers are ISE settings in which it visitors receive
messages designed to educate them on specific topics and to promote visitors seeking more information on these topics.

Zoos provide an ideal setting for the study of conservation education-based communication (Clayton, Fraser, & Saunders, 2008). For a zoo to be certified by the Association of Zoos and Aquariums (AZA, 2010 pg. 13) they must include both “conservation” and “education” in their missions. Specifically, to exhibit signage and interpretive devices, AZA (2010) requires signage to “be based on the thoughtful development of conservation messages for the institution and may include information regarding the animal’s natural history, conservation and care, ecology, relation to humans, correct taxonomic identification and current status (i.e. endangered or threatened)” (pg 13).

Signage is supposedly one of the most efficient ways of reaching a large number of visitors over a long period of time; therefore signage at zoos is heavily relied on to fundamental messages related to conservation education (Mony, 2007). However, some research suggests signage is often overlooked or ignored by visitors (Screven, 1992). Signage based on empirical data on visitor preferences for signage may prove more effective at attracting visitors’ attention and imparting the desired messages of the zoo.

Science centers and natural history museums focus on environmental and conservation issues as well. Winker (2004) states, “The mission of museum natural history collections is to document biodiversity and its distribution and to serve as a resource for research and education” (pg. 445). In the same vein, Krishtalka and Humphry (2000, pg. 611) state Natural history museums have a commanding mission—nothing short of understanding the life of the planet for the benefit of the earth and its
inhabitants. According to the Association of Science-Technology Centers Incorporated (2009) “science centers are sites for informal learning, and are places to discover, explore, and test ideas about science, technology, engineering, and mathematics.”

These ISE settings receive substantial visitation: according to the AZA there were 175 million visitors to accredited zoos and aquariums in 2008, according to ASTC over 80 million people visit science centers annually and according to the American Association of Museums individual museums with collections focusing on natural history and anthropology average 80,000 visitors per year per museum. While people visit zoos and other ISE settings for myriad reasons, research on visitor motivation identifies that for many visitors, education or learning is a key outcome for a number visitors (Falk, Heimlich, & Bronnenkant, 2007). Adults particularly tend to express a desire for their children to learn from an experience to a zoo (Morgan & Hodgkinson, 2000). Due to both the stated mission and the self-reported desire of many visitors to ISE providers, they are likely settings for research in conservation education.

1.2 Environmental Concerns

Values, which are considered to be the underlying determinants of attitudes and behaviors (Rokeach, 1968, 1973), are difficult to measure. A number of proxies exist that are considered acceptable for measuring individual values and how they are expressed. Related to environmental issues, Stern and Dietz (1994, Stern, 2000) put forth three dimensions of environmental concern, based on underlying values concerning the detrimental effects of environmental degradation on valued objects: egoistic, altruistic, and biospheric. Schultz (2000, 2001; Schultz, Gouveia, Cameron, Tankha, Schmuck, &
Franek, 2005) continued this research by statistically validating the existence of these three distinct *environmental concerns* individuals could hold. These categories of concern are distinct but not unique, meaning that individuals may hold levels of each concern. Briefly the identified characteristics of the three concerns are:

**Egoistic** – Characterized by a concern for the consequences of environmental issues on one’s self. This concern is focused on problems that would force an individual to change their lifestyle, impacts on health, and impacts on financial gain.

**Social-Altruistic** – This concern is represented by the impacts of environmental issues on others. Altruism is expressed through a concern for neighbors, loved ones, and children.

**Biospheric** – A concern for the effect of environmental issues on all living beings. This is expressed through caring about the impact of environmental issues on plants, birds, fish, and other wildlife (Schultz, 2001).

Shultz (Personal Communication, 2008) notes the importance of understanding that these concerns are “progressively inclusive.” That is, they build on each other with the egoistic concern serving as the base concern. An altruistic concern incorporates a concern for all individuals, which would include self (egoistic), while a biospheric concern would incorporate self and others (egoistic and altruistic). Schultz and Zelezny (2003) state that environmental messages are usually framed by altruistic concerns or biospheric concerns, preventing the messages from being more effective in promoting behavioral change in individuals who hold mostly egoistic concerns. The researchers point to studies that suggest most Americans hold egoistic type concerns at higher levels,
suggesting that egoistic framed messages would be more effective in promoting environmentally responsible behaviors. Although individuals can hold varying levels of each concern, it would make sense that messages designed to activate the egoistic (most basic) concern would fare better than those that are designed to activate the higher level altruistic or biospheric concerns (Schultz & Zelezny, 2003).

The assertion that American’s are highly egoistic would suggest that the motivation for the behaviors, environmental or not, of most Americans would be selfish rather than selfless. However, the work of Ronald Inglhart and colleagues (Inglehart, 2008; Inglehart & Baker, 2000) would suggest the opposite. Inglhart has found that as societies transition from industrial to post-industrial a shift in values coincides as well. This shift is from the more selfish survival values to the more democratic self-expression values. Inglhart’s work would suggest that the population of a wealthy country, such as the United States, would be more likely to give environmental protection a high priority. This highlights the need for research to provide empirical guidance to practitioners of EE.

1.3 Framing Communication

In the field of communications, a frame is a way of organizing information that provides meaning to a series of events (Gamson & Modigliani, 1987; Tuchman, 1978). As Chong and Druckman (2007a) state: “Frames in communication matter – that is, they affect the attitudes and behaviors of their audiences” (pg. 109). The logic behind framing theory posits that individuals have a certain (limited) set of beliefs available from memory. These beliefs can be accessed through messages designed to activate the beliefs. Once a belief is activated, an individual subconsciously evaluates if the belief is
strong enough or relevant, thus determining the framing effect of the message: ignoring
the message, creating a new belief about the issue, making other beliefs accessible, or
strengthening the existing beliefs (Chong & Druckman, 2007a).

Research on framing communication in political campaigns and regarding
political issues has been quite prolific (e.g.: Brader, 2005; Druckman & Chong 2007b;
Feldman & Zaller 1992). Often research conducted on framing effects seeks to examine
how different frames may influence individual attitudes and behaviors regarding a
specific issue (Price, Nir, & Capella, 2005; Richardson, 2005). For example, does a
message framed using economic costs of welfare bring out different attitudes than a
message on the same topic using a humanitarian frame (Feldman & Zaller, 1992)? It has
been shown using experimental methods that framing effects of political advertising not
only can sway a voter politically, but also change the manner in which voters make
choices (Brader, 2005). Effective framing is a very powerful tool, and one that the field
of EE and ISE could use to potentially put forth their messages to the general public more
effectively (Nisbett, 2009).

Communication framing and framing theory (Chong & Druckman, 2007a) shape
the studies reported in this dissertation. A critical form of communication in ISE settings
such as zoos, designed to educate visitors, is signage or the signs that accompany each
exhibit. According to Screven (1992), inadequate content on signage contributes to the
inability of signs to communicate key zoo messages. Studying values as a means of
informing the messages zoos and other conservation based organizations use on their
signage may serve to increase visitor attention to key messages and influence visitor
attitudes and future behavior. By correctly framing communication, aligned with
visitors’ underlying values, zoos and other conservation based ISE organizations might more effectively convey messages encouraging behaviors that are consistent with their conservation missions (Saunders, 2003).

One valuable specific frame, environmental concern, could address this gap in the literature. Current theory suggests communication framed by environmental concerns should have a large impact on shaping individuals’ attitudes and behaviors toward the environment. For this dissertation, studies were developed for the purpose of examining the effect of framing conservation messages using environmental concerns. The studies were built on theory regarding the ability of communication based on environmental concern to motivate individuals’ actions. The findings contribute to theory in environmental communication and conservation psychology as well as provide practical results usable to educators and program developers in zoos and other conservation based ISE organizations.

### 1.4 Research Questions

The primary purpose of these studies is to better understand how message framing can be utilized by conservation focused ISE providers to encourage individuals to adopt behaviors that are consistent with the conservation missions of ISE providers (Stern, 2000). The desired outcome of answering this question is to have an understanding of the psychological mechanism of framing messages and how to best utilize framing in conservation focused ISE contexts. In order to answer this overall question the following questions were explored:
1) How does framing, using environmental concern, influence an individuals’ intention to partake in specific behaviors or change patterns of behavior, in relation to environmental conservation issues?

2) What elements must be present to effectively frame an environmental issue with environmental concern? For example, is it necessary to focus on one’s family and others in their community to effectively frame a message with the social-altruistic concern or is the family element the critical component of the message?

3) Will individuals who receive frames that align with egoistic environmental concerns express a greater intention to engage in behavioral change?

4) What preferences do individuals have regarding written messages framed by environmental concern?

5) What is the relationship between an individuals’ expressed environmental concern, overlap between nature and self, and preferences for statements framed by environmental concern?

Question 1 was designed to explore the possible relationships that exist between framing, environmental concern, and intent to engage in specific behaviors that have been identified as contributing to the conservation of critical resources or species. Question 2 more closely examines the specifics involved in framing a message, and if there are elements that can be identified and possibly generalized to messages relating to other environmental issues. Question 3 tested a specific aspect of theory put forth by Schultz and Zelezny (2003) that individuals (Americans in particular) tend to be more egoistic in their concerns and therefore messages that focus on egoistical reasons for behavior/
behavior change will have a greater positive effect on the American public. Questions 4 and 5 examined individuals’ expressed concerns and the relationships that these concerns have with individuals’ stated preferences for messages aligned with the different environmental concerns.

1.5 Significance of the Study

The studies reported within this dissertation focus on communication to an individual. A recent report suggests that as industries have begun to present themselves as more ecologically focused, individual actions now play a greater role in harming the environment, and that without collective action these negative behaviors will continue harming the planet (UNESCO, 2007). Other recent polls have shown that individuals are well aware of environmental issues and the negative outcomes associated with these problems, yet this has not been acted upon through behavioral or policy change (Pew, 2007, 2009, Washington Post-ABC News, 2008; Zogby, 2006).

The studies reported within this dissertation contribute to the theoretical base and knowledge within Conservation Psychology, specifically answering Saunders’ (2003) call for research that explores ways of effectively communicating with individuals. Saunders suggests that by exploring ways of communicating with individuals on a level that they are comfortable with, we can create more powerful messages. This task is critical for conservation psychology as a field and for conservation based ISE providers as a collection of institutions. Consider the potential impact with over 200 million visitors to zoos, natural history museums, and science centers in a year; each visit representing an opportunity for the institution to impress upon the visitor the importance
of engaging in conservation behaviors or avoiding behaviors detrimental to the environment.

1.6 Limitations

1) This dissertation reports on study results from adult visitors (over age 18) and findings cannot be generalized to all visitors to informal science education providers.

2) Given the diversity of zoos, science centers, and natural history museums the results of this study are valid for the study site alone. However, the findings can be used to inform theory on communicating with the large number of visitors to ISE contexts.

3) Participants engaged in this study on a voluntary basis, which could result in a selection bias. It is possible that the concerns and behaviors of those who agreed to participate are higher or lower than those who chose not to participate in the studies. One example of participant selection bias is those who have very strong positive attitude towards visiting zoos: these participants may overstate their willingness to engage in behaviors they feel would be appropriate of those who are frequent visitors to zoos.

1.7 Assumptions

1) Zoos, natural history museums, and science centers are an appropriate setting for research on conservation themed messages.

2) The institutions used in this study are representative of similar institutions throughout the United States.

3) Participants understood the verbal and written instruction of the researcher.
4) Participants responded to the questions honestly.

1.8 Definition of Terms

The following definitions are for variables examined throughout the studies reported in this dissertation. These terms and others are covered more extensively in the Literature Review section (Chapter 2).

1) Environmental Concern – Value based concern that individuals’ hold oriented around three sets of valued objects: self, other people, and the biosphere (Schultz, 2001). Environmental concern begins as subconscious evaluation of the potential threat that an environmental issue poses on a valued object and manifests as behaviors taken to reduce or avoid this threat. As reported in this dissertation, Environmental Concern is operationalized as an individuals’ score on the Environmental Concern Scale (ECS, Appendix A; Schultz, 2001). The specific concern is labeled as egoistic, social-altruistic, or biospheric and references the defined concerns listed above and by Schultz (2001).

2) Frame – A way of communication that organizes reality in a way that promotes particular definitions or interpretations of an issue or event (Chong & Druckman, 2007a; Tuchman, 1978). Frames were operationalized via written messages designed to elicit one of the three types of environmental concern (egoistic, social-altruistic, biospheric) identified by Stern, Dietz, and Kalof (1993) and Schultz (2000, 2001). Messages framed by environmental concern were created and administered on the topics global climate change, water pollution, the yellow sandshell mussel and a general message on the topic of environmental issues.
3) **Framing Effect** – When individuals arrive at different positions on an issue, depending on the priority given to various considerations, based on how an issue is framed by the communicator (Chong & Druckman, 2007a). For the studies reported in Chapter 5, framing effects were measured by the differences in behavioral intent expressed by the participants based on which message they receive.

4) **Intent** – As laid out by Azjen’s (1991) Theory of Planned Behavior. Intention is the step prior to actually carrying out a behavior. Participants were asked to self-report their level of intention to engage in specific behaviors using items with a seven point rating scale.

5) **Involvement** – Involvement has been found to be a mediating factor in individuals’ receptivity to communication frames (Teel, Bright, Manfredo, & Brooks, 2006). Involvement was measured by individuals self-report on an item asking their level of knowledge on the specific environmental topics used.

6) **Pro-Environmental Behavior** – The intended behaviors measured in this study fall into the categories of *Activism* (joining a group or signing a petition), *Private Sphere Behaviors* (consumer purchasing behavior), and *Information Seeking* as defined by Stern (2000). In no way are the behaviors measured the only behaviors that could be considered pro-environmental. Nor were researchers intending to promote the measured behaviors. These are behaviors consistent with the mission of ISEs and would not be considered detrimental to the environment.
7) **Inclusion of Nature in Self** - The amount of overlap that an individual sees his or her life having with the element of nature, which is defined by Schultz (2000) as “all living things.” This concept is operationalized by participants self report on the Inclusion of Nature in Self Scale (Appendix B; Schultz, 2002).
Chapter 2: Review of the Literature

The studies reported in this dissertation explore and test theory related to framing environmental communication. Together the studies represent a thorough examination of framing environmental communication using environmental concerns as the frame. Separately each study focuses more narrowly on portions of the framing effects of environmental concern. Therefore this literature review covers concepts that will be applicable to the study as a whole, but may not be contained in each individual study. The topics, along with their appropriate headings will be as follows:

2.1 Conservation Psychology

2.2 Environmental Concern

2.3 Inclusion of Nature in Self

2.4 Communication: Frames and Framing Effects

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2.1 Conservation Psychology

Conservation Psychology (CP) as a recognized field of study is a relatively recent phenomenon (Brook, 2001; Myers, 2001; Reser, 2001; Saunders, 2003). As a concept CP, has been around over 35 years. In 1973 Maloney & Ward stated “Ecology is uniquely psychology’s problem” (pg. 583). They were correct in that many of the deeply disturbing environmental issues we have faced over the past four decades can be
attributed to human behaviors. CP is rooted in the recognition that humans play a critical role in causing or amplifying our environmental problems (Lidicker, 1998; Maloney & Ward, 1973; Saunders, 2003). Thus, psychological research, research on human behavior, is equally as critical as ecological research on the environmental issues we hope to mitigate via changes in human behavior (Schmuck & Schwartz, 2002). CP aims to work with environmental education to complement the knowledge that we have gained through studies in natural science that explain the “what and how” of our biological world. CP looks at how this accumulated knowledge can be effectively transmitted to the people of our planet in a meaningful way; leading to individuals engaging in pro-environmental behavioral adaptation and change across large populations of visitors to ISE contexts (Heimlich & Ardoin, 2008; Hungerford & Volk, 1990; Monroe, 2003; Zelezny & Schultz, 2000).

In 2003, *Human Ecology Review* published an issue dedicated to defining and shaping the field of CP including setting forth the future agenda for research. This was a watershed moment, in part because it brought validation to a field that had already been in existence and also because the issue serves as a baseline for measurement of the accomplishments of CP. Saunders’ (2003) lead article focused on explaining where CP fits in with other fields such as biology and education, and on setting forth the research agenda. Included in the call for research was “Developing strategies to foster caring, shaping values, and measure success” (pg. 144).

More specifically, Saunders (2003; Saunders, Brook, & Myers, 2006), called for “the need to find ways to reframe debates and strategically communicate to the existing values that people have.” The importance of research exploring the reframing of debates
was reiterated by Schultz and Zelezny’s (2003) call to re-frame environmental messages so that they align with the values that are expressed by our (American) society. While Schultz and Zelezny (2003) speculated on the effectiveness of this reframing of communication, they did not give any empirical evidence to support their speculation.

### 2.2 Environmental Concern

The topic of environmental concern (EC) finds its roots in the psychology and sociology literature of the 1970s (Dunlap & Van Liere, 1978; Lounsbury & Tornatzky, 1977; Maloney & Ward, 1973; Weigel & Weigel, 1978). Faced with the environmental problems of consumption, land use, and destructive behaviors of the time period that, according to Weigel & Weigel (1978), were “incompatible with the survival of the individual, the species, and the planet” (pg.3) researchers were looking for measurements that would assist with explaining or predicting certain behaviors that individuals were likely to engage in. EC was loosely defined by Weigel and Weigel’s (1978) Environmental Concern Scale as “individuals’ relatively enduring beliefs and feelings about ecology such that predispositions to engage in pro- or anti-environmental actions could be anticipated” (pg. 4). Whereas a previous scale measuring concern (Maloney & Ward, 1973) measured EC as an individuals’ emotionality related to ecological issues. Lounsbury and Tornatzky (1977) did not attempt to define EC; however their scale reflects “concerns” about very specific issues such as overpopulation and recycling.

After this initial interest in EC, there was very little published research in the 1980s and 1990s related to EC. The reasons for this include limitations in the scales that were created such as low reliability, low correlation with behaviors, and lack of a
comprehensive theory tying the various lines of research together (Dunlap, Van Liere, Mertig, & Jones, 2000; Schultz, 2001; Stern, Dietz, Kalof, & Guagnano, 1995). Whether for the reasons stated previously, or simply a change in research interests, EC research saw a decline until the mid 1990s. Schultz (2001) suggests that more recent theoretical developments in EC are what made it possible to pursue more recent research on the structure and predictive values of EC.

Theoretical developments regarding EC suggest that all individuals have concern for the future of our environment and preventing catastrophic environmental degradation (Schultz 2000 & 2001; Schultz, et al., 2005; Stern, Dietz, & Kalof, 1993; Stern & Dietz, 1994). The reasons for concern include concern for self and one’s well being, concern for the sake of other humans, and concern for of all living beings. Most likely individuals’ incorporate some level of concern for all of these (Schultz, 2000) in their worldview. In the 1990s researchers began to examine the structure of these concerns and identify meaningful categories of existing concern. As is often the case in psychological research, Stern and Dietz (1994) and Stern, Dietz, and Guagnano (1995) attempted to create a measurement that would statistically verify the existence of the three theorized types of concern.

These researchers based their theories utilizing EC on Schwartz’ studies of the more general (non-environmental) norm activation model of altruistic behavior (1973, 1977, 1992). This model attempts to explain why some humans engage in “helping” when they encounter other individuals in need. According to Schwartz, this happens through values that are activated in part by one person having an awareness of the consequences of specific behaviors on others. Stern, Dietz, and Kalof (1993) merged
existing theory to better explain environmental behaviors, by proposing that EC was an extension of Schwartz’ norm activation model, creating what was eventually termed value-belief-norm theory (VBN; Stern, 2000). This theory posited that people act based on the adverse consequences they believe environmental problems will have on their EC.

More specifically, as shown in Figure 1, Stern’s (2000) VBN theory categorizes EC as “values” that are the base of a “causal chain” that lead to environmental behaviors. This suggests that each variable directly affects the next variable and that to access EC would be to affect behavior at the most basic level. A later study analyzing the predictive capability of VBN (Kaiser, Hubner, & Bogner, 2005) found that measuring the various components of the theory could account for 65 percent of the pro-environmental behaviors that a sample of college students engaged in. Slimak and Dietz (2006) echo these findings, examining risk perception through the frame of VBN theory, concluding that the theory could be a “plausible explanation” of participants’ perception of ecological risk.
VBN theory and the research leading to its creation helped to shape the construct of environmental concerns. Researchers have labeled these concerns (Schultz 2001; Stern & Dietz, 1994; Stern, 2000) as egoistic, social-altruistic, and biospheric. Egoistical concerns relate to the impact of environmental problems on one’s self. This includes one’s health, self, future, and lifestyle. Social-altruistic concerns relate to the impact of environmental problems on other human beings; for example one’s neighbors, children, and all people. Lastly, biospheric concern encompasses the concern of environmental problems impacting all living beings: plants, animals, marine life and birds.

Values, as a concept, have been defined by researchers as “important life goals” (Schultz & Zelezny, 2003) and as underlying determinants of attitudes and beliefs (Olson
& Zanna, 1993), which serve as guiding principles in a person’s life (Schwartz, 1992). Although not measuring values itself, a scale that measures EC could be thought of as a proxy measure for individuals’ underlying values and therefore, potentially serve the purpose predicting attitude and behavior (Stern, Dietz, & Guagnano, 1995a; Stern, Dietz, & Guagnano, 1995b; Stern, Dietz, & Kalof, 1993; Stern & Dietz, 1994). Stern & Dietz (1994) presented the results of a survey study they conducted, containing items hypothesized to align with the three types of concern. Factor analysis on the results suggested the data fit a two-factor model of EC better than a three-factor model. This left the researchers suggesting that the intricate differences between the theorized ECs were not yet able to be teased out through survey research.

Picking up on Stern and Dietz’s (1994) attempt to measure the three separate hypothesized ECs, Schultz (2000) conducted a study that gathered answers to the open ended questions regarding the properties of individuals EC. From these results, Schultz (2001) created the Environmental Concern Scale (ECS) hypothesized to measure individuals’ levels of the three types of concern. Using confirmatory factor analysis, Shutz found the scale did measure three types of concern, in the expected categories, had an acceptable level of fit (> .90) as measured by the Goodness of Fit Index, and the Tucker Lewis Index. Snelgar (2006) conducted a study comparing Schultz’ (2001) ECS and the Adverse Consequences Scale (Joireman, Lasane, Bennett, Richards, & Solaimani, 2001), which is a similar scale attempting to measure EC and also based on the work of Stern (2000). The results of Snelgar’s (2006) study showed that the ECS was a more statistically reliable scale in measuring the three hypothesized factors of EC.
Research using the ECS has focused on the correlations of ECS scores to Schwartz’ (1994) dimensions of value, other environmental attitude and behavior scales, and the predictive value of the ECS for environmental behaviors. In 1994, Schwartz wrote that human values could be classified into two separate dimensions. One dimension contains values that reflect “self-transcendence” such as unity with nature, being concerned for the well being of others, and accepting others as equal; these are pitted against “self-enhancement” values in the same dimension. Self-enhancement values include the pursuit of individual success and dominance over others. Researchers posit that those who have strong self-transcendence values have a greater concern for the environment and engage in more pro-environmental behaviors than those who are stronger in self-enhancement values (Dutcher, Finley, Luloff, & Johnson, 2007; Schultz & Zelezny, 1999; Schultz, 2001; Schwartz, 1994).

Using items from Schwartz’ values inventory (1992, 1994), researchers found that egoistic concerns on the ECS are positively correlated with self-enhancement and negatively correlated with self-transcendence values (Schultz, 2001; Schultz & Zelezny, 1999; Stern et al. 1999). Altruistic and biospheric ECS scores correlate negatively with self-enhancement and positively with self-transcendence (Shultz 2001; Stern et al. 1995). These previous studies, as well as others (Schultz, Gouveia, Cameron, Tankha, Schmuck, & Franek, 2005; Schultz, Shriver, Tabanico & Khazian, 2004), have had similar results using international samples, suggesting these ECs exist at varying levels across human populations.

Studies on behaviors have found that EC predicts pro-environmental intentions for political activities, policy support for environmental issues, energy saving measures,
and support for travel restrictions (Nillson & Kuller, 2000, Poortinga, Steg, & Vlek, 2004; Stern et al., 1995). However, Bamberg (2003) reports on results backing his suggestion that EC is an indirect rather than a direct predictor of behaviors. Bamberg asserts that situation specific thoughts individuals incur when making a behavioral decision are true direct predictors of behavior. Situation specific thoughts are covered more in the Theory of Planned Behavior section below.

While researchers have focused on measuring levels of EC and predicting behavior using ECs, there have been no published empirical studies examining the effectiveness of framing communication using ECs. Schultz and Zelezny (2003) published an article which called for a “reframing” of environmental messages, putting forth two critical ideas for the studies reported on in this dissertation. First, the authors claim that creating messages designed to tap in to individuals’ environmental concerns is an effective method of creating positive environmental behaviors. Second, the authors suggest that in America, statements focusing on egoistical concerns should resonate more than statements framed by the other ECs. This is based on their review of research suggesting that Americans value individualism and that they are motivated by materialistic gains in status (Kohls, 1984). An alternative point of view comes from the work of Inglhart (2008; Inglehart and Baker, 2000), which suggests Americans would be highly post-materialistic and therefore much more likely to value tolerance and interpersonal trust. Similarly to Schultz and Zelezny (2003), Lee (2008) suggests that environmental messages promoting specific behaviors be framed by environmental concerns. Lee comes to this conclusion as the result of her study examining thousands of Hong Kong female adolescents, finding environmental concern to be the “most
important” predictor of behavior in these youth when compared to measurements of perceived environmental responsibility, perceived effectiveness of environmental behavior, and perceived seriousness of environmental problems. Again Lee (2008) suggests framing communication using environmental concern; however she did not test the effectiveness of this type of communication.

2.3 Inclusion of Nature in Self

Inclusion with nature has been defined as “the degree to which an individual believes that s/he is a part of the natural environment, cares for the environment, and is committed to protecting the environment” (Schultz, 2002, pg. 74). Inclusion of nature in self, sometimes referred to as connectedness, is a relatively recent concept researchers have been investigating (Bruni, Fraser, and Schultz, 2008; Bruni and Schultz, 2009; Davis, Reed, and Green, 2009; Dutcher et al., 2007). It is thought that environmental connectedness is directly related to environmental concern with the basic principle guiding the concept being: the more connected or included one feels with nature the more they will care for and protect nature. (Nisbet, Zelenski, and Murphy, 2009; Schultz, 2000, 2002). Whereas an individual with little connectedness to nature cares much more about his or her self and is more committed to protecting the self, see figure 2 (Schultz, 2002).
Researchers argue that inclusion with nature or how connected one feels with nature may be the most important determinant of how an individual develops environmental values (Dutcher, et al., 2007; Kals, Schumacher, & Montada, 1999; Schultz, 2002). An important feature of the conceptualization of inclusion with nature is that inclusion focuses on connectivity or how humans see their selves as part of the environment (Dutcher et al., 2007), and not how humans utilize the environment materially. Therefore, increasing one’s inclusion with nature necessarily involves removing the barriers that exist between self and nature. Schultz (2002), states that increasing individuals’ inclusion with nature may be the most critical task for achieving future sustainability.

Published research on inclusion of nature in self has focused on the predictive value of scales designed to measure individuals’ level or feeling of inclusion. Inclusion of
self and nature has been measured using both implicit and explicit instruments of measurement. Schultz (2001, 2002; Bruni, Fraser, & Schultz, 2008) and Dutcher (2000, Dutcher et al., 2007) modified a previously existing scale, the Inclusion of Other in Self scale (Aron, Aron, & Smollan, 1992; Aron, Aron, Tudor, & Nelson, 1991) which has been used to measure how much overlap individuals saw between their selves and their significant others, to measure inclusion of nature in self. This modified scale asks individuals to choose from seven pairs of overlapping circles which one best describes their relationship with the natural environment.

Results from studies using this explicit Inclusion of Nature in Self (INS) scale have shown that connectedness positively correlates with biospheric concerns and environmental behaviors (Schultz, 2001, 2002). Schultz (2001) suggests INS is a strong predictor of individuals’ environmental concerns and engagement in environmentally friendly behavior. It has also been found that females express higher levels of connectedness than males (Schultz et al., 2004 & Schultz & Tabanico, 2007). Bruni, Fraser, & Schultz (2008) found no significant differences between participants INS scores prior to and upon conclusion of a zoo visit. Dutcher et al. (2007), using the INS as part of a larger instrument, also found significant positive correlations between connectivity, environmental concern, and environmental behaviors among Pennsylvania landowners.

Arguing that connectedness with nature may be an implicit or primitive belief; researchers have also designed implicit tests for the inclusion of nature in self (Bruni, Fraser, & Schultz, 2008; Schultz, et al. 2004; Schultz & Tabanico, 2007). Implicit Associations Tests (IAT) are based on the belief that measuring individuals reaction
times to categorizing words on a computer is an accurate means of tapping into unconscious beliefs and associations (for a review of IAT from those who created and proliferated the procedure see Greenwald, McGhee, & Schwartz, 1998; Greenwald et al., 2002; Greenwald, Nosek, and Banaji, 2003). These implicit association tests are administered on computers or hand held devices and request individuals to classify items into categories based on whether the individual feels the item is part of the natural environment or part of the built environment. Studies using IATs have shown individuals feel stronger connections to natural environments than built environments, that higher connectedness scores correlate with environmental attitudes, and that connectedness can change (increase) based on experiences in natural settings, e.g. parks and zoos (Bruni, Fraser, & Schultz, 2008; Schultz, et al. 2004; Schultz & Tabanico, 2007).

2.4 Communication: Frames and Framing Effects

In communication, frames are a way to organize the reality of an issue or event in a way that promotes a particular way of defining or interpreting the event (Chong & Druckman, 2007a; Gamson & Modigliani 1987 & 1989; Shah, Watts, Domke, & Fan, 2002; Tuchman, 1978). Frames can be thought of as storylines, which simplify an issue in order to make it pertinent to a specific audience (Ferree, Gamson, Gerhards, & Rucht, 2002; Price, Nir, & Capella, 2005; Scheufele, 1999). Frames consist of the words, images, metaphors, comparisons, and presentation styles that are used when communicating information regarding an issue (Chong & Druckman, 2007b; Gamson & Modigliani, 1987, 1989). Frames are based on a simplified version of the facts
surrounding a situation, which makes them different than putting a “false spin” on an issue (Nisbet, 2009).

The importance of effectively framing issues cannot be understated. Chong and Druckman (2007a) state frames “affect the attitudes and behaviors of their audiences.” (pg. 109). Likewise, the existence of frames in everyday communication cannot be denied, Nisbet (2009) states:

“Framing is an unavoidable reality of the communication process, especially as applied to public affairs and policy. There is no such thing as unframed information, and most successful communicators are adept at framing, whether using frames intentionally or intuitively” (pg. 15).

This is due in part to the need for information to be presented in a meaningful way. Large studies with copious data are necessarily boiled down to a few key points when discussed with the general public. Deciding what and how data are presented to the general public is necessarily a subjective process. Further, news media, politicians, and mission-based organizations often frame issues in ways that promote their interests. For example, Kellstedt (2003) identified that the media often framed race in either individualistic or egalitarian frames. From this work he created lists of terminology commonly used in each frame. Likewise, researchers (Shah et al., 2002) examined the frames used by newspaper reports of the Bill Clinton, Monica Lewinsky scandal, finding that the President’s approval ratings tended to coincide with how media outlets were framing the scandal. Political frames often surround issues when policy is being debated. Affirmative action (Fine, 1992; Richardson, 2005), support for war (Boettcher & Cobb, 2006; Ryan, 2004), abortion (Ferree, et al., 2002; Rohlinger, 2006) and gay marriage
(Price, Nir, & Cappella, 2005; Smith, 2007) are a few of the specific issues in which researchers have identified the frames used by politicians and the media.

Framing effects occur when an individual’s opinion on an issue is altered based on how that issue is presented or framed (Chong & Druckman, 2007a, 2007b; Rasinski, 1989; Sniderman & Theriault, 2004; Zaller, 1992). Chong and Druckman (2007a; 2007b) put forth a theory on how framing effects occur in individuals. According to the researchers three elements must be present for an individual to experience framing effects.

1. The issue or concept that is being framed needs to be stored in the memory of the individual. That is, it is available in the memory of the individual.

2. The issue or concept must be accessible and capable of being retrieved for consideration from the long-term memory of the individual.

3. Conscious evaluation, which occurs if the individual is sufficiently motivated and sees the applicability of the frame to the issue.

Researchers have closely examined a number of issues, demonstrating the framing effects that occur. Jacoby (2000) found that public perception of government spending varied strongly based on issue framing. Grant and Rudolph (2004) demonstrated that frames suggesting whose rights are at stake in the issue, influenced individuals’ feelings toward campaign finance. Fine (1992) found evidence suggesting public response to questions regarding the issue of affirmative action was influenced by how that issue was framed. Hiscox (2006) investigated the effects of framing on the issue of the international economy and global trading. His results suggested that the less knowledge an individual has regarding an issue, the greater the framing effect may be.
Framing effects have also been examined in connection with individuals’ behavior choices. Meyerowitz and Chaiken (1987) found that college aged women were influenced by the framing of messages regarding breast self examinations; negative framed messages which focused on the consequences of not performing breast self exams having a stronger positive effect on women’s attitudes and behavior than messages stressing the positive consequences of performing the breast self exam. In discussing similar findings, Rothman and Salovey (1997) suggest that when it comes to issues of health, individual behavior will also be influenced by whether the frame is “illness-detecting” or “health-affirming.” Block and Keller (1995) found that on the issues of sexually transmitted diseases and skin cancer, study participants who were more motivated to process information were also more influenced by negatively framed messages. More recently, researchers have been investigating the frames and framing effects of messages regarding the epidemic levels of obesity in the United States (Lawrence, 2004; Saguy & Riley, 2005); in the hopes of uncovering a way to effectively communicate the dangers of obesity to the general public.

2.5 Framing Environmental Communication

It has been suggested that framing environmental communication effectively will lead to changes in human behaviors that effect the environment (Davis, 1995; Saunders, 2003; Schultz & Zelezny, 2003). Effective framing is credited with being able to resolve deeply entrenched environmental issues and disputes, eventually bringing citizens to the table to participate in policy decisions (Lewicki, Gray, & Elliot, 2002). Schiller et al. (2001) argue that the process of policy development that involves the general citizenry
can only be effective if the technical jargon of scientists is replaced by messages that frame issues in a salient way to individual citizens.

Experts in environmental communication have suggested the need to clearly state the problem and possible outcomes when addressing environmental issues (Cantrill, 1993; Rowan, 1991; Vaughan & Seifert, 1992). Building on this base of research, others have examined how environmental communications can be structured to motivate individuals to adopt or change behaviors in ways that are friendly to the environment (Brunner, 1991, Davis, 1995; Ellen, Weiner & Cobb-Walgren, 1991). Utilizing the tenets of Prospect Theory (Kahneman & Tversky, 1979) scholars argue communication stressing loss due to inaction will be more persuasive than communication stressing gains due to actions (Lopes, 1987; Miller & Fagley, 1991; Tversky & Kahneman, 1981). Davis’ (1995) experiment with different frames of communication found that framing effects do occur influencing individuals’ intentions to participate in certain behaviors and that communication emphasizing the negative results of inaction were a stronger influence on intended future behavior when they were combined with the results of inaction affecting the current generation rather than future generations.

The media and the frames used surrounding debate over an environmental issue is a critical factor in how the public at large views the issue. Environmental communication researchers do not take this fact lightly. Nisbet (2009) suggests that the current gridlock over moving forward regarding climate change policy is due in part to the partisan framing efforts that a variety of media outlets have used. Durfee (2006) examined how framing air quality issues influenced individuals’ risk perception. Further, Gamson and Mogdigliani (1989) linked media coverage and framing of nuclear energy to the ebb and
flow of public support for nuclear energy; while others (e.g. Burgess, Harrison, & Filius, 1998) suggest that how media frames environmental issues can have an effect on all levels of policy setting and agenda making.

In environmental communication, a number of current issues have been examined to find the different frames used when communicating these issues, and how these frames influence individuals. Researchers have argued issues surrounding global warming were politicized by conservative political and media groups, effectively halting the U.S. involvement in international treaties, by purposely using doubt as a frame (McCright & Dunlop, 2000; 2003). Others have found that messages using affect and imagery have a measurable influence on American perceptions of climate change (Leiserowitz, 2006). Teel, Bright, Manfredo and Brooks (2006) examined using different frames regarding the environmental impact of drilling for oil in Alaska. Although the researchers were looking for “biased processing,” the results they found are applicable to framing as well. Data from this study suggest that individuals will process information regarding controversial environmental issues in a manner consistent with their prior views. This finding led to the recommendation by the authors that attitude change may require messages that go beyond a simple presentation of facts, i.e. messages framed in ways that make an issue salient, such as how issues may personally affect individuals.

Effective framing has also been suggested as a powerful tool for mediating environmental conflicts. Shmueli (2008) uses three environmental conflict case studies from Israel to demonstrate framing as a way to develop a common language that respects various perceptions of a situation and allows for disputants to engage in discussion. Similarly, Buijs (2009) reported on a study of river management and ecological
restoration in the Netherlands. Findings from this study suggested the local community near the restoration project used an *attachment frame*, an *attractive nature frame*, and a *rurality frame* when discussing the restoration project. Unfortunately, the promoter of the restoration focused on biodiversity and safety, frames that did not strike the local population as meaningful. Findings from this study again highlight how critical framing an issue to the specific needs of groups can be. Lewicki, Gray, and Elliot (2003) go a step further, arguing that frames and framing of environmental conflicts such as natural resource use, water use, toxic chemicals, and growth management are what cause and cure these conflicts. This work is part of the Environmental Framing Consortium (http://www.environmentalframing.org/index.shtml) a collaboration between researchers at seven universities that has existed since 1998 with the purpose of figuring out how stakeholders make sense of what is going on in environmental conflicts. These researchers suggest that through effective framing these conflicts can be remedied.

### 2.6 Theory of Planned Behavior

The Theory of Planned Behavior (TPB; Ajzen, 1991) is a theoretical model used to predict individuals’ behaviors. According to the TPB, behavioral intent, the intention to perform a specific behavior, immediately precedes performing the behavior. Intent is determined by the individuals’ attitude toward the behavior, subjective norms, and the perceived amount of control that the individual has over performing the behavior. Further, perceived amount of control over performing the behavior is also viewed as having a direct effect on the behavior; referred to as situation specific thoughts. If one
does not perceive their self to be in control of a situation they are less likely to engage in the behavior that would have been predicted by the TPB.

Figure 3. Theory of Planned Behavior (Azjen, 1991)

TPB has been used to explain and predict behavior in a number of different fields of study. Ajzen and Driver (1992) found TPB could satisfactorily predict leisure behavior of college students. Parker, Manstead, and Baxter (1992) found that TPB could explain intentions of drivers to commit various traffic violations, including drinking and speeding while driving. Krueger and Carsrud (1993) used TPB to demonstrate that the entrepreneurial ventures could be predicted using the variables attributed to TPB.
Similarly, George (2004) used TPB components to explain college students’ decisions to make online purchases or not.

Researchers have also used TPB to explain individuals’ likelihood to engage in a number of health related activities. In a 1996 review of 56 studies using TPB, Godin and Kok found that TPB explained about 34% of variance in future behaviors for the health related behaviors in the studies. In a study of hand washing by nurses in an emergency room, O’Boyle, Henry, and Larson (2001) found that while TPB predicted a 70% adherence to hand washing recommendations by these participants, actual observation of behavior revealed a drastically lower adherence. The authors suggest that the actual activity taking place in the emergency room played a major role in determining this behavior. In 2005, Armitage used TPB to show that perceived behavioral control was a significant predictor of intention and behavior when it came to participants completing a 12-week fitness plan.

TPB has been used to study a number of natural resources issues. A recent study (Kaiser, Hubner, & Bogner, 2005) found that measuring the components of the TPB could account for 95 percent of the pro-environmental behavior a sample of college students engaged in. Although this is higher than the 65 percent explanation VBN provided as reported in the same study, VBN is still useful in that it focuses specifically on environmental values and behaviors. Cheung, Chan, and Wong (1999) found TPB significantly predicted Hong Kong college students’ intention and subsequent self-report to participate in wastepaper recycling. Hrubes, Ajzen, and Daigle (2001) used TPB to predict hunting behavior, finding that intentions to hunt contributed strongly to the prediction of self-reported hunting behavior and that perceptions of behavioral control
did not predict hunting behavior. Similarly, Trumbo and O’Keefe (2001) found TPB to predict individuals’ intention to conserve water.

### 2.7 Informal Science Education Organizations - Outcomes

Zoos and aquariums have been charged with integrating conservation education as part of the visitor experience (AZA, 2009). To be accredited by the American Zoological Association (AZA) a zoo or aquarium must show that this is a priority. Many zoos include education explicitly in their mission statements (Patrick, Mathews, Ayers, & Tunnicliffe, 2007). Natural history museums have been tasked with providing resources for those researching biodiversity and environmental issues and educational opportunities on these topics for their visitors (Krishtalka and Humphrey, 2000; Winkler, 2004). Science centers while focusing broadly on scientific topics quite often have exhibits focusing on environmental issues (Hoffstein and Rosenfield, 1996).

There has been a fair amount of research on ISE visitors and learning in zoos. Zoos offer what is referred to as “free-choice learning” experiences (Falk & Dierking, 2002). It is suggested that in these free-choice learning environments what one learns is based on personal motivations and interests, rather than the requirement of an assigned task (Crane, 1994; Falk & Dierking 2000; 2002; Maarshalk, 1988; Storksdieck, Ellenbogen, & Heimlich, 2005).

With over 175 million visitors per year in the U.S. (AZA, 2007), zoos have the potential to play a major role in shaping the education of our society outside of the classroom. Researchers have begun looking closely at the learning and behavioral outcomes that can be traced to visiting a zoo or aquarium (Caro, Pelkey, & Grigione,
1994; de White & Jacobson, 1994; Falk, Reinhard, Vernon, Bronnenkant, Heimlich & Deans, 2007; Kruse & Card, 2004). Additionally researchers have found it necessary to examine the motivations that bring visitors to these institutions, as an influential factor in the learning outcomes visitation will have (Falk & Adelman, 2003; Falk, Heimlich, & Bronnenkant, 2008).

Many researchers have focused on learning and behavioral outcomes of visits to specific exhibits at specific institutions. Birney (1988) published the results of a formative evaluation on the “Flying Walk” exhibit at the Brookfield Zoo, demonstrating that the exhibit had high attractiveness and staying power, components assumed to be necessary for an exhibit to promote learning. Heinrich and Birney (1992) evaluated an animal demonstration program at the Brookfield Zoo finding that visitors retained the educational messages of the program in interviews conducted six weeks post visit. Schnackenberg (1997) reported on her study at the Phoenix Zoo where she interviewed visitors to determine the “effectiveness” of exhibits in their Arizona reptile area. Her results included some simple guidelines for effective signage and the finding that the most memorable sign reported by visitors was one that had been developed by local school children, explaining the difference between “poisonous” and “venomous” animals.

Doering (1992) investigated the impact of a Smithsonian Institution exhibit on the tropical rainforests on knowledge and awareness of rainforest conservation issues. Her results found that the exhibit increased awareness of rainforest conservation issues. Swanagan (2000) found that visitors to Zoo Atlanta’s elephant exhibit, who had more active experiences with the elephants such as watching a keeper demonstration, were more likely to support conservation efforts than visitors who had a more passive
experience. Similar studies have been conducted at other zoos and aquariums, finding that conservation themed exhibits do increase visitor knowledge of conservation issues (Bielick & Karns, 1998; Hayward, 1998; Gates & Ellis, 1999; Saunders & Stuart-Perry, 1997; Yerke & Burns, 1991). Although there is limited ability to generalize studies that are classified as “evaluations” of specific exhibits, they do demonstrate a critical finding in favor of zoos and their role in conservation education: visitors are able to recognize and retain key conservation messages presented in zoo exhibits.

Studies with more broadly applicable results found that visitors to a Swiss zoo who engaged in an exhibit containing a touch table retained more information about the topic than visitors who experienced the same exhibit without the touch table (Lindemann-Mathies & Kamer, 2005). These results were replicated in follow-up interviews with the visitors two months later. Weiler and Smith (2008) found the more interpretive devices such as movies, signage, and docents, zoo visitors came into contact with, the greater cognitive impact the visit had. Mony (2008) examined the role of docents in communicating key conservation messages to zoo visitors. Her findings suggested that visitors view docents as a credible source of conservation messages; however, the ability for these messages to be conveyed is hampered by the sometimes limited knowledge of these messages by the docents themselves. Similarly, Hodak (2008) found that aquarium visitors who were present at a sea otter exhibit during presentations given by live interpreters retained knowledge of sea otters over a longer period of time and displayed changes in behavior in follow up interviews, when compared to visitors who had visited the exhibit without the presence of an interpreter.
While most visitors tend to state that they visit zoos and aquariums because they are locations that provide fun experiences for families (Tofield, Coll, Vyle, & Bolstad, 2003), researchers have speculated that a key component to the family experience is the ability to learn in a free-choice setting (Packer & Ballantyne, 2004). Packer (2006) acknowledged this and put forth the term “learning for fun” to describe the phenomenon of individuals enjoying the process of learning in free-choice settings, yet failing to acknowledge that learning is what they seek. These findings point to the need for zoos and similar free choice learning institutions to understand the intricacies of their audience(s). Currently, as pointed out by Falk and Heimlich (2009), institutions often try to segment their visitors based on simple measurements of demographics such as education and income. The literature suggests a deeper understanding of the visitor is necessary (Meyer, 2010).

Falk et al. (2007) conducted a seminal study of the long-term effects of visiting a zoo. Findings from this study showed that zoo visitors attributed an increase in feeling like they are part of a solution to environmental issues, and that what visitors take away from a zoo visit is related to the motivations or identity that a visitor takes for the visit. Falk and colleagues have developed an effective typology of classifying visitors to free choice learning institutions such as zoos, science centers, and natural history museums based on what is termed as their identities (Falk, 2006; Falk, Heimlich, & Bronnenkant, 2008; Falk & Storksdiek, 2005). The five identity categories as described in Falk, Heimlich, & Bronnenkant (2008) are:
• Explorers are curiosity-driven with a generic interest in the content of the museum. They expect to find something that will grab their attention and fuel their learning.

• Facilitators are socially motivated. Their visit is focused primarily on enabling the experience and learning of others in their accompanying social group.

• Professional/Hobbyists feel a dose tie between the museum content and their professional or hobbyist passions. Their visits are typically motivated by a desire to satisfy a specific content-related objective.

• Experience Seekers perceive the museum as an important destination, so their satisfaction derives mainly from having "been there and done that.

• Rechargers are primarily seeking to have a contemplative, spiritual and/or restorative experience. They see the museum as a refuge from the work-a-day world.

Findings from the 2008 Falk et al. study suggest that Facilitators and Explorers are the two most common identities found among visitors to zoos and aquaria. The usefulness of segmenting visitors by identities is that in turn institutions can begin to understand how and why visitors experience the institution, enabling the institution to provide learning experiences that will maximize the effect of the visit for the different identities. Meyer (2010) found that zoo visitor motivations differed from those of conservatory visitors in that zoo visitors who expressed a dominant motivation were most likely to be explorers or facilitators, while conservatory visitors were most likely to be professional-hobbyists or rechargers. Findings of difference between visitors to ISE
providers suggest that it may not be wise to take a one-size fits all approach for
programming at these institutions.

Conclusion

This chapter has reviewed the literature around constructs that are critical to the
research conducted for this dissertation. Conservation psychology (Saunders, 2003) has
provided the theoretical and applied framework for our investigation focusing on
communication using the pre-existing values individuals’ hold. Framing communication
effectively can be a powerful tool for creating or changing attitudes and behaviors
(Chong & Druckman, 2007a); desired environmental education outcomes.

Environmental concern is a specific frame of communication that has been put forth as
potentially being of value to environmental educators and ISE settings that focus on
conservation education (Schultz & Zelezny, 2003). However, this has yet to be tested.

ISE settings are critical applied settings for conservation communication research
(National Research Council, 2010; 2009). We have reviewed the literature to date on the
type of learning that takes place in ISE settings, suggesting that most adults experience
science education through informal channels. Guides to communication in ISE settings
do exist, however they often do not contain empirical data supporting their use over the
use of any other framing guide. These bodies of literature suggest a critical gap in the
knowledge is testing the use of EC frames of communication in ISE settings. The
research reported on in this dissertation serves to address this gap.
Chapter 3: Methodology

3.1 Overall Study

This dissertation reports on a series of studies designed to explore the framing effects of environmental communication framed by environmental concern (EC). In Chapter 4 we examine zoo visitor preferences for messages framed by environmental concern, and the relationship between environmental concern, inclusion of nature in self, and zoo visitors’ preference of messages. Chapter 5 examines framing effects of messages framed by environmental concern by measuring individuals’ intention to participate in specific pro-environmental behaviors after they receive a message framed by one of the concerns. In the same chapter we report on findings from structured interviews to explore deeper our previous findings that biospheric messages motivate individuals to a greater extent than egoistic or social-altruistic framed messages. By examining these concepts, the studies contribute to understanding of preferred frames of communication (e.g. egoistic environmental concern frame), explore the notion of using environmental concerns as an effective way to frame communication, and contribute to the applied knowledge that environmental education (EE) practitioners have available to inform their practice. We conclude with how our findings contribute to theory and call for future studies on communication framed by environmental concern.
The primary purpose of these studies is to better understand how message framing can be utilized by conservation focused ISE providers to encourage individuals to adopt behaviors that are consistent with the conservation missions of ISE providers (Stern, 2000). The desired outcome of answering this question is to have an understanding of the psychological mechanism of framing messages and how to best utilize framing in conservation focused ISE contexts. In order to answer this overall question the following questions were explored:

1) How does framing written messages, using environmental concern, influence an individuals’ intention to participate in specific behaviors or change patterns of behavior, in relation to environmental conservation issues?

2) What elements must be present to frame an environmental issue appropriate to an individuals’ environmental concern value orientation?

3) Will individuals who receive frames that align with egoistic environmental concerns express a greater intention to engage in behavioral change?

4) What preferences do individuals have regarding written messages framed by environmental concern?

5) What is the relationship between individuals’ expressed environmental concern, overlap between nature and self, and preferences for statements framed by environmental concern?

Table 1 describes the components of each phase of each study. The following sections describe the population, sample, and location of each study, the questions guiding each study, the methods used to collect data, the instruments used to collect data, and an overview of the analysis performed for each study.
<table>
<thead>
<tr>
<th>Study</th>
<th>Phase</th>
<th>Sample Size</th>
<th>Method</th>
<th>Question’s explored (numbers from page 45)</th>
<th>Measurements</th>
</tr>
</thead>
</table>
| 1     | I     | N=298       | Survey | Question 4  
Question 5 | ECS (Schultz, 2001)  
INS (Schultz, 2002)  
Preference of statement |
|       | II    | N=400       | Survey | Question 4  
Question 5 | ECS (Schultz, 2001)  
INS (Schultz, 2002)  
Preference of statement  
Rating of statements |
| 2     | I     | N=252       | Quasi-experimental random assignment with control group | Question 1  
Question 3 | Involvement Scale  
Intention Scale  
Demographics |
|       | II    | N=180       | Quasi-experimental random assignment with control group | Question 1  
Question 3 | Involvement Scale  
Intention Scale  
Demographics  
Political views |
| III   |       | N=45        | Structured open ended interviews | Question 2 | Interview schedule |

Table 1. Questions, sample size, method, and instruments used by study
3.2 Study One: Phase I and Phase II

Study one phase I and phase II reported in Chapter 4 of this dissertation, report on the relationship between environmental concern, inclusion of nature in self, and preferences for written messages framed to align with specific concerns. Both phases of this study provide data to inform the questions:

- What preferences do individuals have regarding written messages framed by environmental concern?
- What is the relationship between an individuals’ expressed environmental concern, overlap between nature and self, and preferences for statements framed by environmental concern?

3.3 Study One: Phase I and Phase II Population and Sampling Procedures

The population of interest for study one was adult zoo visitors. The accessible population for study one was adult visitors to Large Zoo City One and Large Zoo City Two, during the time in which data were being collected. Data were collected in the field or a naturalistic setting (Campbell & Stanley, 1963; Voigt, 1999) onsite at each zoo. Adult visitors (18 years old and older) were of interest specifically because they have the decision making power regarding what information seeking they engage in, products they purchase, and what organizations they belong to or contribute to; behaviors that were investigated in this study and the others reported in this dissertation.

The reason for choosing zoos as a location to conduct the studies was primarily to replicate real situations in which individuals encounter conservation messages. Zoos are
tasked with creating effective conservation messages, through signage, exhibits, educational programming, and docent contact, designed to promote behavioral outcomes in visitors, that reduce the negative impact of human behavior on our planet (AZA, 2008; Patrick et al., 2007). The nature of the setting of zoos allowed for the research to be conducted on location, where it is reasonable to assume that visitors come into contact with information similar to the messages being tested. Conducting the study onsite has the potential to lend credibility to the results in the eyes of practitioners of EE in settings such as zoos, botanical gardens, nature centers, and parks. The zoos that participated in this study are accredited by the American Zoological Association (AZA).

Based on the desire to generalize to theory rather than statistical generalization to a population, the researcher did not employ traditional random sampling for recruiting participants. The method used to recruit participants is commonly referred to as focal sampling (Harris, 1995; Meyer, 2010; Mony, 2007). Focal sampling is an effective method to recruit participants in visitor studies settings such as zoos or museums, where numerous people are engaging in a public activity. Focal sampling consists of the researcher picking an area in which they will recruit participants and mentally drawing a line, whereby those who cross that line are engaged by the researcher and a request is made to participate in the research. Once the researcher has completed administering the questionnaire, the next visitor who crosses the line is approached, called sequential sampling or continuous sampling.

Sample sizes of 298 and 400 were recruited to participate in the two phases, making them large enough to allow statistical generalization.
3.4 Study One: Phase I and Phase II Method

Study one phase I and phase II were both designed as one-shot data collections, using self-administered questionnaires (Fink, 2006; Salant & Dillman, 1994). Phase I data collection took place August 2009 at Large Zoo City One. Participants were adult (age 18 and above) visitors to the zoo. Participants were asked to complete the Environmental Concern Scale (ECS; Schultz, 2001) and the Inclusion of Nature in Self scale (INS; Schultz, 2002). Participants were then asked to read a statement that had been created by the researcher regarding the Yellow Sandshell, an endangered mussel native to Ohio waterways (Appendix C). The Yellow Sandshell was thought to be relevant as the location of data collection was in the State of Ohio. Lastly, participants were asked to choose one of three statements they preferred most (Appendix D). These statements were created by the researcher and vetted by the experts listed in section 3.6 below. Each statement was hypothesized to align with one of the three concerns measured by the ECS. A total of 298 participants completed phase I of the study.

In November 2009 study one phase II was conducted at Large Zoo City Two. The purpose of study one phase II was to see if the results from study one phase I could be replicated at a different zoo and an added measurement asking participants to rate each statement allowed for addition correlation analysis. Participants were adult (age 18 and above) visitors to the zoo. A total of 400 participants were recruited to participate in phase II. Visitors were asked to complete the ECS, INS, and choose which statement they preferred out of three statements, each framed using a separate environmental concern. These statements were regarding generic environmental issues (Appendix E). For phase II, the species specific message concerning the Yellow Sandshell was replaced.
by messages designed to reflect the hazards of environmental degradation in general.

This was a decision made by the researcher after examining the results from the first phase of study one. The removal of the message regarding the Yellow Sandshell allowed the results of preferences between the two groups to be compared in relation to the presence or lack of presence of species specific information. Figure 4 shows the difference between phase I and phase II of study one.
Figure 4. Study one phase I and phase II design
3.5 Study One: Phase I and Phase II Instruments

Study one phase I and phase II used the following instruments to collect data:

1) **Environmental Concern Scale** (Schultz 2001; Schultz, Gouveia, Cameron, Tankha, Schmuck, & Franek, 2005; Snelgar, 2006). This 12 item, seven-point, rating scale asks individuals to rate their level of concern for items that fall under the three different identified concerns (See Appendix A). Schultz (2001) reports the reliability from two separate studies examining the constructs measured by the ECS. Study one which used a sample comprised of college students, found an alpha of 0.71 for the egoistic items, 0.64 for the altruistic items, and 0.86 for the biospheric items. Study two used a more diverse population, adults in California who participated in phone interviews, and found alphas of 0.88 for egoistic items, 0.90 for altruistic items, and 0.90 for biospheric items.

2) **Inclusion of Nature in Self** (Bruni, Fraser, & Schultz, 2008; Schultz, 2002). This scale has a series of seven pairs of circles with various distances between the circles. One circle represents the self, the other circle nature. The closer the circles are to overlapping, the closer the individual feels their relationship with nature is. (See Appendix B). Schultz (2002) states the instrument has been found to be “reliable across time, and to correlate positively with biospheric attitudes, scores on the New Environmental Paradigm, ecocentrism, and self-reported behavior” (pg. 72).

3) **Statements written to reflect the different types of concerns.** These statements were created by the researcher and edited by the experts for this dissertation, listed below in section 3.6. Each of the three statements was hypothesized to
align with one of the three concerns measured by the ECS. For study one phase I, the statements asked visitors to seek more information regarding the Yellow Sandshell, an endangered mussel found in Ohio waterways. (See Appendix D). The Yellow Sandshell was chosen because it is not a charismatic mega fauna, thus avoiding the emotional response that many have to that type of species. The Yellow Sandshell is also native to Ohio; this was intentional to make the problem of their decline more relevant to participants, many of whom it is assumed reside in Ohio, as the samples were taken from a zoo in Ohio.

Study one phase II did not utilize a species-specific statement. Instead participants were given a choice of three statements that were written generically about their desire to seek more information regarding how they could conserve natural resources (Appendix E). The statements used for study one phase I and phase II were vetted by some or all of the experts listed in the message creation section.

3.6 Study One: Phase I and Phase II Message Creation

In order to successfully carry out study one phase I and phase II, it was necessary to create messages framed to align with the different identified sets of environmental concerns. These messages were originally created by the researcher then reviewed and edited by a number of experts. These experts include the professors serving on the dissertation committee: Dr. Joe E. Heimlich, Dr. Jeremy Bruskotter, and Dr. Robyn Wilson. Also serving as an expert advisor and statement editor were Dr. P. Wesley Schultz of California State University San Marcos and Dr. Christopher Myers of Miami
University. The statements were then pilot tested on a sample (N=20) of visitors at an informal learning venue.

3.7 Study One: Phase I and Phase II Analysis

Analysis conducted on the data was done using SPSS v. 17 and included central tendencies, and correlations among ECS scores, INS scores and message preference. Data were also compared between institutions. A total of 698 participants (phase I N=298, phase II N=400) allowed for statistical comparison between groups by demographics and generalization to theory. Central tendencies were compared including independent samples t-test’s on mean scores for ECS and INS and chi squared for message preference based on demographics. Pearson product moment correlation and Spearman Rho were used as appropriate to analyze the relationships between ECS, INS, preferred statement, and statement ratings.

3.8 Study Two: Phase I

Study two phase I reported in Chapter 5 of this dissertation examined the effects of framing written communication using environmental concern and self reported intent that individuals express to engage in specific pro-environmental behaviors related to the topic of global climate change. The data collected for study two phase I were used to answer the specific research questions:

- How does framing messages using environmental concern influence an individuals’ intention to partake in specific behaviors, or change patterns of behavior, in relation to environmental conservation issues?
Will individuals who receive frames that align with egoistic environmental concerns express a greater intention to engage in behavioral change?

3.9 Study Two: Phase I Population and Sampling Procedure

The population of interest for this study was adult visitors to institutions that offer informal science education. The accessible population for this study was adult visitors (age 18 and older) to Large City Natural History Museum, during the time in which data were being collected. Data were collected in the field or a naturalistic setting (Campbell & Stanley, 1963; Voigt, 1999), onsite at a natural history museum. Adult visitors were of interest specifically because they have the final decision making power regarding what information seeking they engage in, products they purchase, and what organizations they belong to or contribute to; behaviors that were investigated in this study and the others reported in this dissertation.

Based on the desire to generalize to theory rather than statistical generalization to a population, the researcher did not employ traditional random sampling for recruiting participants. The method used to recruit participants is commonly referred to as focal sampling (Harris, 1995; Meyer, 2010; Mony, 2007). Focal sampling is an effective method to recruit participants in visitor studies settings such as zoos or museums, where numerous people are engaging in a public activity. Focal sampling consists of the researcher picking an area in which they will recruit participants and mentally drawing a line, whereby those who cross that line are engaged by the researcher and a request is made to participate in the research. Once the researcher has completed administering the
questionnaire the next visitor who crosses the line is approached, called sequential sampling or continuous sampling.

There were a total of 252 participants, 63 per treatment and the control group. Sample size was determined based on Cohen’s (1992) recommendations for a medium effect size with significance of .01 and power of .800 for running an ANOVA between four groups. All participants were adults, over the age of 18, who were visiting the natural history museum on the dates data were collected in December 2009. Figure 5 shows the research design for study two phase I and phase II.

3.10 Study Two: Phase I Method

The study was conducted using a quasi-experimental design or field experiment (Campbell & Stanley, 1963; Vogt, 1999) in that data were collected onsite at a natural history museum. However, participants were randomly assigned treatments upon agreeing to participate in the study. Rather than allowing the participants to choose which statement they preferred, participants were randomly given one of four statements. For study two phase I, the topic of the statements was global climate change (Appendix E). Each statement was created by the researcher and edited by the experts. Three of the statements (treatments) were designed to align with each of the specific environmental concerns and the control was written stating only facts surrounding the circumstances of global climate change. The statements were randomly assigned to visitors who agreed to participate.

Prior to reading the treatment message, participants were asked to complete a brief questionnaire containing five items designed to measure prior involvement in global
climate change issues (Appendix F). The items were developed by the researcher and reviewed by the experts listed in section 3.12. It has been shown that involvement, such as belonging to an environmental organization or giving money to environmental causes, plays a role in individuals’ processing of information regarding environmental issues (Teel, Bright, Manfredo, & Brooks, 2006). Basic demographic information was then requested (Appendix I).

Figure 5. Study two phase I and phase II design

3.11 Study Two: Phase I Instruments

Study two phase I utilized the following instruments to collect data from participants:

1) **Involvement Scale (Appendix G):** A five item scale created by the researcher and reviewed by the experts listed in section 3.12. The involvement scale was designed to measure the level of prior involvement participants self-report
regarding global climate change issues. The items used a seven point ranking scale that asked participants to rank how strongly they felt they are involved with each item. Prior involvement in issues has been found to contribute to biased processing and a greater knowledge of the issue (Chaiken and Trope, 1999; Eagly and Chaiken, 1993; Teel et al., 2006). The reliability for this scale was .742.

2) **Intent Scale (Appendix H):** A seven item scale created by the researcher and reviewed by the experts listed in section 3.12. The intent scale was designed to measure the self-reported intention of participants to engage in specific behaviors related to global climate change. The items used a seven point ranking scale that asked participants to rank how likely they were to engage in specific behaviors for each item. The behaviors used fit into the categories of activism, non-activist public sphere behaviors, and behaviors in organizations (Stern, 2000). The reliability for this scale was .896.

3) **Demographics (Appendix I):** Demographic information was collected from participants to allow for statistical examination of the results. Demographics were closed ended items that were created by the researcher and reviewed by the experts listed in section 3.12.

**3.12 Study Two: Phase I Scale and Message Creation**

In order to successfully carry out study two phase I it was necessary to create messages framed to align with the different identified sets of environmental concerns. These messages were originally created by the researcher and then edited by a number of
experts. These experts include the professors serving on the dissertation committee: Dr. Joe E. Heimlich, Dr. Jeremy Bruskotter, and Dr. Robyn Wilson. The statements were then pilot tested on a small sample (N=20) of visitors to an informal learning venue.

3.13 Study Two: Phase I Analysis

Analysis of the data was conducted using SPSS v. 17. and included Analysis of Covariance (ANCOVA) controlling for the level of prior involvement, based on involvement scale mean. The independent variable (which EC statement participants received) was compared with the dependent variable (summated mean of intention scale), correlation between prior involvement and intent to act, and crosstabs of the central tendencies based on which treatment participants received. Correlations between demographic information and prior involvement were run, as were correlations between demographic information and intention scale scores. When appropriate, post-hoc measurements (Bonferroni) were used to determine which treatment groups were truly statistically significant in their differences.

3.14 Study Two: Phase II

Study two phase II reported in Chapter 5 of this dissertation examined the effects of framing using environmental concern and self reported intent that individuals express to engage in specific pro-environmental behaviors related to the topic of water pollution. The data collected for study two phase II were used to answer the research questions:
• How does framing messages using environmental concern influence an individuals’ intention to partake in specific behaviors or change patterns of behavior, in relation to environmental conservation issues?
• Will individuals who receive frames that align with egoistic environmental concerns express a greater intention to engage in behavioral change?

3.15 Study Two: Phase II Population and Sampling Procedure

The population of interest for study two phase II was adult visitors to institutions that offer informal science education. The accessible population for this study was adult visitors (age 18 and older) to Large Zoo City Two during the time in which data were being collected. Data were collected in the field or a naturalistic setting (Campbell & Stanley, 1963; Voigt, 1999), onsite at a zoo. Adult visitors were of interest specifically because they have the decision making power regarding what information seeking they engage in, products they purchase, and what organizations they belong to or contribute to; behaviors that were investigated in this study and the others reported in this dissertation.

Based on the desire to generalize to theory rather than statistical generalization to a population, the researcher did not employ traditional random sampling for recruiting participants. The method used to recruit participants is commonly referred to as a focal sampling (Harris, 1995; Meyer, 2010; Mony, 2007). Focal sampling is an effective method to recruit participants in visitor studies settings such as zoos or museums, where numerous people are engaging in a public activity. Focal sampling consists of the researcher picking an area in which they will recruit participants and mentally drawing a
line, whereby those who cross that line are engaged by the researcher and a request is made to participate in the research. Once the researcher has completed administering the questionnaire the next visitor who crosses the line is approached, called sequential sampling or continuous sampling.

3.16 Study Two: Phase II Method

The study was conducted using a quasi-experimental design or field experiment (Campbell & Stanley, 1963; Vogt, 1999) in that data were collected onsite at Large City Zoo Two. Participants were randomly assigned treatments upon agreeing to participate in the study. Rather than allowing the participants to choose which statement they preferred, participants were randomly given one of four statements. For study two phase II the topic of the statements was water pollution (Appendix J). Each statement was created by the researcher and edited by the experts listed in section 3.18. Three of the statements (treatments) were designed to align with each of the specific environmental concerns and the control was written stating only the facts surrounding the circumstances of water pollution. The statements were randomly assigned to visitors who agreed to participate.

Prior to reading the treatment message, participants were asked to complete a brief questionnaire containing five items designed to measure prior involvement in water pollution issues (Appendix K). The items were developed by the researcher and reviewed by the experts listed in section 3.18. It has been shown that involvement, such as belonging to an environmental organization or giving money to environmental causes,
plays a role in individuals’ processing of information regarding environmental issues (Teel et al., 2006).

After receiving the treatment message, participants were asked to complete a five item scale regarding their intentions to engage in specific environmental behaviors (Appendix H). The intention scale was created by the researcher and reviewed by the experts. There were a total of 180 participants, 45 per treatment and the control group. Sample size was determined based on Cohen’s (1992) recommendations for a medium effect size with significance of .05 and power of .800 for running an ANOVA between four groups. All participants were adults, over the age of 18, who were visiting the zoo on the dates in April, 2010 the data were collected. Figure 5 shows the research design for study two phases I and II.

3.17 Study Two: Phase II Instruments

Study two phase II utilized the following instruments to collect data from participants:

1) **Involvement Scale (Appendix K):** A five item scale created by the researcher and reviewed by the experts listed in section 3.18. The scale was designed to measure the level of prior involvement participants self report regarding water pollution. The items used a seven point ranking scale which asked participants to rank how strongly they felt they are involved with each item. Prior involvement in issues has been found to contribute to biased processing and a greater knowledge of the issue (Teel, et al. 2006; Chaiken and Trope, 1999; Eagly and Chaiken, 1993). The reliability alpha for this scale was .515.
2) **Intent Scale (Appendix L):** A seven item scale created by the researcher and reviewed by the experts listed in section 3.18. The intent scale was designed to measure the self-reported intention of participants to engage in specific behaviors related to water pollution. The items used a seven point ranking scale that asked participants to rank how likely they were to engage in specific behaviors for each item. The behaviors used were taken from the categories of activism, non-activist public sphere behaviors, and behaviors in organizations (Stern, 2000). The reliability for this scale was .888.

3) **Demographics (Appendix M):** Demographic information was collected from participants to allow for statistical examination of the results. Demographics were closed ended items that were created by the researcher and reviewed by the experts listed in section 3.18.

4) **Political View Item:** Participants were also asked to rate on a seven point scale how conservative or liberal they consider their political views. A rating of one was extremely conservative and a seven was extremely liberal.

### 3.18 Study Two: Phase II Scale and Message Creation

In order to successfully carry out study two phase II it was necessary to create messages framed to align with the different identified sets of environmental concerns. These messages were originally created by the researcher and then edited by a committee of experts. These experts include the professors serving on the dissertation committee: Dr. Joe E. Heimlich, Dr. Jeremy Bruskotter, and Dr. Robin Wilson. The statements were pilot tested on a sample (N=20) of visitors to an informal learning venue.
3.19 Study Two: Phase II Analysis

Analysis of data collected from study two phase II was conducted using SPSS v. 17. and included ANCOVA controlling for the level of prior involvement participants had and ANCOVA controlling for the involvement scale mean and political viewpoint. The independent variable (which EC statement participants received) was compared with the dependent variable (summated mean of intent scale), correlation between prior involvement and intent to act, and crosstabs of the central tendencies based on which treatment participants received. Correlations between demographic information and prior involvement were examined as were correlations between demographic information and intention scale scores. Post-hoc measurements (Bonferroni) were used to determine which treatment groups were truly statistically significant in their differences.

3.20 Study Two: Phase III

Study two phase III reported in Chapter 5 of this dissertation sought to further explain and expand the results from study two phases I and II. Specifically, study two phase III was designed to provide data to inform the question:

- What elements must be present to frame an environmental issue appropriate to an individuals’ environmental concern value orientation?

3.21 Study Two: Phase III Population and Sampling Procedure

The population of interest for study two phase III was adult visitors to institutions that offer informal science education. The accessible population for this study was adult visitors (age 18 and older) to Large City Science Museum during the time in which data
were being collected in May 2010. Data were collected in the field or a naturalistic setting (Campbell & Stanley, 1963; Voigt, 1999), onsite at a science center. Adult visitors were of interest specifically because they have decision making power regarding the information seeking they engage in, products they purchase, and organizations they belong or contribute to; behaviors that were investigated in this study and the others reported in this dissertation. A sample size of 45 participants was utilized for this phase of the study.

Based on the desire to generalize to theory rather than statistical generalization to a population the researcher did not employ traditional random sampling for recruiting participants. The method used to recruit participants is commonly referred to as a focal sampling (Harris, 1995; Meyer, 2010; Mony, 2007). Focal sampling is an effective method to recruit participants in visitor studies settings such as zoos or museums, where numerous people are engaging in a public activity. Focal sampling utilizes a continual ask which consists of the researcher picking an area in which they will recruit participants and drawing an imaginary line, whereby those who cross that line are engaged by the researcher and a request is made to participate. Once the researcher has completed administering the questionnaire the next visitor who crosses the line is approached, Once the researcher has completed administering the questionnaire the next visitor who crosses the line is approached, called sequential sampling or continuous sampling.

3.22 Study Two: Phase III Method

The study was conducted using a structured open ended interview (Patton, 1990). The study was naturalistic in that data were collected onsite at a science center (Campbell
& Stanley, 1963). Open-ended interviews are a recommended method for data collection when the goal is to explore deeper the reasons underlying a phenomena (Marshall & Rossman, 1999). The interviews were conducted onsite at Large City Science Museum and lasted approximately five minutes per interview.

3.23 Study Two: Phase III Instruments

Study two phase III utilized the following instruments to collect data from participants:

1) Structured open ended interview schedule (Appendix O): The interview schedule was created by the author and Joe E. Heimlich.

2) Messages framed by environmental Concern (Appendix N): These messages were created by the researcher and edited by the experts listed in section 3.24.

3.24 Study Two Phase III Message Creation

In order to successfully carry out study two phase III it was necessary to create messages framed to align with the different identified categories of environmental concerns. These messages were originally created by the researcher and then edited by a number of experts. These experts include the professors serving on the dissertation committee: Dr. Joe E. Heimlich, Dr. Jeremy Bruskotter, and Dr. Robyn Wilson. The statements were then pilot tested on a sample (N=20) of visitors to an informal learning venue.
3.25 Study Two Phase III Analysis

Data were recorded by hand as participants spoke, with any clarifications being requested at the time of the interview. Data were entered into a Microsoft Word 2007 document by the researcher, sorted by question. Data were then sorted by question into themes that were developed as the researcher read and re-read the data. Themes were defined as concepts that were mentioned by five or more participants out of a sample of 45.
Chapter 4: Zoo Visitor Environmental Concern, Inclusion of Nature in Self, and Preferences for Statements Framed by Environmental Concern.

Abstract

Zoos exist in part to promote conservation education and behaviors that are considered to have less of an impact on the environment. Effective communication with visitors is critical to achieve this outcome. Researchers examined the relationship between individuals’ environmental concern, feelings of inclusion with nature, and preferences for statements that are framed by environmental concern (Schultz, 2001). Findings from the study suggest that zoo visitors have high levels of biospheric concern and in general prefer statements framed by biospheric concern. When given multiple statements, each framed by a separate environmental concern, we found a correlation between the visitors rating of each statement and their level of the type of concern the statement aligned with. Implications of these findings include the need to consider context when framing messages and that biospheric framed messages are preferred when there is only one choice of frame. However, using multiple messages framed by a variety of concerns may prove the most effective way of communicating to zoo visitors.
Introduction

Zoos continuously strive to effectively communicate the nuance of critical environmental issues to their visitors. Typically communication at zoos occurs through one-way interaction with signage or brief encounters with docent volunteers (Mony, 2007; Screven, 1992). There is little doubt that framing communication matters when it comes to shaping individuals’ attitudes and behaviors (Chong & Druckman 2007; Nisbet 2009). This is particularly true when it comes to shaping individuals’ attitudes and behaviors towards issues facing our environment (Davis, 1995; Moser, 2009; Oskamp, 2003; Schultz & Zelezny, 2003). In laying out the future of the budding field of conservation psychology, Saunders (2003) suggests that a critical area of applied research will focus on “ways to reframe debates and strategically communicate to the existing values that people have” (pg 144). The human induced or intensified environmental problems that our world faces and the political polarization of environmental issues serve as evidence to the current ineffectiveness of environmental communication.

There have been a number of published papers, manuals, and audience segmentation studies that suggest guidelines for communicating with individuals within these audience-based typologies, particularly around the topic of global climate change (Biodiversity Project 2004; Earth Justice, 2008; Globalchange.gov, 2009; Maibach, Roser-Renouf, & Leserowitz; Pike, Dopplet, Herr 2010). However, there is a dearth of research related to the application of these communication strategies to individuals. Moving beyond creating audience segments to the implementation of the strategies suggested by the research will prove useful for theory related to the framing effects of communication. Applied research can also inform the application of environmental
communication by organizations such as zoos and aquariums, whose purpose in part is to provide environmental education to a variety of individuals (Patrick, Mathews, Ayers, Tunnicliffe, 2007).

Environmental concern (EC) (Stern, Dietz & Kalof, 1993; Stern & Dietz, 1994; Schultz 2000, 2001) provides a framework to begin testing the effectiveness of messages designed to align with individuals pre-existing values. Schultz and Zelezny (2003) posit that reframing environmental messages using environmental concern could lead to a more motivated citizenship, in favor of alleviating environmental troubles. Zoos provide an excellent testing ground for these messages due to their importance as informal science education (ISE) providers (Falk, Heimlich, & Foutz, Chapter 1, 2009; National Research Council, 2009). As an ISE provider zoos have an environmental and educational focus to their messaging, which promotes conservation behaviors (Association of Zoos and Aquariums, 2010). There is potential for visitors to encounter many messages during a routine visit. The study reported on in this current manuscript investigated the relationship between individuals’ environmental concern, feelings of connectedness with nature, and preferences for statements framed by environmental concerns in the setting of two zoos.

**Literature Review**

*Environmental Concern*

Takacs-Santa (2007) suggests the definition of EC in the literature has been inconsistent. Therefore, it must be made explicit how EC is being defined for this paper. EC has been defined as “individuals’ relatively enduring beliefs and feelings about
ecology such that predispositions to engage in pro- or anti-environmental actions could be anticipated” (Weigel & Weigel, 1978, pg. 4). Maloney and Ward (1973) measured EC as an individuals’ emotionality related to ecological issues. Lounsbury and Tornatzky (1977) do not attempt to define EC; however their scale reflects “concerns” about very specific issues such as overpopulation and recycling. More recently scholars have suggested EC is a value-based orientation of concern individuals’ have for the future of our environment and preventing catastrophic environmental degradation (Stern, Dietz, & Kalof, 1993; Stern & Dietz, 1994; Schultz, 2000 & 2001).

Stern’s (2000) VBN theory categorizes EC as subconscious values, which lead to environmental behaviors; EC is relatively enduring, extending from an awareness of the consequences environmental issues have to a valued object. Our definition of EC for this paper is in line with Stern’s definition. That is EC is subconscious until activated by potential threats to valued objects, and can result in an individual engaging in behaviors thought to mitigate the threat to the valued object. EC is not attached to specific environmental issues, as the awareness that an issue would have an impact on the valued object would result in an individual attempting to mitigate the situation regardless of the issue. Further, for this study, we utilize the tripariate categories of EC as measured my Schultz’ (2001) Environmental Concern Scale (ECS): egoistic (concern for self), social-altruistic (concern for other humans), and biospheric (concern for all living beings).

Research using the ECS has focused on the correlations of ECS scores to Schwartz’ (1994) dimensions of values, other scales such as the NEP, and the predictive value of the ECS for environmental behaviors. Using items from Schwartz’ values scale (1992, 1994) researchers have found egoistic concerns on the ECS are positively
correlated with self-enhancement and negatively correlated with self-transcendence values (Schultz, 2001; Schultz & Zelezny, 1999; Stern et al., 1999). While social-altruistic and biospheric ECS scores correlate negatively with self-enhancement and positively with self-transcendence (Stern et al., 1995; Shultz, 2001). In the previous studies and other studies (Schultz, Gouveia, Cameron, Tankha, Schmuck, & Franek, 2005; Schultz, Shriver, Tabanico & Khazian, 2004) results have been found using international samples, suggesting the three factor structure of EC exists throughout various cultures and populations.

Using a sample of American college students, Schultz (2000) found that individuals’ level of biospheric concern could be significantly increased, by having the individual assume the perspective of an animal being harmed in nature. Sevillano, Aragones, and Schultz (2007) replicated these findings, using the same manipulations they revealed that Spanish college students shown animals in distress displayed higher biospheric levels of concern and lower egoistic levels of concern than students shown pictures of animals in their natural settings. The importance of these findings is reflected in studies on perspective taking by others (e.g. Baston, Early, & Salvarani, 1997; Berenguer, 2007) which suggest perspective taking that increases empathy will lead to helping behaviors. In an edited compilation focused on free choice learning and the environment (Meyers, Saunders, and Bexell, 2009) the theoretical implications of empathy created from perspective taking are explored. These authors suggest that empathy is a building block towards eventually caring for the environment and engaging in conservation behaviors, noting that a needed line of future research lies in exploring frameworks (in settings such as zoos) to best convey perspective taking of animals.
Schultz and Zelezny (2003) called for a “reframing” of environmental messages, putting forth two critical ideas. First, these authors claim that creating messages designed to access individuals’ environmental concerns will be effective over time in creating pro-environmental behaviors. Second, the authors suggest that in the United States statements framed using egoistical concerns (benefits to self) should resonate more than either of the other EC frames. Schultz and Zelezny base this assertion on a review of research suggesting Americans value individualism and are motivated by materialistic gains in status (Kohls, 1984). That Americans would be a more selfish or survivalist population would be refuted by the work of Inglhart (2008; Inglehart and Baker, 2000), which suggests Americans, as members of an advanced society, would be highly post-materialistic and therefore much more likely to value tolerance and inter-personal trust.

_Inclusion of Nature in Self_

Inclusion with nature has been defined as “the degree to which an individual believes that s/he is a part of the natural environment, cares for the environment, and is committed to protecting the environment” (Schultz, 2002, pg. 74). Inclusion of nature in self, sometimes referred to as connectedness, is a relatively recent construct researchers have been investigating (Mayer & Frantz 2004; Schultz, Shriver, Tabanico, & Khazian 2004). Environmental connectedness is correlated but separate from environmental concern (Schultz, 2000; 2002; Nisbet, Zelenski, & Murphy, 2009). The basic principles guiding this construct state that the more connected or included one feels with nature the more they will care for and protect nature. Whereas, an individual with little
connectedness to nature cares much more about one’s self and is more committed to protecting the self (Schultz, 2002).

Schultz (2001, 2002, Bruni, Fraser, & Schultz, 2008) and Dutcher (2000; Dutcher et al., 2007) modified a previously existing scale, the Inclusion of Other in Self scale (Aron, Aron, & Smollan, 1992; Aron, Aron, Tudor, & Nelson, 1991) which was used to measure how much overlap individuals saw between themselves and their significant others. Studies using the explicit Inclusion of Nature in Self scale (INS) have found that connectedness positively correlates with biospheric concerns and environmental behaviors (Schultz, 2001, 2002). Schultz (2001) suggests the INS is a strong predictor of individuals’ environmental concerns and engagement in environmentally friendly behavior. It has also been found that females express higher levels of connectedness than males (Schultz et al., 2004; Schultz & Tabanico, 2007). Bruni, Fraser, and Schultz (2008) found no significant differences between participants INS scores prior to and upon conclusion of a zoo visit. Dutcher et al. (2007), using the INS as part of a larger instrument, found significant positive correlations between connectivity and environmental concern and environmental behaviors among Pennsylvania land owners.

_Framing Communication_

How an issue is presented or “framed” matters (Chong & Druckman, 2007a; Nisbett 2009). Generally speaking, many people form opinions about a number of science and technology issues without being fully informed by the knowledge and facts behind the issue, choosing instead to rely on values, trust, and frames (Druckman & Bolson, 2009, Nisbet and Goidel, 2007; Nisbet and Moony, 2007; Scheufele, 2006).
Thus, people form lasting attitudes about these issues based on the limited information they do encounter regarding the issue. How this information is framed can shape these long-term attitudes. As organizations with desired visitor outcomes, including conservation behaviors, zoos must strategically position their communication using the most effective frames possible.

Experts in environmental communication have suggested the need to clearly state the problem and possible outcomes when addressing environmental issues (Cantrill, 1993; Rowan, 1991; Vaughan & Seifert, 1992). Building on this base of research, others have examined how environmental communications can be structured to motivate individuals to adopt or change behaviors in ways that are friendly to the environment (Brunner, 1991; Davis, 1995; Ellen, Weiner & Cobb-Walgren, 1991). Utilizing the tenets of Prospect Theory, (Kahneman & Tversky, 1979) scholars argue that communication which stresses loss due to inaction will be more persuasive than communication focusing on gains due to actions (Lopes, 1987; Miller & Fagley, 1991; Tversky & Kahneman, 1981). Davis’ (1995) experiment with different frames of communication found that framing effects do influence individuals’ intentions to participate in certain behaviors and that communication emphasizing the negative results of inaction were a stronger influence on intended future behavior when they were combined with the results of inaction affecting the current generation rather than future generations.

In the following study, visitor preference for messages was measured. Measuring preferences was based on a review of literature on why individuals visit zoos and other institutions that offer Informal Science Education (ISE) experiences (Falk, Mousourri, & Coulson, 1998; Gilbert & Stocklmayer, 2001; Schauble, Beane, Coates, Martin, &
Stirling, 1996; Yocco, Heimlich, Myers, & Jenike, 2010). All of the literature to date suggests that having an enjoyable time in the presence of family or friends is the top priority for zoo visitors. There is no evidence to suggest that individuals visit zoos looking to experience any type of cognitive distress or to question their pre-existing views on issues.

From our review of the literature we have found EC to be a powerful mental construct influencing individuals’ environmental behaviors (Schultz, 2000; 2001; Stern, Dietz, & Kalof, 1993; Stern & Dietz, 1994). Further it has been theorized that messages framed by EC, specifically egoistic EC, will be effective at promoting individuals to engage in environmentally friendly behaviors or reduce behaviors detrimental to the environment (Schultz & Zelezny, 2003). We have also found that INS is related to EC and is suggested to be a factor in influencing individuals’ environmental behaviors (Schultz, 2002). What has not been investigated to date is the relationship between individuals’ EC and statements framed by EC, or the relationship between individuals’ INS and statements framed by EC. The study reported below addresses this gap by investigating these relationships using two samples of zoo visitors. Further, we examine the assertion (Schultz & Zelezny, 2003) that Americans in general would find statements framed by egoistic concerns to resonate more so than statements framed by other types of EC.
Method

Questions

Two primary questions guided the research reported herein:

1) What preferences do individuals have regarding messages framed by environmental concern?

2) What are the relationships between individuals’ expressed environmental concern, overlap between nature and self, and preferences for statements framed by environmental concern?

To answer the questions listed above a study was conducted using two samples of visitors to two large zoos located in Ohio, United States.

Sample One Data Collection: Protocol and Instruments

Data were collected onsite at Large Zoo City One, in August 2009, throughout the day, and at multiple locations throughout the zoo. Participants were recruited onsite using a focal sampling method to recruit participants, researchers chose a specific place in the zoo and when visitors entered this area they were asked to participate in the study (Harris 1995; Meyer; 2010; Mony 2008; Yocco 2009). Visitors were approached and asked by the researchers if they would be willing to spend five minutes providing researchers with information regarding their concern for the environment.

Visitors who agreed to participate were given a questionnaire packet that contained the INS (Schultz 2002), ECS (Schultz 2001), a statement describing the situation of the Yellow Sandshell, a native Ohio mussel listed as endangered by the Ohio Department of Natural Resources (2010), and a sheet with three statements framed by
separate environmental concerns (Appendix D). Statement one was hypothesized to align with egoistic concern, statement two was hypothesized to align with social-altruistic concern, and statement three was hypothesized to align with biospheric concern.

Visitors were asked to respond to each item, read the statement regarding the Yellow Sandshell, and then read and choose the EC framed statement that they preferred the most. The statement on the Yellow Sandshell and the statements framed by environmental concerns were created by the authors of this article, using information from the Ohio Department of Natural Resources website (2010). The statements were pilot tested on a sample (N=20) of visitors to an informal learning venue, prior to being used in the study. The Yellow Sandshell was chosen because it is native to Ohio waterways and considered locally endangered. Using an invertebrate avoids the potential emotional response that is associated with humans viewing charismatic mega fauna (Feldhammer, Whittaker, Monty, & Weickert 2002), reducing the likelihood of a biospheric response bias.

Six versions of the ECS were used to address order bias. The questionnaire packet was self administered, with no identifiable information collected, reducing the likelihood of participants giving a socially desirable response (Nederhof, 1985; Salant and Dillman, 1994). Participants score on the INS was determined by converting the set of circles selected into a corresponding number from one to seven (Bruni, Fraser, and Schultz 2008). The pair of circles that did not touch was scored a one; the pair of circles, which completely overlapped, was scored a seven. Visitor sex and the type of group with which they were visiting were the demographic information recorded. Three hundred seventy two visitors were asked to participate, 311 (84%) agreed to participate, with 298
returning usable questionnaires. The reasons given for not participating were lack of time and having young children in the group who would not wait for the questionnaire to be completed. There were no distinguishable differences in how people responded to the different versions of the ECS.

**Sample Two Data Collection: Protocol and Instruments**

Data were collected on site at a Large Zoo City Two, November 2009, throughout the days of the week. Participants were recruited on site, using a sampling strategy consistent with sample one.

When visitors agreed to participate, they were given a questionnaire packet that contained the INS (Schultz 2002), the ECS (Schultz 2001), and three general statements regarding environmental issues each shaped by an environmental concern (Appendix E). The statements framed by environmental concern were created by the authors of this article and pilot tested on a sample (N=20) of visitors to an informal learning venue, prior to being used in the study. Participants were asked to rate how strongly they agreed with each statement on a seven point rating scale and to choose the statement they agreed with the strongest. Participants were also asked if they were zoo members, if they donated time or money to a conservation organization in the past 12 months, and how many times they have visited a zoo in the past 12 months. Four hundred eighty visitors were approached, 415 (86.5) agreed to participate, with 400 usable questionnaires collected. The reasons given for not participating were lack of time and having young children in the group who would not wait for the questionnaire to be completed.
Results

Data were entered into SPSS v. 17.0 to facilitate statistical analysis. Central tendencies for each scale were run as were correlations between ECS, INS, and preferred statement.

Participants Sample One

Of the 298 usable questionnaires, 142 (47.7%) participants were male, while 156 (52.3%) were female. Fifteen (5%) participants were observed as individuals visiting the Zoo, 69 (23.2%) participants were in adults only groups, 214 (71.8%) participants were observed to be in inter-generational groups. All participants confirmed that they were 18 years of age or older.

Participants Sample Two

Of the 400 usable questionnaires, 159 (40%) were zoo members, 117 (29%) were visiting a zoo for the first time in the past 12 months, 166 (42%) were visiting a zoo for the second or third time in the past year, while 117 (29%) were visiting a zoo for the fourth time or more in the past year. For charitable behavior, 168 (42%) reported donating money to a conservation organization in the past 12 months, 50 (13%) reported volunteering time to a conservation organization in the past 12 months, while 42 (11%) reported both donating money and volunteering time. All participants confirmed that they were 18 years of age or older.
Results for question 1: What preferences do individuals have regarding messages framed by environmental concern?

Sample One:

Eleven (3.7%) participants chose the egoistic statement, 69 (23.2%) participants chose the social-altruistic statement, while 211 (70.8%) participants chose the third-biospheric statement. Table 2 shows the preferences for each statement by percent overall, by sex, and visitor group type. Participant’s preferred statement did not differ significantly by sex ($x^2(2, N=291) = 0.10, p = .952$). Participant’s preferred statement did not differ significantly by group type ($x^2(4, N=291) = 3.26, p = .515$).

<table>
<thead>
<tr>
<th></th>
<th>Total</th>
<th>Male</th>
<th>Female</th>
<th>Adult only</th>
<th>Multiple adults</th>
<th>Inter-generational group</th>
</tr>
</thead>
<tbody>
<tr>
<td>N=</td>
<td>298</td>
<td>142</td>
<td>156</td>
<td>15</td>
<td>69</td>
<td>214</td>
</tr>
<tr>
<td>Egoistic Statement</td>
<td>3.7</td>
<td>3.6</td>
<td>3.9</td>
<td>0.0</td>
<td>6.1</td>
<td>3.3</td>
</tr>
<tr>
<td>Altruistic Statement</td>
<td>23.2</td>
<td>24.5</td>
<td>23.0</td>
<td>14.3</td>
<td>21.2</td>
<td>25.1</td>
</tr>
<tr>
<td>Biospheric Statement</td>
<td>70.8</td>
<td>71.9</td>
<td>73.0</td>
<td>85.7</td>
<td>72.7</td>
<td>71.6</td>
</tr>
</tbody>
</table>

Table 2. Participant preferred statement by percent total, by sex, by visitor group type

Sample Two:

Forty five (11.3%) participants chose the egoistic statement, 99 (24.8%) participants chose the social-altruistic statement, while 256 (64.0%) participants chose the third-biospheric statement.

Table 5 shows the preferences for each statement by percent overall, by those who volunteered time, those who donated money, those who both volunteered time and money, those who have done neither, zoo membership status, and number of times visited a zoo in the past 12 months. Participants’ preferred statement differed significantly by
volunteer time status ($x^2(2, N= 400) = 6.80, p = .033$). Participants’ preferred statement differed significantly by donate money status ($x^2(4, N= 400) = 10.67, p = .005$). Participants’ preferred statement differed significantly between those who donated both time and money and those who did neither ($x^2(2, N= 266) = 6.82, p = .033$). Participants’ preferred statement did not differ significantly by zoo membership status. Participants’ preferred statement differed significantly by number of visits in the past 12 months, ($x^2(4, N= 400) = 12.91, p = .012$). Zoo members’ preferred statement differed significantly between members who had donated time or money or those who had not ($x^2(2, N= 159) = 8.81, p = .012$).
<table>
<thead>
<tr>
<th></th>
<th>Total</th>
<th>Volunteer Time</th>
<th>Did not volunteer time</th>
<th>Donate Money</th>
<th>Did not donate money</th>
<th>Both</th>
<th>Neither</th>
<th>Zoo Member</th>
<th>Zoo Non-member</th>
<th>Zoo member did not volunteer time or money</th>
<th>Zoo member did not volunteer time or money</th>
<th>Visited zoo once past 12 months</th>
<th>Visited zoo 2-3 times past 12 months</th>
<th>Visited zoo 4 or more times past 12 months</th>
</tr>
</thead>
<tbody>
<tr>
<td>N=</td>
<td>400</td>
<td>50</td>
<td>350</td>
<td>168</td>
<td>232</td>
<td>42</td>
<td>224</td>
<td>159</td>
<td>241</td>
<td>83</td>
<td>76</td>
<td>117</td>
<td>166</td>
<td>117</td>
</tr>
<tr>
<td>Egoistic Statement</td>
<td>11.3</td>
<td>12.0</td>
<td>11.1</td>
<td>8.3</td>
<td>13.4</td>
<td>11.9</td>
<td>13.4</td>
<td>10.1</td>
<td>12.0</td>
<td>6.0</td>
<td>14.5</td>
<td>10.3</td>
<td>14.5</td>
<td>7.7</td>
</tr>
<tr>
<td>Altruistic Statement</td>
<td>24.8</td>
<td>10.0</td>
<td>26.9</td>
<td>18.5</td>
<td>29.3</td>
<td>11.9</td>
<td>30.4</td>
<td>20.8</td>
<td>27.4</td>
<td>14.5</td>
<td>27.6</td>
<td>25.6</td>
<td>30.1</td>
<td>23.9</td>
</tr>
<tr>
<td>Biospheric Statement</td>
<td>64.0</td>
<td>78.0</td>
<td>62.0</td>
<td>73.2</td>
<td>57.3</td>
<td>76.2</td>
<td>56.3</td>
<td>69.2</td>
<td>60.6</td>
<td>79.5</td>
<td>57.9</td>
<td>64.1</td>
<td>55.4</td>
<td>76.1</td>
</tr>
</tbody>
</table>

Table 3. Preferred statement, total and by demographics (in percent)
Participants rated on a seven point rating scale how strongly they agreed with each statement. Table 6 shows the mean and standard deviation for each statement total and by the demographic characteristics measured. Volunteering time had significant differences between groups on the egoistic statement ($t(398) = -2.82, p = .005$); on the social-altruistic statement, ($t(398) = -3.53, p = .000$); and on the biospheric statement, ($t(398) = -5.69, p < .001$). Those who volunteered time had significantly higher means than those who did not for each statement. Donating money had a significant differences between groups on the egoistic statement, ($t(398) = -2.98, p = .003$); on the social-altruistic statement, ($t(398) = -2.88, p = .004$); and on the biospheric statement, ($t(398) = -5.63, p < .001$). Those who donated money had significantly higher means than those who had not for each statement. Doing both volunteering time and donating money had significant differences between groups on the egoistic statement ($t(264) = -3.27, p < .001$); on the social-altruistic statement, ($t(264) = -3.87, p < .001$); and on the biospheric statement, ($t(398) = -5.49, p < .001$). Those who both volunteered time and donated money had significantly higher means than those who did neither for each statement.

Number of visits to a zoo in the past 12 months did not have significant differences between groups on the egoistic or altruistic statement. Those who had visited a zoo four or more times in the past 12 months did have higher means than those who had visited less than four times in the past 12 months on the egoistic and social-altruistic statements. Number of visits to a zoo in the past 12 months had a significant differences between groups on the biospheric statement ($F(2, 397) = 8.93, p < .001$). Those who had visited a zoo four or more times in the past 12 months had significantly higher means...
than those who had visited less than four times in the past 12 months for the biospheric statement.

Zoo member status did not have significant differences between groups for the egoistic or social-altruistic statement. Zoo members had a higher mean than non-members on the egoistic and social-altruistic statement. Zoo member status did have a significant difference between groups for the biospheric statement, \((t(398) = -2.01, p=.045)\). Zoo members had a significantly higher mean than non-members for the biospheric statement. Within those who were zoo members charitable behavior had significant differences between groups for the social-altruistic statement, \((t(157) = -2.24, p=.027)\) and for the biospheric statement \((t(157) = -4.06, p<.001)\). Zoo members who donated time or money had a higher mean than those who had not on the egoistic statement. Zoo members who donated time or money had significantly higher means than those who had not on the social-altruistic and biospheric statements.

<table>
<thead>
<tr>
<th></th>
<th>Egoistic Statement</th>
<th>Egoistic Statement SD</th>
<th>Social-Altruistic Statement</th>
<th>Social-Altruistic Statement SD</th>
<th>Biospheric Statement</th>
<th>Biospheric Statement SD</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Total</strong> (N=400)</td>
<td>5.37</td>
<td>1.31</td>
<td>5.70</td>
<td>1.23</td>
<td>5.95</td>
<td>1.18</td>
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<tr>
<td>Volunteer Time</td>
<td>5.88</td>
<td>1.19</td>
<td>6.16</td>
<td>1.09</td>
<td>6.62</td>
<td>0.85</td>
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<tr>
<td>(N=50)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Did not volunteer time (N=350)</td>
<td>5.29</td>
<td>1.31</td>
<td>5.63</td>
<td>1.24</td>
<td>5.85</td>
<td>1.19</td>
</tr>
<tr>
<td>Donate money (N=168)</td>
<td>5.58</td>
<td>1.32</td>
<td>5.95</td>
<td>1.16</td>
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<td>1.25</td>
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<td>1.20</td>
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<td>Both (N=42)</td>
<td>5.88</td>
<td>1.17</td>
<td>6.29</td>
<td>0.89</td>
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<td>1.28</td>
<td>5.51</td>
<td>1.23</td>
<td>5.65</td>
<td>1.19</td>
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</table>
Table 4: Sample One: Mean and SD on Overall ECS and ECS Subscales. Total and by demographics.

<table>
<thead>
<tr>
<th>Demographic</th>
<th>Mean</th>
<th>SD</th>
<th>Mean</th>
<th>SD</th>
<th>Mean</th>
<th>SD</th>
<th>Mean</th>
<th>SD</th>
</tr>
</thead>
<tbody>
<tr>
<td>(N=224)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Zoo member</td>
<td>5.43</td>
<td>1.20</td>
<td>5.77</td>
<td>1.24</td>
<td>6.09</td>
<td>1.05</td>
<td></td>
<td></td>
</tr>
<tr>
<td>(N=159)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Zoo non-member</td>
<td>5.33</td>
<td>1.38</td>
<td>5.65</td>
<td>1.22</td>
<td>5.85</td>
<td>1.25</td>
<td></td>
<td></td>
</tr>
<tr>
<td>(241)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Zoo member volunteered time or money (N=83)</td>
<td>5.59</td>
<td>1.21</td>
<td>5.98</td>
<td>1.08</td>
<td>6.40</td>
<td>0.85</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Zoo member did not volunteer time or money (N=76)</td>
<td>5.25</td>
<td>1.18</td>
<td>5.54</td>
<td>1.37</td>
<td>5.75</td>
<td>1.14</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Visited zoo once past 12 months (N=117)</td>
<td>5.23</td>
<td>1.43</td>
<td>5.52</td>
<td>1.36</td>
<td>5.88</td>
<td>1.23</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Visited zoo 2-3 times past 12 months (N=166)</td>
<td>5.35</td>
<td>1.28</td>
<td>5.69</td>
<td>1.20</td>
<td>5.73</td>
<td>1.26</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Visited zoo 4 or more times past 12 months (N=117)</td>
<td>5.53</td>
<td>1.21</td>
<td>5.87</td>
<td>1.11</td>
<td>6.32</td>
<td>0.90</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Results for question 2: What is the relationship between individuals’ expressed environmental concern, overlap between nature and self, and preferences for statements framed by environmental concern?

Sample One:

The overall mean for participants was 4.7 (SD=1.5). The distribution of scores on the INS was significant, ($\chi^2(6, N=298) = 149.62, p = .000$). Males and females had
statistically equal means (M=4.74, SD=1.56, F=4.71, SD=1.44). Group type did not have significant differences on INS mean.

Participant mean and SD on the ECS are shown overall and by subscale for total participants and by sex (male or female) and visitor group type in Table 3. Male and female participants had significant differences between groups on the overall ECS score, \(t(296) = -3.47, p=.004\); on the Egoistic subscale \(t(296) = -2.92, p=.004\); on the Social-Altruistic subscale \(t(296) = -3.04, p=.003\); and on the Biospheric subscale \(t(296) = -2.60, p=.010\). Females had significantly higher means than males on each subscale. Visitor group type did not have a significant effect on ECS overall or by subscale.

<table>
<thead>
<tr>
<th></th>
<th>Total</th>
<th>Male</th>
<th>Female</th>
<th>Adult only</th>
<th>Multiple adults</th>
<th>Inter-generational group</th>
</tr>
</thead>
<tbody>
<tr>
<td>N=</td>
<td>298</td>
<td>142</td>
<td>156</td>
<td>15</td>
<td>69</td>
<td>214</td>
</tr>
<tr>
<td>Overall ECS</td>
<td>5.99</td>
<td>5.82</td>
<td>6.14</td>
<td>6.24</td>
<td>5.81</td>
<td>6.02</td>
</tr>
<tr>
<td>Overall ECS SD</td>
<td>0.81</td>
<td>0.86</td>
<td>0.74</td>
<td>0.83</td>
<td>0.86</td>
<td>0.79</td>
</tr>
<tr>
<td>Egoistic subscale</td>
<td>5.83</td>
<td>5.64</td>
<td>6.00</td>
<td>6.17</td>
<td>5.67</td>
<td>5.85</td>
</tr>
<tr>
<td>Egoistic subscale SD</td>
<td>1.08</td>
<td>1.15</td>
<td>0.98</td>
<td>1.05</td>
<td>1.09</td>
<td>1.08</td>
</tr>
<tr>
<td>Social-Altruistic subscale</td>
<td>6.18</td>
<td>6.02</td>
<td>6.33</td>
<td>6.30</td>
<td>5.99</td>
<td>6.24</td>
</tr>
<tr>
<td>Social-Altruistic subscale SD</td>
<td>0.89</td>
<td>0.94</td>
<td>0.82</td>
<td>0.92</td>
<td>1.08</td>
<td>0.81</td>
</tr>
<tr>
<td>Biospheric</td>
<td>5.95</td>
<td>5.80</td>
<td>6.09</td>
<td>6.27</td>
<td>5.77</td>
<td>5.98</td>
</tr>
<tr>
<td>Biospheric SD</td>
<td>0.98</td>
<td>1.05</td>
<td>0.89</td>
<td>0.87</td>
<td>1.04</td>
<td>0.96</td>
</tr>
</tbody>
</table>

Table 5. Mean and SD on Overall ECS and ECS Subscales. Total and by demographics.

As the data are interval, a Pearson’s product-moment correlation was run between INS, ECS, and the three ECS subscales are shown in Table 4. The INS mean was significantly and positively correlated with the ECS overall mean and the Biospheric subscale mean.
The preferred statement was considered ordinal data, so a Spearman’s rho was run between preferred statement, INS, ECS, and the three ECS subscales. Only the mean on the ECS biospheric subscale was significantly correlated with the preferred statement, \(\rho(296) = .118, p = .042\).

**Sample Two:**

Participant mean and SD on the ECS are shown overall and by subscale for total participants and by sex and visitor group type in Table 7. Zoo member status did not have significant differences on the ECS means or on any of the subscale means; however non-members had higher means for each. Number of zoo visits in the past 12 months did not have significant differences on the ECS mean or on any of the subscale means. Those who visited a zoo 2 to 3 times in the past 12 months had the highest overall ECS mean. Donating money had significant differences between groups on the biospheric subscale mean, \(t(398) = -5.68, p < .001\), those who had donated money had a higher mean than those who had not; volunteering time had significant differences between

---

**Table 6. Correlation matrix for ECS and INS scores**

<table>
<thead>
<tr>
<th></th>
<th>INS</th>
<th>ECS Overall</th>
<th>Egoistic subscale</th>
<th>Altruistic subscale</th>
<th>Biospheric subscale</th>
</tr>
</thead>
<tbody>
<tr>
<td>INS</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>ECS Overall</td>
<td>.174*</td>
<td>.857*</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Egoistic subscale</td>
<td>.088</td>
<td>.881*</td>
<td>.725*</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Altruistic subscale</td>
<td>.081</td>
<td>.745*</td>
<td>.373*</td>
<td>.487</td>
<td>-</td>
</tr>
<tr>
<td>Biospheric subscale</td>
<td>.262*</td>
<td>.745*</td>
<td>.373*</td>
<td>.487</td>
<td>-</td>
</tr>
</tbody>
</table>

Notes: (1) N=298 for each correlation  
(2) * Correlation is significant at <.01.
groups on the biospheric subscale mean, \( t(398) = -4.25, p<.001 \), those who had volunteered time had a higher mean than those who had not; doing both donating money and volunteering time had significant differences over doing neither on the biospheric subscale mean, \( t(264) = -5.18, p=.000 \), those who had done both had a higher mean than those who had done neither. Zoo membership status and volunteering time or donating money had significant differences between groups on the biospheric subscale mean, \( t(157) = -2.85, p=.005 \), zoo members who had donated time or money had a higher mean than those who had not.

<table>
<thead>
<tr>
<th></th>
<th>ECS Total</th>
<th>ECS Total SD</th>
<th>Egoistic Subscale ( \bar{X} )</th>
<th>Egoistic Subscale SD</th>
<th>Social-Altruistic Subscale</th>
<th>Social-Altruistic Subscale SD</th>
<th>Biospheric Subscale</th>
<th>Biospheric Subscale SD</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total (N=400)</td>
<td>5.83</td>
<td>0.89</td>
<td>5.58</td>
<td>1.23</td>
<td>6.00</td>
<td>1.06</td>
<td>5.89</td>
<td>1.00</td>
</tr>
<tr>
<td>Volunteer Time (N=50)</td>
<td>5.97</td>
<td>0.89</td>
<td>5.46</td>
<td>1.37</td>
<td>6.05</td>
<td>1.10</td>
<td>6.39</td>
<td>0.86</td>
</tr>
<tr>
<td>Did not volunteer time (N=350)</td>
<td>5.82</td>
<td>0.89</td>
<td>5.59</td>
<td>1.21</td>
<td>5.99</td>
<td>1.05</td>
<td>5.82</td>
<td>0.99</td>
</tr>
<tr>
<td>Donate money (N=168)</td>
<td>5.93</td>
<td>0.83</td>
<td>5.49</td>
<td>1.29</td>
<td>6.08</td>
<td>0.96</td>
<td>6.21</td>
<td>0.90</td>
</tr>
<tr>
<td>Did not donate money (N=232)</td>
<td>5.77</td>
<td>0.93</td>
<td>5.63</td>
<td>1.19</td>
<td>5.93</td>
<td>1.12</td>
<td>5.66</td>
<td>1.00</td>
</tr>
<tr>
<td>Both (N=42)</td>
<td>6.05</td>
<td>0.81</td>
<td>5.49</td>
<td>1.39</td>
<td>6.15</td>
<td>1.02</td>
<td>6.49</td>
<td>0.78</td>
</tr>
<tr>
<td>Neither (N=224)</td>
<td>5.77</td>
<td>0.92</td>
<td>5.65</td>
<td>1.19</td>
<td>5.95</td>
<td>1.11</td>
<td>5.66</td>
<td>0.99</td>
</tr>
<tr>
<td>Zoo member (N=159)</td>
<td>5.76</td>
<td>0.87</td>
<td>5.44</td>
<td>1.21</td>
<td>5.91</td>
<td>1.16</td>
<td>5.91</td>
<td>1.00</td>
</tr>
<tr>
<td>Zoo non-member (241)</td>
<td>5.89</td>
<td>0.90</td>
<td>5.66</td>
<td>1.24</td>
<td>6.05</td>
<td>0.98</td>
<td>5.88</td>
<td>0.99</td>
</tr>
<tr>
<td>Zoo member volunteered time or</td>
<td>5.84</td>
<td>0.89</td>
<td>5.45</td>
<td>1.22</td>
<td>5.94</td>
<td>1.06</td>
<td>6.13</td>
<td>0.99</td>
</tr>
</tbody>
</table>

89
The overall mean for participants on the INS was 4.8 (SD=1.5). The distribution of scores on the INS was significant, ($x^2(6, N=400) =176.07, p = .000$). Members had a higher mean (4.97, SD=1.49) than non-members (4.76, SD=1.49) however this was not significant. Charitable behavior had significant differences between groups on INS with those who had donated money to a conservation organization in the past 12 months ($=5.28$, SD=1.53) rating themselves higher than those who have not ($ =4.56$, SD=1.48), ($t(398) = -4.48$, $p=.000$). Those who had volunteered time to a conservation organization in the past 12 months ($ =5.58$, SD=1.72) rated themselves higher than those who had not ($ =4.74$, SD=1.48), ($t(398) = -3.68$, $p=.000$). Number of visits to a zoo in the past 12 months did not have significant differences between groups on INS score.

<table>
<thead>
<tr>
<th></th>
<th>Total</th>
<th>Zoo member did not volunteer time or money</th>
<th>Visited zoo once past 12 months</th>
<th>Visited zoo 2-3 times past 12 months</th>
<th>Visited zoo 4 or more times past 12 months</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Me</td>
<td>SD</td>
<td>Me</td>
<td>SD</td>
<td>Me</td>
</tr>
<tr>
<td>money (N=83)</td>
<td>5.67</td>
<td>0.84</td>
<td>5.43</td>
<td>1.21</td>
<td>5.88</td>
</tr>
<tr>
<td>Zoo member did not</td>
<td>5.82</td>
<td>0.90</td>
<td>5.64</td>
<td>1.26</td>
<td>5.97</td>
</tr>
<tr>
<td>volunteer time or money</td>
<td>(N=76)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Visited zoo once past</td>
<td>5.86</td>
<td>0.89</td>
<td>5.61</td>
<td>1.19</td>
<td>6.08</td>
</tr>
<tr>
<td>12 months (N=117)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Visited zoo 2-3 times</td>
<td>5.81</td>
<td>0.88</td>
<td>5.46</td>
<td>1.27</td>
<td>5.91</td>
</tr>
<tr>
<td>past 12 months (N=166)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Visited zoo 4 or more</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>times past 12 months</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>(N=117)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Table 7: Sample Two: Mean and SD on Overall ECS and ECS Subscales. Total and by demographics.
Pearson’s product-moment correlation was run between INS, ECS, the three ECS subscales, and the participants’ rating of the three statements. The results are shown in Table 8. Each of the ECS subscales were significantly and positively correlated with the statement hypothesized to align with the concern represented by the subscale. These were the strongest correlations found between the constructs measured.

<table>
<thead>
<tr>
<th></th>
<th>INS</th>
<th>ECS overall</th>
<th>Egoistic subscale</th>
<th>Altruistic subscale</th>
<th>Biospheric subscale</th>
<th>Egoistic statement</th>
<th>Social-Altruistic statement</th>
<th>Biospheric statement</th>
</tr>
</thead>
<tbody>
<tr>
<td>INS</td>
<td>-</td>
<td>-</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>ECS overall</td>
<td>.113</td>
<td>-</td>
<td></td>
<td></td>
<td></td>
<td></td>
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<td></td>
</tr>
<tr>
<td>Egoistic</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Subscale</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Egoistic</td>
<td></td>
<td>-.017</td>
<td>.790**</td>
<td>-</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Altruistic</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Subscale</td>
<td></td>
<td>.057</td>
<td>.800**</td>
<td>.682**</td>
<td>-</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Biospheric</td>
<td></td>
<td>.207**</td>
<td>.592**</td>
<td>.259**</td>
<td>.284**</td>
<td>--</td>
<td></td>
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</tr>
<tr>
<td>Subscale</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Overall</td>
<td></td>
<td>.173**</td>
<td>.409**</td>
<td>.432**</td>
<td>.314**</td>
<td>.279**</td>
<td>-</td>
<td></td>
</tr>
<tr>
<td>Egoistic</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Statement</td>
<td></td>
<td>.213**</td>
<td>.471**</td>
<td>.374**</td>
<td>.490**</td>
<td>.289**</td>
<td>.700**</td>
<td>-</td>
</tr>
<tr>
<td>Social-Altruistic</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Statement</td>
<td></td>
<td>.260**</td>
<td>.317**</td>
<td>.068</td>
<td>.161*</td>
<td>.602**</td>
<td>.458**</td>
<td>.527**</td>
</tr>
</tbody>
</table>

Table 8. Correlation matrix for INS, ECS, and statements

Notes: 1) **Correlation is significant at the 0.01 level (2-tailed).
2) * Correlation is significant at the 0.05 level (2-tailed).

Spearman’s rho was run between preferred statement, INS, ECS, and the three ECS subscales due to the preferred statement being entered as ordinal data. INS score
was significantly correlated with preferred statement, \((\rho(400) = .214, p<.001)\). Mean score on the egoistic subscale was significantly and negatively correlated with preferred statement, \((\rho(400) = -.139, p<.01)\). Mean score on the biospheric subscale was significantly correlated with preferred statement, \((\rho(400) = .392, p<.001)\).

**Discussion**

In answering our first question on zoo visitor preferences for statements framed by environmental concerns, the results of both studies suggest a clear majority prefer statements framed by the biospheric concern: concern for all living things. This claim is strengthened by the ratings participants gave to the individual statements in study two. This would seem to contradict the assertion by Schultz and Zelezny (2003) and fall in line with the work of Inglehardt (2000). However, the context of collecting data on zoo grounds must be accounted for when interpreting this result. It is possible that visitors engaged in a visit to the zoo may be having an experience that has activated and elevated, perhaps temporarily, their biospheric concern. Another potential explanation is that zoo visitors have higher levels of biospheric concern than the general public or those who would choose to do activities other than visit a zoo in their free time.

Further evidence of elevated biospheric concern in zoo visitors is provided by comparing our findings against data from other studies using the ECS with American populations. As shown in Table 9, the biospheric mean was higher and SD lower for this study conducted on zoo grounds than for studies conducted with general populations or on college campuses, including Schultz’ (2000) study manipulating biospheric concern.
<table>
<thead>
<tr>
<th>Study</th>
<th>Sample Population and n</th>
<th>Biospheric subscale $\bar{x}$</th>
<th>Biospheric subscale SD</th>
</tr>
</thead>
<tbody>
<tr>
<td>Yocco phase I (2010)</td>
<td>Zoo visitors age 18 and older (N=298)</td>
<td>5.95</td>
<td>0.98</td>
</tr>
<tr>
<td>Yocco phase II (2010)</td>
<td>Zoo visitors age 18 and older (N=400)</td>
<td>5.89</td>
<td>1.00</td>
</tr>
<tr>
<td>Schultz (2000)</td>
<td>US college students asked to take the perspective of an animal being harmed by pollution (N=30)</td>
<td>5.82</td>
<td>Not reported</td>
</tr>
<tr>
<td>Schultz (2001)</td>
<td>US College Students (N=148)</td>
<td>5.33</td>
<td>1.46</td>
</tr>
<tr>
<td>Schultz (2001)</td>
<td>US College Students (N=1010)</td>
<td>5.33</td>
<td>1.38</td>
</tr>
<tr>
<td>Schultz (2001)</td>
<td>California residents (N=1005)</td>
<td>5.46</td>
<td>1.49</td>
</tr>
<tr>
<td>Schultz et al. (2004)</td>
<td>California undergraduate students (N=160)</td>
<td>5.54</td>
<td>1.39</td>
</tr>
<tr>
<td>Schultz et al. (2004)</td>
<td>California undergraduate students (N=98)</td>
<td>5.47</td>
<td>1.10</td>
</tr>
</tbody>
</table>

Table 9. Comparison of biospheric mean and standard deviation by study

Our findings begin to answer the call put forth by Myers, Saunders, and Bexell (2009) on finding a framework for encouraging perspective taking of animals while visiting institutions such as zoos. If perspective taking is occurring, elicited by a visit to the zoo, this comes voluntarily in an unstructured manner, based on how the visitor chooses to interact with the animals and the programming such as signage. It has been suggested that empathetic perspective taking is more likely to produce helping behaviors (Batson, Fultz, and Schoenrade, 1987; Batson, O’Quinn, Fultz, Vanderplas and Isen, 1983; Myers, Saunders, & Bexell, 2009) whereas the type of perspective taking that occurs when one views the situation from their own perspective can lead to distress, which in turn can lead egoistic behaviors such as attempting to reduce one’s distress by leaving the situation.

For our second question on the relationship between individuals’ expressed environmental concern, overlap between nature and self, and preferences for statements
framed by environmental concern, we found that scores on INS were significantly and positively correlated with scores on the biospheric subscale mean, and positively and significantly correlated with participants rating of the concern framed statements (study two). Our findings affirm results reported by Schultz et al. (2004) on the correlation between INS and biospheric subscale mean. However, Schultz et al. (2004) reported a significant positive correlation between altruistic subscale mean and INS that was not replicated in this study.

In sample one, INS score is positively and significantly correlated with participants’ preferred statement. Further, sample two found the three concern subscale means were significantly and positively correlated with the rating participants gave each statement aligned with that concern. These were also the strongest correlations our study found. This would suggest that statements designed to align with each EC would have a greater impact on those who express higher levels of the specific EC used as a frame.

Egoistic subscale mean was the only subscale not significantly and positively correlated with the biospheric statement mean. An explanation for this may be found in the high correlation between the egoistic subscale mean and the social-altruistic subscale mean and the social-altruistic statement mean; this finding suggests that those who have higher levels of egoistic concern may have incorporated the egoistic aspect of social-altruistic concerns into their preferences for statements.

Our findings provide a theoretical framework for communicating not only with zoo visitors, but for those outside zoo grounds as well. If individuals leave the zoo and return to prior levels of concern then communication needs to reflect this fluctuation in concern. Assuming that a person who expresses high levels of biospheric concern and
receptiveness to biospheric messages while visiting a zoo will do the same away from the zoo may be detrimental to promoting the ideas framed by the communication. This is a state versus trait question, that is are high levels of biospheric concern a permanent trait of zoo visitors or is it a temporary state induced by visiting the zoo?

The findings on the INS score have bearing on zoo visitors’ perspectives of the overlap they feel their lives have with nature. The INS mean for both studies is in line with the results found by Bruni, Fraser, & Schultz (2008), suggesting zoo visitors have relatively moderate levels of inclusion with nature. This may suggest zoo visitors do not look at the act of going to the zoo as an action that contributes to their life overlapping with nature. Clearly, one facet of the modern zoo is an attempt to create an experience in which one feels that they are interacting with nature. While this may be the case, the experience is not creating a greater sense of overlap with nature for zoo visitors as part of their everyday lives.

The differences in mean between groups on the INS provide evidence to support this claim. Those who contribute time or money to conservation organizations had statistically higher scores on their INS. Zoo membership status and number of times that participants had visited a zoo in the past 12 months were not statistically significant in their between group differences. This suggests that those who contribute time or money to conservation organization may have higher INS scores \textit{a priori} to their visit; however, visiting a zoo does not necessarily cause one to have a higher INS score.

Our findings bring into play the assertions by Cialdini, Brown, Lewis, Luce, and Neuberg (1997) that individuals’ concern for others leads to a “self-other” overlap in which the individual sees benefit to self in caring for another (see also Maner, Luce,
Neuberg, Cialdini, Brown, and Sagarin, 2002). In this study there was a collapse of the social-altruistic message into the egoistic message, essentially making them one in the same. This claim is supported by our finding of a strong correlation \((r=0.700)\) between the egoistic statement mean and the social-altruistic statement mean. Similarly, we find a very strong correlation between the altruistic subscale mean and the egoistic subscale mean. We interpret this result to mean that people have multiple reasons to care about the environment, multiple motivating concerns, with the potential for each concern to be accessed in a meaningful way to promote the processing of information.

For practitioners, there are direct applications of these findings to the communication practice of zoo programming. Part of the value of framing messages using environmental concern is that it is transferable to a number of concepts. By testing the Yellow Sandshell messages and generic messages, and getting similar results, our results suggests that visitors may be receptive to messages framed by concern regardless of the specific topic. Our results suggest that communication framed by biospheric concerns would be preferred by a majority of zoo visitors while they are onsite, while also suggesting that individuals who have higher levels of egoistic or social-altruistic concern will prefer messages framed by those concerns as well. The best approach for practitioners would be to have multiple messages for each topic, framed by each of the different concerns.

Our findings on the moderate level of inclusion expressed by zoo visitors may suggest using caution (or not using at all) with messages designed to relate zoo visitors’ lives to their relationship with nature. Zoos cannot assume that visitors enter the zoo feeling a connection to nature. From a different perspective, zoos that wish to increase
visitors’ perceptions that their lives overlap with nature may choose to provide signage and programming that makes explicit how a visit to the zoo connects one’s life with nature. Signage could read: “you are currently visiting an area filled with nature or proceeds from zoo purchases go towards breeding and habitat restoration programs.” Programming could be designed to specifically activate visitors’ awareness of the overlap between their lives and nature, and then further messaging related to knowledge and behavior could be introduced.

Our results may also be useful for communication with zoo members. Our findings suggest that members who stated that they had donated money or volunteered time within the past 12 months have stronger preferences for statements framed by biospheric concern. Communication coming from zoos to their members (e.g. emails, mail flyers, pamphlets) may be most effective if zoo officials know the degree to which members are charitable to conservation organizations. Those who do make charitable donations to conservation organizations may be more receptive to information framed by biospheric concern, while those who do not may be more receptive to egoistic framed communication.

Lastly, 76 (48%) participants who stated they are zoo members also stated that they have not given money to a conservation organization in the past 12 months. Assuming that zoo memberships are renewed yearly, this reflects that many zoo members do not see zoos as conservation organizations or that the money they pay to be members goes to a conservation organization (i.e. the zoo). Regardless of how it is framed, this would be a message that zoos would want to make explicit to their members as often as
possible. Zoos are conservation organizations and they rely on the support of their members to continue doing conservation work.

Future Research

There are a number of potential questions future research may seek to answer. Our results provide evidence for a preference by zoo visitors for statements aligned with biospheric concerns; does this translate into a greater likelihood to engage in specific behaviors if they are encouraged by messages framed with biospheric concern? Would a more experimental approach where groups of participants were compared based on which concern the message they received is framed by provide any evidence of differences between groups?

For zoos, going beyond examination of visitor preferences to explore whether messages create or influence future behaviors is a critical step. Accessing zoo visitors once they have gone back to their daily life to determine the long term effects of specific messages will be critical to inform zoo practice. Particularly if environmental concern is contextual and can be manipulated temporarily, it will be important to determine how long this lasts and how messages that follow up zoo visits should be framed.

Longitudinal studies comparing the long term effect of a single zoo visit to the effects of multiple visits and multiple exposures to zoo programming will be critical for the field as a whole to show its educational value. Documenting and comparing long term changes in attitudes and behaviors between those who never visit zoos, those who visit infrequently (once every year or two) and those who are frequent visitors (multiple times a year) would prove very useful for informing future funding policy towards zoos.
Similarly, research that examines the effects of multiple exposures to messages framed by EC would be ideal for providing stronger support or rejecting the results reported here. Exploring the impact of repeated exposure to messages framed by the different concerns would be very useful to theory. Would individuals repeatedly exposed to egoistic framed messages engage in similar behaviors as those exposed to biospheric framed messages over time? Are the different frames a means to the same end over time?

Other areas for exploration include learning what motivates individuals’ feelings of Inclusion of Nature in Self and if this can be manipulated through communication. Schultz (2002) puts forth individuals who experience greater inclusion with nature will be more likely to protect our environment. Zoos are an excellent venue for providing visitors with an immersive experience and messages that relate their experience to their everyday overlap with nature. Examining communication on zoo grounds, with the intention of increasing a feeling of inclusion with nature would be a step towards accomplishing this.

**Conclusion**

This study focused on framing using environmental concerns in the context of a zoo, useful because results may be applied to a variety of situations and appeal to large segments of visitors to ISE venues. Our findings suggest that visitors preferred statements framed by biospheric concerns, and demonstrate high levels of biospheric concern. Further, our findings suggest that there is a significant and positive correlation between the level of each concern individuals’ express and statements designed to align with each concern.
Overall, the studies contribute to a growing body of knowledge regarding the importance and potential power of zoos to facilitate learning and reinforce or encourage changes in behavior (Dierking, Burtnyk, Buchner and Falk, 2002; Falk et al., 2007; Falk, Heimlich and Foutz, 2009). Our findings may be used both by theorists to explain preferences for communication in ISE settings, and for practitioners to potentially strengthen programming at zoos.
Chapter 5: Examining the Effects of Messages Framed by Environmental Concerns

Abstract

Informal science education providers such as zoos, aquariums, and natural history museums are tasked not only with educating the public on environmental science topics, but with instilling in visitors a desire to engage in behaviors preserving biodiversity and conserving natural resources (e.g. Krishtalka & Humphrey, 2000; Patrick, Mathews, Ayers, & Tunnicliffe, 2007). Effectively communicating environmental issues and the behaviors that either cause or can mitigate these issues is critical for these institutions to achieve their missions. It has been suggested that framing environmental information using environmental concerns would be an effective frame of communication (Schultz & Zelezny, 2003).

We present findings which suggest that there are framing effects associated with messages in informal science education contexts framed by environmental concern, with positive effects coming from biospheric framed messages, and possible boomerang effects from messages framed egoistically. Individuals in informal science contexts are likely more aware of environmental issues due to their surroundings, and are more likely to express an intention to engage in specific behaviors after receiving a message framed by biospheric concern. Implications to theory include that informal science contexts are
effective at creating empathy, which has been suggested as a building block for behaviors helpful to the environment (Myers, Saunders, & Bexell, 2009).

**Introduction**

There is a growing acknowledgement of the critical role of informal science education (ISE), the teaching and learning of science, which takes place in settings such as zoos, science centers, nature centers, and natural history museums (National Research Council, 2009; National Research Council, 2010). A recent editorial in the journal *Nature* stated that “evidence strongly suggests that most of what the general public knows about science is picked up outside school, through things such as television programmes, websites, magazine articles, visits to zoos and museums — and even through hobbies such as gardening and birdwatching” (April, 2010, pg. 813). The National Research Council (Fenichel & Schweingruber, 2010) states that “Society must better understand and draw on informal experiences to improve science education and science learning broadly” (pg.1). Rennie and Williams (2006) state that adults who are out of school and not practicing a career in the science field will only encounter future science learning “voluntarily” through participation in ISE opportunities. The acknowledgment of ISE as a key source of science education for many people points to the need for research to be conducted in ISE settings.

To date, much of the outcomes based research in ISE settings has focused on knowledge gain and attitude change. Importantly, ISE providers such as zoos, natural history museums, nature centers, and parks have stated conservation outcomes as part of their missions. With that in mind, Heimlich (2010) states that these organizations must
evaluate themselves within the context of how well they are fulfilling their mission. For ISE providers with conservation outcomes this means focusing on the knowledge, skills, and behaviors that they impart on their visitors. ISE providers, who expect to be evaluated based on the degree to which they are achieving their conservation based missions, highlight the need for these organizations to effectively communicate with their visitors.

Effectively communicating the causes and consequences of environmental issues such as global climate change (GCC) and water pollution to the general public is critical to both raising awareness and increasing the likelihood that individuals will engage in behaviors that are considered environmentally friendly. There are myriad of guides suggesting how to communicate critical environmental issues to different types of individuals (e.g. Biodiversity Project 2004; Earth Justice, 2008; Globalchange.gov, 2009; Maibach, Roser-Renouf, & Leserowitz, 2009; Pike, Dopplet, Herr 2010). Typically, these guides are based on audience segmentation studies that have examined demographic and psychographic characteristics of different groups of individuals. However, less is known about the actual effectiveness of many of these recommendations or how the general public actually responds to messages that are framed using different guidelines.

The following article presents the results of a study designed to explore the effects of framing communication using environmental concerns (Schultz, 2001). Specifically, we examine the claims of Schultz and Zelezney (2003) who assert that communication regarding environmental issues would be more effective if it were framed by egoistic concern, by administering messages framed using different concerns to visitors to ISE
providers and then measuring visitor self-reported intent to engage in a number of behaviors related to the topic of the message.

**Literature Review**

*Informal Science Education*

Zoos, natural history museums, botanical gardens and other museums are categorized as designed settings where individuals encounter ISE (National Research Council, 2009) They are specifically designed with the intention of promoting science education. These institutions have incorporated science education into their mission. As such, designed experiences have intended goals of the designers and educators who have designed the spaces. With zoos and natural history museums there is an explicit intention to promote protection and conservation of natural resources and biodiversity to their visitors (Patrick, Mathews, Ayers, & Tunnicliffe, 2007; Krishtalka & Humphrey, 2000).

A challenge to zoos and natural history museums is that visitors choose which exhibits they engage in and therefore often encounter messages sporadically or in a random order based on the visitors’ viewing pattern (National Research Council, 2009). This contributes to the need for these institutions to offer programming that gains the attention of visitors and efficiently communicates the message; resulting in designers often incorporating elements appealing to visitors’ emotions and senses. Another critical aspect of effective design for exhibits is to build on the prior knowledge and awareness learners already have of the world around them (National Research Council, 2010).

To date, much of the research that has been conducted using adult visitors to ISE institutions has focused on measuring changes in knowledge and attitudes. Researchers
have found that experiences in ISE settings can increase individuals interest in scientific topics (Engle and Conant, 2002; Kuhn and Franklin, 2006; National Research Council, 2009; Renninger, 2000), increasing the likelihood that a visitor will have a meaningful learning experience and building intrinsic motivation (Deci & Ryan, 2002) thought to be key for life long learners. Ardoin (2009) suggests visitors’ behavioral outcomes are a necessary and promising area for future research in zoos and other environmental ISE providers. Specifically, she cites “foot in the door” behaviors, simpler conservation behaviors (e.g. water conservation, energy conservation) that may lead to broader lifestyle changes, as ones that should be investigated in these settings.

Environmental Concern

Takacs-Santa (2007) suggests the definition of EC in the literature has been inconsistent. Therefore, it must be made explicit how EC is being defined for this paper. Our definition of EC for this paper is in line with Stern’s (2000) definition. That is EC is subconscious until activated by potential threats to valued objects, and can result in an individual engaging in behaviors thought to mitigate the threat to the valued object. EC is not attached to specific environmental issues, as the awareness that an issue would have an impact on the valued object would result in an individual attempting to mitigate the situation regardless of the issue. Further, for this study, we utilize the tripartate categories of EC as measured my Schultz’ (2001) Environmental Concern Scale (ECS): egoistic (concern for self), social-altruistic (concern for other humans), and biospheric (concern for all living beings).
Framing Communication

Frames organize the reality of an issue or event in a manner that promotes a particular way of defining or interpreting the event (Chong & Druckman, 2007a; Gamson & Modigliani, 1987 & 1989; Shah, Watts, Domke, & Fan, 2002; Tuchman, 1978). Frames can be thought of as storylines, which simplify an issue in order to make it pertinent to a specific audience (Scheufele, 1999; Ferree, Gamson, Gerhards, & Rucht, 2002; Price, Nir, & Capella, 2005). Frames consist of the words, images, metaphors, comparisons, and presentation styles that are used when communicating information regarding an issue (Gamson & Modigliani, 1987, 1989; Chong & Druckman, 2007b). Frames are based on a simplified version of the facts surrounding a situation, which makes them different from putting a “false spin” on an issue (Nisbet, 2009).

The importance of effectively framing issues cannot be understated. Chong and Druckman (2007a) state frames “affect the attitudes and behaviors of their audiences” (pg. 109). Likewise, the existence of frames in everyday communication cannot be denied, Nisbet (2009) states:

“Framing is an unavoidable reality of the communication process, especially as applied to public affairs and policy. There is no such thing as unframed information, and most successful communicators are adept at framing, whether using frames intentionally or intuitively” (pg. 15).

Framing effects are what occur when an individuals’ opinion on an issue is altered based on how that issue is presented or framed (Chong & Druckman, 2007a, 2007b; Rasinski, 1989; Sniderman & Theriault, 2004; Zaller, 1992). Researchers have closely examined a number of issues, demonstrating the framing effects that occur. Jacoby
(2000) found that public perception of government spending varied strongly based on issue framing. Grant and Rudolph (2003) demonstrated that frames, which suggest whose rights are at stake in the issue, influence individuals’ feelings toward campaign finance. Fine (1992) found evidence suggesting public response to survey questions regarding the issue of affirmative action was influenced by how that issue was framed as well. Hiscox (2006) investigated the effects of framing on the issue of international economy and global trading. His results suggested that the less knowledge an individual has regarding an issue, the greater the framing effect may be.

**Framing Environmental Communication**

It has been suggested that framing environmental communication effectively will lead to positive changes in human behaviors that affect the environment (Davis, 1995; Saunders, 2003; Schultz & Zelezny, 2003). Effective framing is credited with being able to resolve deeply entrenched environmental issues and disputes, eventually bringing citizens to the table to participate in policy decisions (Lewicki, Gray, & Elliot, 2002). Schiller et al. (2001) argue that the process of policy development that involves the general citizenry can only be effective if the technical jargon of scientists is replaced by messages that frame issues in salient way to individual citizens.

Experts in environmental communication have suggested the need to clearly state the problem and possible outcomes when addressing environmental issues (Cantrill, 1993; Rowan, 1991; Vaughan & Seifert, 1992). Building on this base of research, others have examined how environmental communications can be structured to motivate individuals to adopt or change behaviors in ways that are friendly to the environment
(e.g. Brunner, 1991, Ellen, Weiner & Cobb-Walgren, 1991; Davis, 1995). Utilizing the tenets of Prospect Theory (Kahneman & Tversky, 1979), scholars argue that communication stressing loss due to inaction will be more persuasive than communication stressing gains due to actions (Tversky & Kahneman, 1981; Lopes, 1987; Miller & Fagley, 1991). Davis’ (1995) experiment with different frames of communication found that framing effects do influence individuals’ intentions to participate in certain behaviors and that communication emphasizing the negative results of inaction were a stronger influence on intended future behavior when they were combined with the results of inaction affecting the current generation (rather than future generations).

Other Factors Contributing to the Effectiveness of Messages

Research on persuasion and the processes individuals use when encountering persuasive arguments have often focused on the role of involvement. Researchers (Darke & Chaiken, 2005; Johnson & Eagly, 1989) put forth that multiple types of involvement exist, each having a unique impact on how individuals process arguments. Issue relevant involvement, where one has participated in activities related to the issue, leads to biased processing as shown by Teel et al. (2006). Value relevant involvement occurs when underlying values are activated in relationship to an issue, and is hypothesized to lead to biased processing as well (Johnson & Eagly 1989, Teel et al. 2006).

In their meta-analyses of studies manipulating involvement, Johnson and Eagly (1989) report that Value-Relevant involvement leads to biased processing of information, or resistance to attitude change. However, there is some evidence this can be overcome
with strong arguments. High involvement of this type is more resistant to change than those with a lower level of this type of involvement. These results make sense when looking at this type of involvement; people who belong to groups or are actively involved in an issue most likely have developed strong, firm attitudes on these issues.

Eagly and Chaiken (1993) put forth that the quality of an argument plays a major role in attitude change or formation when an individual is elaborately processing information. Prior knowledge plays a crucial role and must be acknowledged by persuasive messages. Johnson and Eagly (1989) note that subjects are more knowledgeable regarding issues when the type of involvement is value-relevant. This would be expected in that one should hold more knowledge regarding an issue relevant to their lives and less about numerous other issues not considered relevant to the individual. What this means for promoting attitude change is that messages need to acknowledge the positions that may be held by individuals, while trying to move them towards the position that the persuasive message would like them to hold. This also suggests that when involvement is high, no amount of persuasive communication will change someone’s attitude. Persuasive communication related to deeply held values might be best suited for attitude formation situations.

Many characteristics of information or arguments have been examined to determine what is effective in persuading individuals. Wood (2000) offers that research shows persuasive messages are more effective when they match the function underlying an individuals’ attitude. Many people are very sensitive to how others view them and may respond to a persuasive appeal shaped in a manner that reflects this view (e.g. turning off the lights shows others you care about the earth). It has also been cautioned
that messages, which match individuals’ experiences, while identifying goals that have not been adopted, may cause stress and therefore resistance (Tykocinski et al., 1994).

The role of group on self-identity has been examined by research on persuasion, and has implications for messages dedicated to an intended audience. Turner (1982, 1991) suggests that those who view themselves as in-group tend to adopt the attitudes they believe are sanctioned by the group. In particular, through a process called referent informational influence, individuals feel reinforced in their views if they find other in-group members share these views. This would make the process of changing attitudes either easier or more difficult depending on the view of the group. Because of the strength of supposed in-group attitudes it creates a blocking or resistant affect on attitudes viewed as out-group. This may be part of what drives the clear division between members of political parties on environmental issues such as global climate change (Nisbet, 2009).

**Present Study**

In our review of the literature we have found that ISE providers such as zoos and natural history museums exist, in part, to fulfill a mission that would lead to visitors engaging in conservation behaviors based on the information they encounter during a visit. Further, there are numerous suggestions for how to communicate environmental issues in meaningful ways, including the use of EC as a frame. However, there is a lack of studies in applied settings to guide practitioners and provide empirical evidence supporting these suggestions. The study presented in this paper addresses the need for empirical data to test the hypothesis that communication using environmental concern as
a frame, can be effective at motivating intent in zoo and natural history museum visitors. We do this through the use of samples obtained from visitors to a zoo, a natural history museum, and a science center.

**Method**

**Questions**

1. How does framing using environmental concern influence an individuals’ intention to engage in specific behaviors or change patterns of behavior, in relation to environmental conservation issues?

2. Will individuals who receive frames that align with egoistic environmental concerns express a greater intention to engage in behavioral change?

3. What elements must be present to effectively frame an environmental issue using environmental concern?

**Questions One and Two Data Collection: Protocol and Instruments**

Two samples were taken to provide data informing question one and question two of this study. The study was a quasi-experimental field study (Campbell & Stanley, 1969; Vogt, 1999), and data were collected onsite at a natural history museum and a zoo, from visitors, while they were visiting. A focal sampling (Harris, 1995) method was used to recruit participants; visitors were intercepted in specific areas of the museum and asked to participate in the study. Upon agreement participants were then randomly assigned either one of the three treatment messages or the control message. Participants were allowed to complete the questionnaire themselves to reduce the likelihood of a
socially desirable response. There was no incentive offered to individuals for participating.

Participants at the natural history museum received a questionnaire containing an item measuring the participants’ current level of involvement regarding global climate change, a randomly assigned a treatment statement regarding global climate change framed by an environmental concern, or the control statement (Appendix F), and a seven item scale measuring their intention. Participants at the zoo received a similar instrument and messages as the natural history museum sample, focusing instead on water pollution. An additional item was included for zoo visitors, asking participants to rate their political view on a seven point scale with a one being extremely conservative and a seven being extremely liberal.

Participants

A total of 252 natural history museum visitors were recruited for study one, 63 per treatment and the control group. Sample size was determined based on Cohen’s (1992) recommendations for a medium effect size with significance of .01 and power of .800 for running an ANOVA between four groups. For those who chose to respond 36% were male and 64% were female. For the zoo sample A total of 180 zoo visitors were recruited for sample two, 45 per treatment and the control group. Sample size was determined based on Cohen’s (1992) recommendations for a medium effect size with significance of .05 and power of .800 for running an ANOVA between four groups. For those who chose to respond 41% were male and 59% were female. All participants were over the age of 18. Data were entered into SPSS v. 17 to facilitate statistical analysis.
The difference in sample size reflects onsite conditions, which dictated a shorter period of time for data collection in the zoo.

*Intent Scale Creation*

To measure participants’ intent on engaging in future behavior a seven item scale (Table 10 and Table 11) was administered. Participants were asked to rate how likely they were to engage in the activities contained in the items. A one was extremely unlikely and a seven was extremely likely. The items were created by the authors of this study and pilot tested on a sample (N=20) of visitors to an informal learning venue. The pilot test focused on the clarity and fluidity of the statements. For the natural history museum sample the seven items making up the intent scale had a reliability of .896. For the zoo sample the seven items making up the intent scale had a reliability of .888.

*Question Three Data Collection: Protocol and Instrument*

To answer question three, visitors to a science center were recruited using the same methods outlined for question one and two. Upon agreeing to participate in the study participants were asked to read three statements about environmental issues framed by environmental concern (Appendix N). Participants were asked to sort the statements into the order in which they were preferred. Data were then collected using a structured interview (Appendix O). The first author administered the interviews, with responses being recorded by hand. Interviews lasted approximately five minutes.
Participants

A total of 45 visitors to a science center were recruited and completed the interview. Twenty (44.4%) participants were male and 25 (55.6%) were female. Thirty (66.7%) participants were in groups containing at least one child younger than 18. All participants were over the age of 18.

Results

How does framing, using environmental concern, influence an individuals’ intention to engage in specific behaviors or change patterns of behavior, in relation to environmental conservation issues?

Natural History Museum Sample

To determine level of prior involvement in global climate change participants responded to the item I am knowledgeable regarding the effects of global climate change. Participants in the control group (\(\bar{x} = 5.25, \text{SD} = 1.33\)) had the highest mean and lowest standard deviation on this item. Participants in the Social-altruistic group (\(\bar{x} = 5.11, \text{SD} = 1.48\)) had the second highest mean and second lowest standard deviation; These were followed by the biospheric group (\(\bar{x} = 4.97, \text{SD} = 1.57\)) and the egoistic group (\(\bar{x} = 4.62, \text{SD} = 1.80\)); this suggests that overall participants had high levels of prior involvement. The control group had the highest level of prior involvement in global climate change, while those in the egoistic group had the lowest level of prior involvement.

Participants in the biospheric group had the highest mean for five of the seven items forming the intent scale (Table 10). Participants in the Social-altruistic group had
the highest mean for the intent scale item *Volunteer my time to an organization whose purpose is to advocate solutions to the problems of global climate change and seek out more information on what I can do to help the situation regarding global climate change*. Standard deviations were mixed between items and suggest bi-modality in participants’ intentions. Participants in the social-altruistic, biospheric, and control groups were most likely to pay more for a product made in an environmentally friendly way. Participants in the egoistic group were most likely to go out of my way to purchase a product in an environmentally friendly way. Participants in the egoistic, social-altruistic, and control group were least likely to donate money to an organization whose purpose is to advocate solutions to the problem of global climate change. Participants in the biospheric group were least likely to volunteer my time to an organization whose purpose is to advocate solutions to the problem of global climate change.

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<tr>
<th></th>
<th>Egoistic</th>
<th>Egoistic</th>
<th>Social-Altruistic</th>
<th>Social-Altruistic</th>
<th>Biospheric</th>
<th>Biospheric</th>
<th>Control</th>
<th>Control</th>
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<tbody>
<tr>
<td><em>Volunteer my time to an organization whose purpose is to advocate solutions to the problem of global climate change.</em></td>
<td>3.32</td>
<td>1.70</td>
<td>3.65</td>
<td>1.98</td>
<td>3.25</td>
<td>1.73</td>
<td>3.40</td>
<td>1.58</td>
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<tr>
<td><em>Donate money to an organization whose purpose is to advocate solutions to the problem of global climate change.</em></td>
<td>3.22</td>
<td>1.84</td>
<td>3.52</td>
<td>1.96</td>
<td>3.71</td>
<td>1.96</td>
<td>2.73</td>
<td>1.89</td>
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<tr>
<td><em>Pay more for a product made in an environmentally friendly way.</em></td>
<td>4.46</td>
<td>1.86</td>
<td>5.03</td>
<td>1.59</td>
<td>5.60</td>
<td>1.62</td>
<td>4.40</td>
<td>1.76</td>
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environmentally friendly way. Go out of my way to purchase products that were made in an environmentally friendly way.

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<th>Item</th>
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<th>SD</th>
<th>Mean</th>
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<td>Go out of my way to purchase products that were made in an</td>
<td>4.51</td>
<td>1.81</td>
<td>4.87</td>
<td>1.51</td>
<td>5.11</td>
<td>1.73</td>
<td>4.33</td>
<td>1.73</td>
<td></td>
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<td>environmentally friendly way. Seek out more information about global</td>
<td>4.41</td>
<td>2.01</td>
<td>4.73</td>
<td>1.66</td>
<td>5.00</td>
<td>1.55</td>
<td>4.33</td>
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<td>2.10</td>
<td>4.97</td>
<td>1.62</td>
<td>4.32</td>
<td>1.47</td>
<td>3.98</td>
<td>2.19</td>
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<tr>
<td>Seek out more information on what I can do to help the situation</td>
<td>4.24</td>
<td>2.16</td>
<td>4.90</td>
<td>1.73</td>
<td>5.32</td>
<td>1.80</td>
<td>4.30</td>
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<td>regarding global climate change.</td>
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<tr>
<td>Tell other people I know about global climate change.</td>
<td>4.08</td>
<td>1.63</td>
<td>4.53</td>
<td>1.45</td>
<td>4.62</td>
<td>1.16</td>
<td>3.93</td>
<td>1.46</td>
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</table>

Table 10. Mean, SD, and Median for intent scale items and summated scale by group.

Note:

(1) Items on the intent scale were rated on a seven point scale with a one being strongly disagree and seven being strongly agree.

Participants who received the biospheric message on global climate change had the largest mean on the intent scale, followed by social-altruistic, egoistic, and then the control group (Table 10). The group means suggest slightly positive levels of intent in engaging in these behaviors. An ANCOVA was run to test the difference between groups on the intent scale mean. Message received was entered as an independent variable, the item measuring prior involvement was entered as a covariate, and the mean score on the intent scale was entered as the dependent variable. The test yielded a
significant differences between groups ($F(3, 235) = 4.13, p=.007, \eta^2_p= .048$), with an observed power of .883. Post-hoc analysis (Bonferonni) was performed to determine between which of the messages significant differences occurred. Post hoc testing indicated the differences between the mean for the biospheric group and the control group and the differences between the mean for the biospheric group and the egoistic group were significant at $p <.015$. The biospheric message group was significantly higher on the intent scale than both the control and egoistic message groups. The covariate, involvement, was significantly related to the intent scale mean ($F(1, 235) = 20.41, p=.000, \eta^2_p = .097$).

**Zoo Sample**

To determine level of prior involvement in water pollution participants responded to the item *I am knowledgeable regarding the effects of water pollution*. Participants in the control group ($\bar{x} = 4.93, SD= 1.14$) had the highest mean and lowest standard deviation on this item. Participants in the Social-altruistic group ($\bar{x} = 4.87, SD =1.41$) had the second highest mean and second lowest standard deviation; followed by the egoistic group ($\bar{x} = 4.84, SD= 1.28$) and the biospheric group ($\bar{x} = 4.67, SD=1.65$); this suggests that overall participants had high levels of prior involvement. The control group had the highest level of prior involvement in water pollution, while those in the egoistic group had the lowest level of prior involvement.

Zoo visitors were asked to respond to the item measuring political viewpoint. Each message group had a mean that was slightly on the liberal side of the scale. Biospheric message participants had the highest mean ($\bar{x} = 4.78, SD=1.46$), followed by
the social-altruistic group (\( \bar{x} = 4.69, \text{SD}= 1.33 \)), the egoistic group (\( \bar{x} = 4.56, \text{SD}= 1.32 \)), and the control group (\( \bar{x} = 4.51, \text{SD}= 1.08 \)). No participants stated that they were at a one (extremely conservative). The most frequently selected rating on this item was four, with 36% of participants choosing this neutral option for their political viewpoint.

Overall the means indicate a slight liberal bias for our sample.

The social-altruistic message group had the highest mean for three of the intent items (Table 11). The biospheric message group had the highest mean for the two items measuring intended purchasing behavior. The control group had the highest mean for two of the intent items. Each group had the highest mean for the item *pay more for a product made in an environmentally friendly way*. Each of the EC message groups had the lowest mean for the item *volunteer my time to an organization whose purpose is to advocate solutions to the problem of global climate change*. The control group had the lowest mean for the item *donate money to an organization whose purpose is to advocate solutions to the problem of global climate change*.

<table>
<thead>
<tr>
<th></th>
<th>Egoistic</th>
<th>Egoistic</th>
<th>Social-Altruistic</th>
<th>Social-Altruistic</th>
<th>Biospheric</th>
<th>Biospheric</th>
<th>Control</th>
<th>Control</th>
</tr>
</thead>
<tbody>
<tr>
<td>Volunteer my time to an organization whose purpose is to advocate solutions to the problem of global climate change.</td>
<td>2.38</td>
<td>1.15</td>
<td>3.13</td>
<td>1.71</td>
<td>3.04</td>
<td>1.17</td>
<td>3.36</td>
<td>1.68</td>
</tr>
<tr>
<td>Donate money to an organization whose purpose is to advocate solutions to the problem of global climate change.</td>
<td>3.04</td>
<td>1.45</td>
<td>3.36</td>
<td>1.55</td>
<td>3.24</td>
<td>2.08</td>
<td>3.29</td>
<td>1.42</td>
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</tbody>
</table>
global climate change.
Pay more for a product made in an environmentally friendly way.
Go out of my way to purchase products that were made in an environmentally friendly way.
Seek out more information about global climate change.
Seek out more information on what I can do to help the situation regarding global climate change.
Tell other people I know about global climate change.

Table 11. Mean, SD, and Median for intent scale items and summated scale by group.

<table>
<thead>
<tr>
<th>Item</th>
<th>Mean</th>
<th>SD</th>
<th>Median</th>
<th>4.91</th>
<th>1.00</th>
<th>4.87</th>
<th>1.74</th>
<th>5.84</th>
<th>1.54</th>
<th>5.69</th>
<th>1.00</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pay more for a product made in an environmentally friendly way.</td>
<td>4.91</td>
<td>1.00</td>
<td>4.87</td>
<td>1.74</td>
<td>5.84</td>
<td>1.54</td>
<td>5.69</td>
<td>1.00</td>
<td></td>
<td></td>
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<tr>
<td>Go out of my way to purchase products that were made in an</td>
<td>4.16</td>
<td>1.71</td>
<td>4.69</td>
<td>1.69</td>
<td>5.76</td>
<td>1.55</td>
<td>5.58</td>
<td>1.23</td>
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<td>environmentally friendly way.</td>
<td></td>
<td></td>
<td>4.72</td>
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<tr>
<td>Seek out more information about global climate change.</td>
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<tr>
<td>Seek out more information on what I can do to help the situation</td>
<td>4.04</td>
<td>1.30</td>
<td>4.49</td>
<td>1.22</td>
<td>4.47</td>
<td>1.38</td>
<td>4.56</td>
<td>1.37</td>
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<tr>
<td>regarding global climate change.</td>
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<tr>
<td>Tell other people I know about global climate change.</td>
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<td></td>
</tr>
<tr>
<td>Intent scale total</td>
<td>4.47</td>
<td>1.03</td>
<td>4.91</td>
<td>1.25</td>
<td>5.10</td>
<td>1.24</td>
<td>4.90</td>
<td>1.35</td>
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</tbody>
</table>

Note:

(1) Items on the intent were rated on a seven point scale with a one being strongly disagree and seven being strongly agree.

Those who received the biospheric message had the largest mean on the intent scale, followed by social-altruistic, control group, and then the egoistic treatment group. An analysis of covariance (ANCOVA) was run with the summated mean score on the intent scale as the dependent variable. Statement received was entered as the independent variable and the item measuring involvement the conservative-liberal item were entered as the covariates. The test indicated significant differences between groups on
participants’ intent $F(3,175) = 2.78$, $p = .047 \eta^2_p = .144$ with an observed power of .990. Those who received the biospheric message had the largest $\bar{x}$ on the intent scale, followed by social-altruistic, control group, and then the egoistic treatment group. Post-hoc analysis (Bonferonni) was performed to determine between which of the messages statistically significant differences occurred. Post hoc testing showed that the biospheric group, the social-altruistic group, and the control group had significantly higher means than the egoistic group mean. The covariate, involvement, was significantly related to the intent scale mean ($F(1, 174) = 27.79$, $p = .000$, $\eta^2_p = .138$). The covariate, political viewpoint, was significantly related to the intent scale mean ($F(1, 174) = 29.06$, $p = .000$, $\eta^2_p = .143$).

Our results from the first two questions suggest that there are differences, based on messages receive which are framed by EC, in intent expressed by visitors to engage in environmental behaviors. We found differences between individual behaviors and the frames used as well as evidence that the egoistic frame was significantly less effective than each of the EC frames and the control frame in sample two. Therefore we investigated what the critical components of these messages are, in order to better inform the future creation of messages framed by EC.

*What elements must be present to effectively frame an environmental issue using environmental concern?*

In the following section, a *theme* is defined as a concept in which four or more participants were found to discuss in their response to questioning. For each theme we
provide one example from the data, full transcription of these data can be provided by the lead author.

Participants were first asked to sort the statements (Appendix N) into the order they preferred them. The majority (66.7%) preferred the biospheric framed statement first, followed by the social-altruistic frames statement (26.7%). Seventy five percent of participants placed the egoistic framed statement last in preference.

Participants were asked to explain for each statement why they placed it in the order they did.

Egoistic framed statement

Two themes emerged from the statements made by those who made positive remarks about the egoistic framed statement. These themes suggest that the focus on individual and human well-being is a critical component of the egoistic frame.

1) “You have to take care of yourself first. If we aren’t well then nothing else can be expected to do well or be healthy.”

2) There are likely to be negative consequences of environmental issues in their lifetime; there are specific issues that participants currently are concerned about impacting their life.

“There is motivating to think about the drastic changes that will come along in my lifetime. What if certain outdoor opportunities are no longer available in the near future?”

There were a number of negative themes emerging from participants

1) It is narrow and selfish
“It’s not about yourself; it’s everybody. We all have to live in the same environment. Someone’s selfish really if they don’t care about that.”

2) That current environmental issues are not affecting the current generation as much as they will future generations

“I don’t think we are really too bad off. It’s the future that we need to worry about.”

3) They are in a stage of life in which they are concerned about what future generations will inherit

“Because at our age I would say that we are more concerned about what our grandchildren will have. They are the ones who will have to grow up and inherit the problems we have. Teaching them is what will truly make things OK.”

Social-Altruistic Framed Statement

There were a greater number of participants to make positive comments about the social-altruistic framed statement. Three themes emerged from the statements made by those who made positive remarks about the social-altruistic framed statement. These themes suggest that the critical components to social-altruistic framed statements are the focus on children, and that the focus on humans is critical to some.

1) They have children

“I have a young child. That starts to make people thing about beyond their lifetime in a way they didn’t before.”

2) It specifically mentions children and future generations
“Because I’m not only concerned about myself so I’d place children and future generations above that.”

3) It is an anthropocentric statement; humans have more value than other life forms

“I’m more giving, looking toward the sake of children. It focuses on humans.”

Although not a theme, the concept that the present is not as bad as the future came up again in one participant’s positive comment towards the statement:

“It mentions children. That’s why I chose it. People are more important than plants and animals. The future is more in trouble than the current day.”

There were not enough negative statements made regarding the social-altruistic framed statement for themes to emerge. Comments made reflect that not having children may make statement less preferable.

“I don’t have children but it is important to leave future generations with a functional world.”

**Biospheric Framed Statement**

Overwhelmingly, the theme that emerges from the favorable response to this statement is that it is inclusive, beyond humans.

“If we don’t take care of everything there wouldn’t be a point. My concern for self and others is part of all living things; it’s a system I can’t just be concerned about a part of it so I started with the message that included everything.”

No negative themes emerged due to the low number of negative comments made by participants towards the biospheric framed message; some did suggest that not focusing on humans detracted from the message.
“Plants, animals, marine life to me this detracts from the message because it is less about humans.”

The interview explored if participants felt being in an environment such as a science center or zoo increased their awareness of environmental issues. Participants stated that they were aware of the environmental theme to venues such as zoos and science centers; that they read and respond to the messages they encounter at these venues, and that they expect to encounter these messages when they visit zoos and science centers. This suggests visitors are primed for messages, possibly biospheric framed, focusing on the environment.

“It’s the main topic here so it’s on top of my mind.”

Participants mention the conversation among visitors that is facilitated during visits to these institutions.

“It affects children because they are impressionable. When I was young I learned so much from visiting these places. We need to start young and develop an awareness at an early stage”

Participants also discussed specific exhibits both that they have encountered during their current visit and from previous visits to other institutions.

“It makes you more aware. It consciously makes you more aware. We just entered the building here and were more aware. And at the zoo we saw a skit about animals and how they need rescued. That made us think about that during our zoo visit”

Participants did not feel their order of preference would have changed if they were in a venue not focusing on science and the environment. As reflected in the
comments above participants responded in terms of an increased awareness but not in a manner that reflected a shift in the type or level of concern.

**Discussion**

Our results suggest that in a zoo or natural history museum context, messages framed by biospheric concerns were most effective for motivating information seeking and other positive behaviors. These results suggest that messages framed by biospheric concerns will be preferred in a zoo context over messages framed by social-altruistic or egoistic concerns. When immersed in an environment such as these ISE providers, individuals may take on a perspective that allows for biospheric messages to be attended to and processed more meaningfully than those framed by the other concerns.

The results from phase two also suggest a “boomerang effect” in that participants who received the egoistic framed message express lower intent than the other frames, and the mean for this group was lower than that of the control group. Individuals visiting a zoo or similar ISE provider expect that they will encounter messages framed by concerns that are not individualistic or egoistic. Visitors to these institutions attribute their awareness to the exhibits and other aspects of the built environment when visiting these institutions. This may also suggest that visitors would reject or not attend to messages in these setting that are framed egoistically.

Our results suggest that controlling for both involvement and political views found significant differences between groups for intent. This may suggest that messages framed by involvement or political views would be more effective at promoting behavior change. However the dichotomous nature of political views highlights the importance of
framing using EC: an EC frame that does not align with a visitor's EC should not cause the visitor to become offended or reject the message, whereas messages framed by an opposing political view may cause a visitor to process the message in a biased manner (Teel et al., 2006).

Our results suggest differences in the level of intent for future behaviors. Behaviors related to volunteering time and money had the lowest level of intent across groups. Purchasing behaviors such as paying more or going out of the way to purchase products that are made in environmentally friendly ways had the highest levels of intent across groups.

Very few participants in our study found desirable aspects of the egoistic frames statement. Those who made positive remarks about the social-altruistic framed statements focused on the children and future generations’ component of the statement. The *others in my community* component of the social-altruistic message went completely unreferenced by participants as being positive or negative. Those who made positive remarks regarding the biospheric framed statement find the inclusive nature of the statements to be desirable. These participants saw value in all life forms and the connection between the health of all living things and the health of humans.

We did not find evidence that visitors explicitly felt that their surroundings affected their preferences for the statements framed by environmental concern. We found that visitors to ISE institutions are acutely aware of their surroundings, suggesting visitors may be primed and expecting messages using a biospheric frame. The visual stimuli put forth by ISE providers are effective in gaining the conscious attention of the
visitor and seemingly to cause meaningful processing the information (Eagly & Chaiken, 1993).

Our findings add to the growing body of knowledge on the impact of visiting ISE contexts (National Research Council, 2009; 2010). We have shown the manner in which information is framed in ISE settings can contribute to the behavior that individuals express intention of undertaking in the future. Generalizing this finding to the other components of the Theory of Planned Behavior (Azjen, 1991) we would also expect then that framing can impact the attitudes and knowledge of visitors to institutions offering ISE programming. This has been shown for knowledge gained by zoo visitors by Falk et al. (2007).

Our findings are also relevant to the body of knowledge on persuasion and how individuals process information (i.e. biased or not) in ISE settings (Eagly & Chaiken, 1993). It is has been suggested that high involvement leads to biased processing (Johnson & Eagly, 1989) especially when it involves highly controversial environmental issues (Teel et al., 2006). However, our findings suggest that we do see movement in intent based on the frame individuals’ received in our studies. This suggests that when accounting for involvement and political view the processing that occurs in ISE contexts may be meaningful in shaping attitudes and future behaviors.

Our findings suggest that political views should be accounted for in theories regarding attitude formation and behavior in relation to environmental issues. Much has been written on the political polarization of global climate change (e.g. Nisbet, 2009) however our findings stem from messages regarding water pollution. This suggests that political views affect individuals’ attitudes or behaviors towards the environmental issues
beyond the highly charged and highly visible issues of global climate change or drilling for oil in the Alaska National Wildlife Refuge or in the Gulf of Mexico.

Practical Application of Findings

Our findings have direct bearing on institutions offering ISE programming and how this programming is developed. We have found that framing communication using environmental concern is an effective means of communicating information in a way that shows significant differences in expressed intent by visitors. Ideally, issues and information would be framed multiple times and in multiple places using all three frames of environmental concern. That situation is a luxury not afforded to most ISE providers so our first suggestion would be to use the biospheric and social-altruistic frames together to reach the broadest portion of the audience. If only one message using one frame is possible, our suggestion in ISE settings would be the biospheric frame.

Another recommendation to practitioners based on our findings, is a word of caution when developing programming and interpretive materials for use with visitors: choosing an effective frame is critical and perhaps not as easy as going with what seems right or what is stated as being based on research. With the proliferation of how-to guides on visitors and recommendations based on studies of psychographic and demographic information, it is common to see communication guides, which purport to serve a variety of audience needs. However, if a communication guide does not provide evidence that it has been tested in an applied setting a practitioner should first do some basic testing with visitors before investing significant resources in framing communication using a specific guide. Our findings also suggest that it may be more
productive for ISE providers to focus on purchasing and information seeking behaviors and not focus as strongly on volunteering or contributing money to groups that advocate solutions to environmental issues.

A final word on the relevance of our findings to practitioners is that they do matters! Our findings suggest that the communication in ISE settings does matter in that it influences the intention of engaging in future behavior of visitors. With most adults receiving their knowledge on scientific issues through ISE experiences, there should be no discounting the importance of the field and the importance of well trained, knowledgeable practitioners. The interpretive designers, the educators, the docents, all staff and volunteers who provide educational opportunities to visitors have the chance to make a difference regarding the outcomes of the experience for the visitor.

Implications for Future Research

A critical direction for future research based on our findings would be to investigate the long term effect of messages framed by the different concerns. Would one frame be more effective than another at promoting long term retention of messages? Our findings show that onsite during the visit the biospheric frame was more successful at creating intent, but would this hold up over time? Perhaps the egoistic message, although least likely to create intent during the visit, would be the message retained the longest due to its contrast with the biospheric preference shown by visitors.

Similarly, what are the effects of multiple exposures to messages over time? Would exposure to the same frame repeatedly be more effective than exposure to multiple frames repeatedly? Logistically, a study like that would be very difficult to
conduct, however the findings would have lasting value. A longitudinal study of the behavioral impact of visiting ISE providers would be a truly groundbreaking study in the field.

Lastly, we have put forth in our findings that context matters. However, studies in other contexts are a must for rejecting our assertion. We would recommend studies in a variety of social venues from sporting events to shopping areas to venues that are similar to zoos or natural history museums but have little or no ISE programming such art museums. This would provide communication practitioners across fields with empirical data on which to make decisions on how to frame environmental messages.

**Conclusions**

The study reported on provides empirical data to inform the framing of communication by ISE providers using environmental concern. Our findings suggest the biospheric concern frame produces higher intent than other frames using environmental concern. We found this to be true for the separate issues of global climate change and water pollution. Our findings stem from data collected in a variety of ISE settings and potentially generalizable to similar ISE settings such as parks and nature centers.

Recommendations from our findings include the use of multiple frames on multiple messages regarding environmental issues if possible and focusing on purchasing behaviors that are environmentally friendly. Our findings add to the body of research suggesting the power of ISE providers and highlight the ability of an effective frame of communication in these settings. Our findings suggest ISE providers can effectively
frame communication to potentially produce behaviors considered positive for an engaged and educated citizenry.
Chapter 6 – Towards an Applied Theory of Communication in Informal Science Education Contexts Framed by Environmental Concern

Abstract

Informal science education settings such as zoos, natural history museums, and science centers are tasked with educating the public about complex scientific topics. Conservation based informal science education contexts also aim to inspire visitors to engage in behaviors which would mitigate or reduce the environmental troubles we face today. To these ends, effective communication in informal science settings is critical. The following article lays the groundwork for theory on communication in informal science education contexts using messages framed by environmental concern. We briefly cover the literature on environmental concern and then discuss the findings and implications of a series of studies conducted by the authors. We assert that environmental concern is an effective frame of communication in informal science settings and that the biospheric concern frame is the most preferred and effective frame to use. We discuss potential fruitful avenues for future research on messages framed by environmental concerns and the implications to theory that our findings have.
Introduction

A key task for Informal Science Education (ISE) programming is the effective communication of extremely complex scientific concepts to participants who may be lay people in terms of scientific background and knowledge. Further, many ISE providers such as zoos and natural history museums have incorporated into their mission behavioral outcomes based on participating in onsite programming (Association of Zoos and Aquariums, 2010; Krishtalka & Humphrey, 2000; Patrick, Mathews, Ayers, & Tunnicliffe, 2007). We know across disciplines that the way information is framed will have an affect on the formation of attitudes and potentially affect future behaviors related to the message topic. While there is no lack of “how-to” guides for framing scientific communication (e.g. Biodiversity Project 2004; Earth Justice, 2008; Globalchange.gov, 2009; Maibach, Roser-Renouf, & Leserowitz; Pike, Dopplet, Herr 2010), many of these are based on demographic and psychographic profiles of potential participants, are not supported by published field testing, and would require frequent changes in how information is stated depending on the intended audience. All of this can lead to a lack of clarity in what is potentially the biggest decision an ISE provider that utilizes permanent signage can make: how to frame these messages?

In an ISE setting that focuses on animals, environmental science, or natural history, environmental concern (Schultz, 2000; 2001) is an effective frame for messages asking visitors to engage in future information seeking behaviors. In the following section we briefly review the literature related to environmental concern and highlight relevant findings on message framing from the communications literature. We then
assert, based on empirical data, 1) that environmental concerns can be used to frame myriad (if not all) environmental issues presented by ISE providers, 2) the biospheric concern frame is most preferred and effective in creating intent by visitors in the context of a visit to an ISE provider, 3) the context of ISE providers that focus on animals, natural history, and environmental science may cause a perspective taking in visitors which serves to temporarily increase biospheric concerns, 4) environmental concern is an inclusive frame, and 5) individuals’ concern regarding specific environmental issues may shift due to media attention and personal relevancy. We then briefly discuss the presence or lack of truly altruistic motivations as related to our findings on framing communication using environmental concerns, the impact of life stage on message framing, and the need to consider populations outside those considered status quo of ISE visitor, i.e. incorporating messages framed for multi-cultural, multi-gendered, and socio-economic diverse populations.

Our hope is to lay the groundwork for more research on framing communication to the general public using environmental concern. Throughout the article we provide opportunities for future questions and studies to be created in the hopes of contributing to the development of stronger theory that can be applied by practitioners. In the conclusion of this paper we will highlight the call for more research on specific findings that we put forth. Ultimately our goal is to build a body of knowledge that can be utilized with the greatest simplicity by ISE providers who work in direct contact with their constituents.
Review of the Literature

Environmental Concern

The concept of environmental concern (EC) has not been consistently defined by the literature (Tankas-Santa, 2007). Environmental concern finds its roots in the psychology and sociology literature of the 1970s (Dunlap & Van Liere, 1978; Lounsbury & Tornatzky, 1977; Maloney & Ward, 1973; Weigel & Weigel, 1978). Our definition of EC for this paper is in line with Stern’s (2000) definition. That is EC is subconscious until activated by potential threats to valued objects, and can result in an individual engaging in behaviors thought to mitigate the threat to the valued object. EC is not attached to specific environmental issues, as the awareness that an issue would have an impact on the valued object would result in an individual attempting to mitigate the situation regardless of the issue.

Theoretical developments regarding EC suggest that all individuals have concern for the future of our environment and preventing catastrophic environmental degradation (Stern, Dietz, & Kalof, 1993; Stern & Dietz, 1994; Schultz, 2000 & 2001; Schultz, et al., 2005). The reasons for this concern most likely range from self serving to the sake of other humans to the sake of all living beings, most likely incorporating some level of concern for all of these (Schultz, 2000; 2001). In the 1990’s researchers began to examine the structure of these concerns and identify meaningful categories of existing concern (Stern and Dietz 1994; Stern, Dietz, and Guagnano 1995). Stern, Dietz, and Kalof (1993) advanced the theory by proposing that EC was an extension of the Schwartz’ norm activation model, creating what was eventually identified as the value-
belief-norm theory (Stern, 2000). This theory posits that people act based on the adverse consequences they believe environmental problems will have on their EC. This suggests by accessing or influencing EC, educators would have the potential to create positive behavioral change in individuals. Further, for this article, we utilize the tripartite categories of EC as measured my Schultz’ (2001) Environmental Concern Scale (ECS): egoistic (concern for one’s health, well-being, lifestyle, and future), social-altruistic (concern for one’s children, other humans, and future generations), and biospheric (concern for all living beings, including humans).

Schultz and Zelezny (2003) put forth two critical ideas for communication framed by EC. First, the authors claim that creating messages designed to tap in to individuals’ environmental concerns will be effective in creating positive environmental behaviors. Second, the authors suggest that in America, statements focusing on egoistical concerns should resonate more. This is based on their synthesis of research suggesting that Americans value individualism and motivated by materialistic gains in status (Kohls, 1984). It is notable that the body of work attributed to Inglehart (e.g., Inglehart, 2000; Inglehart & Baker, 2008) would suggest that as societies become more advanced members leave behind selfish/survivalist values and move towards tolerance, interpersonal trust, and environmental preservation.

Framing Environmental Communication

In communication, frames are a way to organize the reality of an issue or event in a way that promotes a particular way of defining or interpreting the event (Chong and Druckman, 2007a; Gamson & Modigliani, 1987 & 1989; Shah, Watts, Domke, & Fan,
Frames can be thought of as storylines which simplify an issue in order to make it pertinent to a specific audience (Scheufele, 1999; Ferree, Gamson, Gerhards, & Rucht, 2002; Price, Nir, & Capella, 2005). Frames consist of the words, images, metaphors, comparisons, and presentation styles that are used when communicating information regarding an issue (Gamson & Modigliani, 1987, 1989; Chong & Druckman, 2007b). Frames are based on a simplified version of the facts surrounding a situation, which makes them different from putting a “false spin” on an issue (Nisbet, 2009).

Framing effects occur when an individual’s opinion on an issue is altered based on how that issue is presented or framed (Chong & Druckman, 2007a, 2007b; Rasinski, 1989; Sniderman & Theriault, 2004; Zaller, 1992). It has been suggested that framing environmental communication effectively will lead to positive changes in human behaviors that effect the environment (Davis, 1995; Saunders, 2003; Schultz & Zelezny, 2003). Experts in environmental communication have suggested the need to clearly state the problem and possible outcomes when addressing environmental issues (Cantrill, 1993; Rowan, 1991; Vaughan & Seifert, 1992).

The ways in which media frame debate on an environmental issue is a critical factor in how the public at large views the issue, and is not taken lightly by environmental communication researchers. Nisbet (2009) suggests that the current gridlock regarding climate change policy is due in part to the partisan framing efforts by a variety of media outlets. Durfee (2006) examined how framing air quality issues influenced individuals’ risk perception, finding that the frames used in news articles could influence individuals’ perceptions of risk. Further, Gamson and Mogdigliani
(1989) linked coverage and framing of nuclear energy to the ebb and flow of public support for nuclear energy; while others (e.g. Burgess, Harrison, & Filius, 1998) suggest that the ways media frame environmental issues can have an effect on all levels of policy setting and agenda making.

In environmental communication, a number of current issues have been examined to decipher the different frames used when communicating environmental issues and how these frames influence individuals. For example, researchers have argued issues surrounding global warming were politicized by conservative political and media groups, effectively halting the U.S. involvement in international treaties, by purposely using doubt as a frame (McCright & Dunlop, 2000; McCright & Dunlop, 2003). Others have found that messages using affect and imagery have a measurable influence on American perceptions of climate change (Leiserowitz, 2006). Teel, Bright, Manfredo, and Brooks (2006) examined different frames regarding the environmental impact of drilling for oil in Alaska. Data from this study suggest that individuals will process information regarding controversial environmental issues in a manner consistent with prior views. This finding led to the recommendation by the authors that attitude change may require messages that go beyond a simple presentation of facts, e.g. messages framed in ways that make an issue salient.

**Informal Science Education**

The research reviewed in this article was conducted onsite at three types of organizations that offer informal science learning experiences: a zoo, natural history museum and a science center. It is widely acknowledged that individuals encounter most
of what they may learn about science through experiences with informal science education (Falk, Dierking, & Foutz 2007; National Research Council, 2009; Rennie & Williams, 2006). Zoos, natural history museums, and science centers are ISE settings in which visitors receive messages designed to educate them on specific topics and to promote seeking more information on these topics. Zoos provide an ideal setting for the study of conservation education-based communication (Clayton, Fraser, & Saunders, 2008). For a zoo to be certified by the Association of Zoos and Aquariums (AZA, 2010 pg. 13) they must include both “conservation” and “education” in their missions. Specifically, to exhibit signage and interpretive devices, AZA (2010) requires signage to “be based on the thoughtful development of conservation messages for the institution and may include information regarding the animal’s natural history, conservation and care, ecology, relation to humans, correct taxonomic identification and current status (i.e. endangered or threatened)” (pg 13).

Signage is supposedly one of the most efficient ways of reaching a large number of visitors over a long period of time; therefore signage at zoos is heavily relied on to fundamental messages related to conservation education (Mony, 2007). However, some research suggests signage is often overlooked or ignored by visitors (Screven, 1992). Signage based on empirical data on visitor preferences for signage may prove more effective at attracting visitors’ attention and imparting the desired messages of the zoo.

Science centers and natural history museums focus on environmental and conservation issues as well. Winker (2004) states, “The mission of museum natural history collections is to document biodiversity and its distribution and to serve as a resource for research and education” (pg. 445). In the same vein, Krishtalka and
Humphry (2000, pg. 611) state Natural history museums have a commanding mission—nothing short of understanding the life of the planet for the benefit of the earth and its inhabitants. According to the Association of Science-Technology Centers Incorporated (2009) “science centers are sites for informal learning, and are places to discover, explore, and test ideas about science, technology, engineering, and mathematics.”

These ISE settings receive substantial visitation: according to the AZA there were 175 million visitors to accredited zoos and aquariums in 2008, according to ASTC over 80 million people visit science centers annually and according to the American Association of Museums individual museums with collections focusing on natural history and anthropology average 80,000 visitors per year per museum. While people visit zoos and other ISE settings for myriad reasons, research on visitor motivation identifies that for many visitors, education or learning is a key outcome for a number visitors (Falk, Heimlich, & Bronnenkant, 2007). Adults particularly tend to express a desire for their children to learn from an experience to a zoo (Morgan & Hodgkinson, 2000). Due to both the stated mission and the self-reported desire of many visitors to ISE providers, they are likely settings for research in conservation education.

Methods

The assertions made in this article stem from findings from two studies conducted to answer the five questions listed below. Table 12 shows a breakdown of each study including sample location, method, sample size, and question answered.
1) How does framing influence an individuals’ intention to participate in specific behaviors or change patterns of behavior, in relation to environmental conservation issues?

2) What elements must be present to frame an environmental issue appropriate to an individuals’ environmental concern value orientation?

3) Will individuals who receive frames that align with egoistic environmental concerns express a greater intention to engage in behavioral change?

4) What preferences do individuals have regarding written messages framed by environmental concern?

5) What is the relationship between individuals’ expressed environmental concern, overlap between nature and self, and preferences for statements framed by environmental concern?
<table>
<thead>
<tr>
<th>Study</th>
<th>Venue</th>
<th>Sample Size</th>
<th>Method</th>
<th>Question’s explored #’s from above</th>
<th>Measurements</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Large Zoo City One</td>
<td>N=298 zoo visitors</td>
<td>Survey</td>
<td>Question 4 Question 5</td>
<td>ECS (Schultz, 2001) INS (Schultz, 2002) Preference of statement</td>
</tr>
<tr>
<td></td>
<td>Large Zoo City Two</td>
<td>N=400 zoo visitors</td>
<td>Survey</td>
<td>Question 4 Question 5</td>
<td>ECS (Schultz, 2001) INS (Schultz, 2002) Preference of statement Rating of statements</td>
</tr>
<tr>
<td></td>
<td>Large Natural History Museum City Three</td>
<td>N=252 natural history museum visitors 63 per message</td>
<td>Quasi-experimental, random assignment with control group</td>
<td>Question 1 Question 3</td>
<td>Involvement Intention Scale Demographics</td>
</tr>
<tr>
<td></td>
<td>Large Zoo City Two</td>
<td>N=180 zoo visitors, 45 per message</td>
<td>Quasi-experimental, random assignment with control group</td>
<td>Question 1 Question 3</td>
<td>Involvement Intention Scale Demographics Political views</td>
</tr>
<tr>
<td></td>
<td>Large Science Center City Two</td>
<td>N=45 science center visitors</td>
<td>Structured open ended interviews</td>
<td>Question 2</td>
<td>Interview schedule</td>
</tr>
</tbody>
</table>

Table 12: Studies and methods used to acquire data
Towards a Theory Based on Empirical Evidence

The Usefulness of Environmental Concern and the Effectiveness of Biospheric Concern

A key argument for the usefulness of EC is that it can be used to frame messages on myriad topics related to humans concern about the consequences of environmental issues. We assert that statements framed by EC can be created for most if not all environmental issues. In two samples, using survey methods, zoo visitors were asked to state and rate their preferences for statements framed by environmental concerns. We found that a majority of participants preferred the statement framed by biospheric concern. These statements were described the status of an endangered mussel native to local waterways. Using a separate sample, we found similar results; a majority of participants stated a preference for a generic statement regarding environmental issues and information seeking behaviors. Participants were asked to rate their level of agreement with the statements framed by the different concerns as well; the biospheric statement received the highest level of agreement.

Using a quasi-experimental design, we found similar results for samples using a highly politically charged topic, global climate change; and a less politically charged (in the location the study was conducted) topic, water pollution. For the sample using messages regarding global climate change we controlled for prior involvement in the issue. Participants read a statement on global climate change, which was framed by one of the concerns or a control statement which contained facts. Participants then completed a scale measuring future intent of behaviors line with Stern’s (2000) taxonomy of environmental behaviors. When controlling for prior involvement we found that
participants who received the biospheric framed messages expressed significantly greater intent in engaging in future behaviors over those who received the egoistic message or the control message.

For the sample using messages on the topic of water pollution, we used visitors to a zoo. The measurements and frames from the global climate change study were used, as well as an added item which asked participants to rate their political views from conservative to liberal. We used the score on this item to control for the effects of political view, alongside the effects of prior involvement. Our findings, which were in line with the prior study, were that participants receiving the biospheric framed messages expressed a significantly higher intent than those who received the egoistic or the control message. We also found significant correlations between political view, involvement, and intent to engage in environmentally friendly behaviors. This finding needs to be taken into account by program providers: environmental issues are inherently political issues.

In the water pollution study, we found evidence of what is called a “boomerang effect” towards egoistic framed messages in a zoo setting. A boomerang effect occurs when a message is produced with a specific intention; however the result of an individual coming into contact with that message produces the opposite intent. Not only is the message ineffective, it is actually counter-effective (for a review see Byrne and Hart, 2009). Boomerang effects have been linked with messages on topics such as anti-litter (Reich and Robertson, 1979), smoking (Wolburg, 2006), and donations (Small, Lowewenstien, and Slovic, 2007). Related to our study, Hart and Nisbet (2010) found
boomerang effects in messages related to global climate change. This was attributed to participants’ political views (conservative political view points experienced a boomerang effect). Hart and Nisbet also found that the boomerang effect could be somewhat mitigated by focusing on the local effects of climate change.

Our assertion of a boomerang effect for the egoistic framed message is based on the finding from the quasi-experimental study of zoo visitors. Visitors who received a message framed by egoistic concern expressed significantly lower intent not only to those who received the biospheric frame, but also lower than those who received a control message that was a statement of facts on the topic of water pollution. Since we did not experience a similar finding in a study of visitors to a natural history museum, we would make a recommendation that is particularly applicable to zoos: do not frame messages using egoistic concern. To be blunt, it would be preferable to have no message at all on a topic over having a message that produces a boomerang effect. We interpret these findings as further evidence of the potential for success in framing messages using biospheric concerns in these ISE contexts.

**Perspective Taking: a Contextual Increase of Biospheric Concern**

Another finding from this suite of studies that visitors to ISE contexts have heightened levels of biospheric concern. Our main argument derives from the level of biospheric concern we found in zoo visitors, as measured by Schultz’ (2001) scale. As shown in Table 13, we found higher levels of biospheric concern with strikingly lower standard deviations, among zoo visitors than have been reported in any similar studies.
using American samples. Included in these studies is Schultz' (2000) study in which he found those asked to take the perspective of an animal being hurt by its environment expressed significantly higher levels of biospheric concern than those who did not engage in perspective taking.

<table>
<thead>
<tr>
<th>Study</th>
<th>Sample Population and n</th>
<th>Biospheric subscale $\bar{x}$</th>
<th>Biospheric subscale SD</th>
</tr>
</thead>
<tbody>
<tr>
<td>Yocco phase I (2010)</td>
<td>Zoo visitors age 18 and older (n=298)</td>
<td>5.95</td>
<td>0.98</td>
</tr>
<tr>
<td>Yocco phase II (2010)</td>
<td>Zoo visitors age 18 and older (n=400)</td>
<td>5.89</td>
<td>1.00</td>
</tr>
<tr>
<td>Schultz (2000)</td>
<td>US college students asked to take the perspective of an animal being harmed by pollution (n=30)</td>
<td>5.82</td>
<td>Not reported</td>
</tr>
<tr>
<td>Schultz (2001)</td>
<td>US College Students (n=148)</td>
<td>5.33</td>
<td>1.46</td>
</tr>
<tr>
<td>Schultz (2001)</td>
<td>US College Students (n=1010)</td>
<td>5.33</td>
<td>1.38</td>
</tr>
<tr>
<td>Schultz (2001)</td>
<td>California residents (n=1005)</td>
<td>5.46</td>
<td>1.49</td>
</tr>
<tr>
<td>Schultz et al. (2004)</td>
<td>California undergraduate students (n=160)</td>
<td>5.54</td>
<td>1.39</td>
</tr>
<tr>
<td>Schultz et al. (2004)</td>
<td>California undergraduate students (n=98)</td>
<td>5.47</td>
<td>1.10</td>
</tr>
</tbody>
</table>

Table 13. Comparison of findings of mean score on biospheric concern using Schultz's ECS scale

The value in this finding is that theorists suggest perspective taking leads to empathy which can lead to helping behaviors (Meyers, Saunders, and Bexell, 2009). Further exploration of this finding is necessary but would require the use of a non-ISE visiting control group. Developing an instrument to be administered in ISE settings such as zoos to measure if visitors feel more in touch with plants or animals who are harmed by environmental troubles than non-visitors; if visitors are more aware of the impacts of
environmental issues on animals etc. than non-visitors, and if visitors take the perspective of these animals when they encounter messages in the ISE setting. This would provide evidence to the presence or lack of perspective taking by visitors in zoos. If findings continue to suggest perspective taking occurs while visiting these ISE providers, effective theory would need to incorporate that multiple visits should lead to greater empathy which would lead to a greater likelihood of engaging in helping behaviors towards animals, plants, etc. in the environment as suggested by theorists on perspective taking (Myers, Saunders, and Bexell, 2009). However, this would be difficult in that creating a causal chain necessitates the use of controlled population studies at each link of the chain of causality.

Our finding that zoo visitors have levels of biospheric concern higher than those found by Schultz (2000) in his perspective taking experiment and those found in other studies suggests that the increased level of biospheric concern may be contextual; that perspective only lasts while visiting the zoo or other ISE provider. However, there is another explanation beginning to be explored, that zoo visitors are psychographically different from the general population and different from visitors to other informal settings (Fraser, 2010; Meyer, 2010), that zoo visitors have had different life experiences and different perspectives which have led them to become zoo visitors. Schultz and Zelezny (2003) posit that messages framed by egoistic concerns would be more effective for communicating environmental issues to the American public. This would suggest that our findings may not apply in other contexts such as shopping at a mall, viewing television, or at a sporting event. This is important to note because each of these
scenarios are locations where one may encounter messaging related to environmental actions. Further studies are necessary to determine the type of concern that would be most effective for communicating environmental issues in these contexts. It should hold true then that a coordinated messaging campaign which takes advantage of the knowledge that individuals hold various levels of concern depending on the context would be most effective if it takes advantage of framing messages using the type of concern aligned with the specific venue.

*The Inclusiveness of Environmental Concern*

Another advantage of environmental concern frames is they are not dichotomous; they do not pit one side against the other. Examining the frames more closely, one can see that they potentially build upon each other to become more inclusive from egoistic to social-altruistic to biospheric. An individual motivated by egoistic concerns could potentially see that they are part of “all living things” and therefore would not feel excluded by a message framed by biospheric concerns. The same can be said for a social-altruistic frame in which an egoistic individual could realize they too are part of “people in my community.” Because the concerns build on each other, an individual receiving a statement framed by a concern that is not their dominant concern is less likely to become offended or resistant to a message if they can see how it may relate to what they are concerned about; in other words, if the frame is inclusive rather than exclusive.

The results of an individual in a public space, such as an ISE setting, coming across a message framed by a misaligned concern seem benign when compared to the
potential results of an individual coming in contact with messages framed by misaligned political or religious frames, which are generally more peripheral beliefs and therefore more emotionally laden (Bem, 1970). Although framing an issue politically or with religion would be a way to motivate a large number of visitors, it would also be a way to cause biased processing of the message and lead to the message being ineffective. Further, it may turn off the visitor who may then choose to become a non-visitor of the specific institution in the future. The use of messages framed by EC could help to avoid issues of political or religious bias inherent in environmental messaging.

Findings suggest that biospheric framed messages would be the most inclusive. In structured interviews with visitors to a science center we again found that the majority of participants preferred the generic environmental issues biospheric framed statement over statements framed by the other concerns. We explored further what was causing the preference for this frame. We found the inclusive nature of the biospheric frame is what caused the majority of participants to prefer that statement. Our findings suggested that while most participants had nothing to note negatively regarding the biospheric framed statement, those who did react negatively expressed an anthropocentric view of the world, suggesting they felt that ensuring the safety and survival of humans is the top priority.
Concerned about what?

Part of our inquiry focused on uncovering specific topics of concern to visitors to ISE providers and also delving into how these concerns are developed. We found evidence that, to some degree, specific issues of concern may be temporal and strongly influenced by media coverage. We back up this assertion with empirical data collected during a time of intense media coverage of an active deep water oil well leak in the Gulf of Mexico. All 45 participants interviewed specifically mentioned being concerned about the oil spill. As data were collected outside of the Gulf area it can be assumed that in part these participants gained their knowledge from television, newspaper, internet, and/or radio news reports.

The ability of the topic of specific concerns to change as quickly as the headlines, points to a potential shortcoming for ISE providers who utilize permanently installed signage to convey messages: responsiveness. Being able to rapidly respond to current events with temporary exhibits/signage would allow for ISE providers to take advantage of top of mind topics; perhaps leading to a greater likelihood of meaningful processing of the message by visitors. Although this may not be a surprise to those who provide programming in ISE settings, our results suggest that in terms of relevancy, the media will play a part in dictating the content to which visitors are most likely to be responsive.

With the understanding that most signage is permanent and most programs are developed and tested over a period of months if not years, it is with no flippancy that we make a recommendation that ISE providers be sure to incorporate an aspect of their
programming that can be immediately responsive to current events. This may be as simple as providing current topical messages that are updated or changed on a daily basis, or perhaps more effectively, creating temporary experiences such as cart programs or roving interpreters, which focus on a topic currently receiving attention in the media. Our assumption is that combining communication framed by environmental concern (biospheric) with top-of-mind topics would lead to the greatest potential for ISE providers to effectively communicate with their visitors in meaningful ways.

Media were not the only factor that played a role in the specific topics of individual concern. Another method of developing a concern is involvement with a specific aspect of nature either through work or a hobby. Our interview study asked participants if they were involved in any environmental issues for which they had stated concern for (for the study we told participants that involvement was donating either time or money to an environmental issue). We found that individuals who stated they were currently involved in an environmental issue they were concerned about had become involved through their participation either through work or personal life in activities related to that cause.

For example, a female participant stated she was involved in cleaning local waterways. She noted she had become concerned and involved with local water issues because she was an avid boater at a local lake. Another female participant explained that she was involved with conservation of sea animals. Her reason for concern and involvement was that she had been employed by an aquarium and developed a passion for sea creatures through her work. A male participant stated that he was a
member/donor to the Audubon Society due to his bird watching hobby. Perhaps those who incorporate zoo visiting into their personal life have developed a greater concern for animals based on life experiences (Fraser, 2010). Perhaps this would lead to involvement as we have defined it.

We attempted to gain insight into the importance of context by asking participants if they felt that they would have stated different preferences if they were viewing the messages in a different setting. The data acquired through this question suggest participants were able to state that they felt a greater awareness of environmental issues while they were in the context of a science center, however visitors felt their preferences did not shift based on context. This suggests that the signage and exhibits prime visitors to these ISE contexts; they are expecting to come into contact with messages and programming promoting environmental behaviors. This further highlights the need for research to be done in authentic settings, using similar messages, and compared with data collected from samples in non-ISE contexts to determine how other experiences prime visitors for messages.

*Everything I do, I do for you, because I see how it benefits me!*

According to some, altruistic behavior, that which an individual engages in for the sake of the benefit of others, plays a key role in reducing the impact of environmental issues. Batson and colleagues (e.g. Batson, Duncan, Ackerman, Buckley, and Birch, 1981; Batson and Shaw, 1991; Batson, Ahmad, and Stocks, 2004) have spent thirty years arguing that empathy can induce altruism. In short the *empathy-altruism hypothesis*
possits that empathetic concerns felt for another produces altruistic motivations and behaviors that relieve the need of the other (Batson, 2009).

The concept of altruism has no shortage of critics. Perhaps the most potent argument against true altruism is that individuals specifically do things for others only when they see a benefit to self (e.g. Cialdini, Brown, Lewis, Luce, & Neuberg, 1997). These behaviors can be motivated by a need for the helping individual to reduce the empathy caused by the other, by the desire for a helping individual to avoid punishment (e.g. social expectations of others observing), or reward seeking. It is not suggested that individuals are consciously aware that they benefit from these behaviors or that individuals engage in these behaviors to be manipulative. The response by many is that there is simply no true altruism that exists in human behavior (Maner et al., 2002).

The findings from our studies are in line with the view that altruism is more of another form of self-serving behavior rather than a completely no-strings attached way of doing kind deeds. We found that when individuals’ discussed what they like about the altruistic message, none made any mention of the “others in my community.” All statements reflected concern for one’s children and grandchildren. In our two survey samples we found a significant positive correlation between individuals’ level of egoistic concern as measured by Schultz’ ECS scale (2001) and preferences for the altruistic framed statement.

We are not saying that altruistic statements are without value. Our findings suggest exactly the opposite. Most individuals’ rated altruistic framed statements higher than the egoistic frame. It would seem that individuals are more motivated by the others
whom they have developed strong bonds with, possibly more so than by interest in self. This is in line with interpreting seemingly altruistic behaviors as actually occurring because one sees a benefit to self (proxy egoism). Therefore, we recommend these altruistic messages as a means of communication that encompasses both the egoistic and altruistic concerns for many individuals.

*Life Stages and Legacy issues*

There is a body of knowledge showing that individuals’ goals and concerns for the future are related to their life stage (e.g. Ebner, Freund, Baltes, 2006; Nurmi, 1992). Findings from our research suggest that an individuals’ stage of life has an impact on the type of concern that they hold. Individuals who have children or grandchildren were most likely to mention that these family members influence their worldview on environmental issues. We spoke with adults who suggested their outlook on the world changed once they became parents; shifting their focus to the importance of children. We also spoke with older participants who stated they felt it is critical to pass on a concern for the environment to their grandchildren, as they are the future stewards of the environment. These findings suggest an individual who does not have a child or grandchild may be less likely to find meaning in the particular framing of the social-altruistic framed statement mentioning children. That is not to say that these individuals have no concern for the future or for children, but they have not had the experiences referenced by the participants noted above.
Those who are elderly, regardless of child status, are also concerned about issues about the world they want to leave behind for those who come after them. It would make sense that as one ages the window in which they view their future, health, and lifestyle becomes smaller and potentially of decreasing importance. Research suggests that the elderly want to leave the world in an improved condition for future generations (McAdams & de St. Aubin, 1998) and that concern over the environmental legacy left behind is a motivation for volunteerism related to the environment (Pillemer, Wagnet, Goldman, Bushway, & Meador, 2009-2010). These legacy issues would suggest that the elderly would be more open to messages framed by the social-altruistic frame or the biospheric frame.

*A Call for Research with Under Represented Populations*

Any discussion of framing generally assumes homogeneity in those receiving the frame. Let us ask ourselves: would our results look any different if we focused on members of the Lesbian, Bisexual, Gay, Transgender, Queer (LBGTQ) community? ISE settings such as zoos and museums continue to suffer from *heteronormativity*; the privileging of heterosexuality in the roles put forth and expected by visitors (Heimlich & Fraser, 2009). In 2009 the *Journal of Museums and Social Issues* took on the topic of “Where is queer?”, suggesting that though large proportions of queer populations visit cultural institutions they do not see their lifestyle reflected in and are not necessarily comfortable being open in these settings (Heimlich & Koke, 2009). Would our results hold true among these much under represented populations? Russell, Sarick, and
Kennelly (2002) suggest that these communities experience environmental education in ways much different than others, necessitating a curriculum designed to engage these audiences.

Similarly, let us ask ourselves: would the results look different if we focused on racial minorities? The fields of environmental injustice and environmental racism assert that minority and low income communities share a disproportionate amount of environmental issues (e.g. Cole & Foster, 2001; Graham, Beaulieu, Sussman, Sadowitz, & Li, 1999). How would individuals who grew up in communities affected by local toxic hazards respond to messages framed by concern? Would the relatively benign frame of environmental concern fall on calloused ears? How would individuals who have witnessed loved ones fall victim to toxins in the environment respond to the social-altruistic messages?

**Conclusion**

Because our findings suggest that there is value in framing messages using environmental concern we feel there is value in building a body of research that will refine a theory of communication using environmental concern. We have put forth a number of assertions that we provide empirical evidence to support. Our hope is that our theory can provide researchers a frame to create rejectable hypothesis in the future and that our findings can contribute to the programming of ISE providers. We recognize that there will never be a one size fits all approach to communicating with the large number of individuals who experience ISE every day. It is critical to move the field forward by
examining what can be done to increase the likelihood of effective communication,
thereby increasing the opportunity for these providers to fulfill their missions.
References


http://www.astc.org/about/pdf/Backgrounders/AboutASTC2009.pdf


Dutcher, D. D. Landowner perceptions of protecting and establishing riparian forests in central pennsylvania. Pennsylvania State University. Unpublished Dissertation,


*Global warming: A divide on causes and solutions.*


Meyer, E. M. (2010). *A deeper understanding of the visitor: the insights provided through psychographic data of visitors to Columbus's free choice learning institutions.* Unpublished Thesis. The Ohio State University, Columbus, OH.


Morgan, J. M., & Hodgkinson, M. *The motivation and social orientation of visitors attending a contemporary zoological park*


Schnackenberg, H. L. View the zoo! evaluation of visual communication in an outdoor educational setting. *Annual Meeting of the Association for Educational Communications and Technology, Phoenix, AZ.*


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Appendix A: Environmental Concern Scale (Schultz, 2001)

People around the world are generally concerned about environmental problems because of the consequences that result from harming nature. However, people differ in the consequences that concern them the most. Please rate each of the following items from 1 (not important) to 7 (supreme importance) in response to the question:

I am concerned about environmental problems because of the **consequences for:**

<table>
<thead>
<tr>
<th></th>
<th>Not important</th>
<th>Supreme importance</th>
</tr>
</thead>
<tbody>
<tr>
<td>Plants</td>
<td>1  2  3  4  5  6  7</td>
<td></td>
</tr>
<tr>
<td>Me</td>
<td>1  2  3  4  5  6  7</td>
<td></td>
</tr>
<tr>
<td>People in my community</td>
<td>1  2  3  4  5  6  7</td>
<td></td>
</tr>
<tr>
<td>Marine life</td>
<td>1  2  3  4  5  6  7</td>
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<tr>
<td>My lifestyle</td>
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</tr>
<tr>
<td>All people</td>
<td>1  2  3  4  5  6  7</td>
<td></td>
</tr>
<tr>
<td>Birds</td>
<td>1  2  3  4  5  6  7</td>
<td></td>
</tr>
<tr>
<td>My health</td>
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<td></td>
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<td>Children</td>
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<td>Animals</td>
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<td>My future</td>
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<tr>
<td>Future generations</td>
<td>1  2  3  4  5  6  7</td>
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</table>
Appendix B: Inclusion of Nature in Self Scale (Schultz, 2002)

Please circle the picture below which best describes your relationship with the natural environment. How interconnected are you with nature?
Appendix C: Yellow Sandshell Statement

Yellow Sandshell (*Lampsilis teres anodontoides*)

Freshwater mussels such as the Yellow Sandshell (Pictured below) are essential components of healthy freshwater eco-systems. These mussels perform a vital task by filtering contaminates from the water they live in. A strong population of mussels is a sign of a healthy freshwater eco-system.

The Yellow Sandshell is currently listed as endangered by the Ohio Department of Natural Resources. Some causes of the decline in Yellow Sandshell population include pollution, habitat destruction, and competition from invasive species.
Appendix D: Study One Phase I Statements

Please read the following statements and circle the selection that you agree with the most:

1) It is important to me to have healthy freshwater eco-systems. I would like to find out more about what I can do to help conserve the Yellow Sandshell.

2) It is important for my children and future generations to have healthy freshwater eco-systems. I would like to find out more about what I can do to help conserve the Yellow Sandshell.

3) It is important for all living things to have healthy freshwater eco-systems. I would like to find out more about what I can do to help conserve the Yellow Sandshell.
Appendix E: Study One Phase II Statements

People may be concerned about the environment for a number of reasons. All of these reasons are valid. The following statements are designed to reflect a few of the reasons individuals are concerned about the environment. Please circle the number that corresponds to how strongly you agree with each of the statements below. If you were to strongly agree with the statement you’d circle a 7, if you strongly disagree with the statement you’d circle a 1. If you are somewhere in between you’d circle a 3, 4, or 5.

Preventing further degradation of the environment is important. I am concerned about the well being of the environment for myself. For the sake of my future, my health, and maintaining my lifestyle, I would like to find out more information on what I can do to conserve our resources.

<table>
<thead>
<tr>
<th>Strongly Disagree</th>
<th>Strongly Agree</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 2 3 4 5 6 7</td>
<td></td>
</tr>
</tbody>
</table>

Preventing further degradation of the environment is important. I am concerned about the well being of the environment for others. For the sake of children, others in my community, and future generations I would like to find out more about what I can do to conserve our resources.

<table>
<thead>
<tr>
<th>Strongly Disagree</th>
<th>Strongly Agree</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 2 3 4 5 6 7</td>
<td></td>
</tr>
</tbody>
</table>

Preventing further degradation of the environment is important. I am concerned about the well being of the environment for all living things. For the sake of humans, plants, animals, marine life, and birds I would like to find out more about what I can do to help conserve our resources.

<table>
<thead>
<tr>
<th>Strongly Disagree</th>
<th>Strongly Agree</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 2 3 4 5 6 7</td>
<td></td>
</tr>
</tbody>
</table>
Part B)
Again, you may identify with all of the above statements, but we are also interested in finding out which you would choose if only one of the statements could be used. Now, please look over the three statements above and circle the one you most agree with. Once you complete this step please return the completed form to the researcher.
Appendix F: Study Two Phase I Statements Framed by Environmental Concern

Egoistic

Global climate change will affect your life!

Global climate change refers to the shifting temperature in regions around the earth, which scientists believe is happening at a rate that is more rapid than in the past. There are a number of consequences to this rapid change that will affect your living situation, your health, your lifestyle, and your future. According to the experts these consequences may include: an increase in diseases you could be exposed to such as malaria, an increase in air quality problems which could harm your lung health, and a decrease in your access to certain foods grown around the world. The experts also suggest that global climate change may negatively impact the availability of fresh water and the quality of fresh water, you may have access to.

The good news is that there are a number of things that you can do to help prevent or lessen the impact of global climate change. Finding out more information about the causes and potential solutions to the impacts of global climate change is a good first step. There is a lot of information regarding global climate change online, at your local library, or right here at the Cleveland Museum of Natural History. Telling your friends, relatives, and community members about the effects of global climate change is another step you can take to help create awareness of the problem. Joining or supporting a group whose purpose is to reduce the effects global climate change can also help to solve the problem. Finally, you can choose to financially support companies that are taking steps to reduce their impact on the environment by purchasing their products over similar ones created in a less responsible manner.

You will personally benefit from preventing or reducing the impact of global climate change.
Global climate change will affect everyone!

Global climate change refers to the shifting temperature in regions around the earth, which scientists believe is happening at a rate that is more rapid than in the past. There are a number of consequences to this rapid change that will affect people, both in your local community and around the world. Today’s children and future generations will also be affected by the consequences of global climate change. According to experts these consequences may include: an increase in diseases people could be exposed to such as malaria, an increase in air quality problems that could harm people’s lung health and their access to certain foods grown around the world could decrease. The experts also suggest that global climate change may negatively impact the availability of fresh water and the quality of fresh water, people may have access to.

The good news is that there are a number of things that you can do to help prevent or lessen the impact of global climate change. Finding out more information about the causes and potential solutions to the impacts of global climate change is a good first step. There is a lot of information regarding global climate change that can be found online, at your local library, or right here at the Cleveland Museum of Natural History. Telling your friends, relatives, and community members about the effects of global climate change is another step you can take to help create awareness of the problem. Joining or supporting a group whose purpose is to reduce the effects global climate change can also help to solve the problem. Finally, you can choose to financially support companies that are taking steps to reduce their impact on the environment by purchasing their products over similar ones created in a less responsible manner.

People locally and around the world, including today’s children and future generations, will benefit from preventing or reducing the impact of global climate change.
Biospheric

Global climate change will affect all the creatures of the world!

Global climate change refers to the shifting temperature in regions around the earth, which scientists believe is happening at a rate that is more rapid than in the past. There are a number of consequences to this rapid change that will affect people, animals, birds, fish, trees, and plants. According to the experts these consequences may include: an increase in diseases people could be exposed to such as malaria, an increase in air quality problems, which could harm health of all living things, and people, plants, and animals could have decreased access to food and other resources. The experts also suggest that global climate change may negatively impact the availability of fresh water and the quality of fresh water, potentially causing harm to all living organisms.

The good news is that there are a number of things that you can do to help prevent or lessen the impact of global climate change. Finding out more information about the causes and potential solutions to the impacts of global climate change is a good first step. There is a lot of information regarding global climate change that can be found online, at your local library, or right here at the Cleveland Museum of Natural History. Telling your friends, relatives, and community members about the effects of global climate change is another step you can take to help create awareness of the problem. Joining or supporting a group whose purpose is to reduce the effects global climate change can also help to solve the problem. Finally, you can choose to financially support companies that are taking steps to reduce their impact on the environment by purchasing their products over similar ones created in a less responsible manner.

All living organisms will benefit from preventing or reducing the impact of global climate change.
Control

Global climate change refers to the shifting temperature in regions around the earth, which scientists believe is happening at a rate that is more rapid than in the past. There are a number of consequences to this rapid change. According to the experts, these consequences may include: an increase in diseases malaria, an increase in air quality problems, and decreased access to food and other resources. The experts also suggest that global climate change may negatively impact the availability of fresh water and the quality of fresh water.

The good news is that there are a number of things that you can do to help prevent or lessen the impact of global climate change. Finding out more information about the causes and potential solutions to the impacts of global climate change is a good first step. There is a lot of information regarding global climate change that can be found online, at your local library, or right here at the Cleveland Museum of Natural History. Telling your friends, relatives, and community members about the effects of global climate change is another step you can take to help create awareness of the problem. Joining or supporting a group whose purpose is to reduce the effects global climate change can also help to solve the problem. Finally, you can choose to financially support companies that are taking steps to reduce their impact on the environment by purchasing their products over similar ones created in a less responsible manner.
Appendix G: Study Two Phase I Involvement Scale

The following statements regard your current perceptions of your behavior and knowledge regarding global climate change.

**How strongly do you agree or disagree with the following statements?** If you strongly disagree you would circle a 1, if you strongly agree you would circle a 7. If you are somewhere in the middle you would circle a 3, 4, or 5.

<table>
<thead>
<tr>
<th>Statement</th>
<th>Strongly Disagree</th>
<th>Strongly Agree</th>
</tr>
</thead>
<tbody>
<tr>
<td>I am knowledgeable regarding the effects of global climate change.</td>
<td>1 2 3 4 5 6 7</td>
<td></td>
</tr>
<tr>
<td>I engage in behaviors that lessen my contribution to global climate change (these behaviors include but are not limited to: shopping locally, carpooling, biking instead of driving, and reducing electricity consumption).</td>
<td>1 2 3 4 5 6 7</td>
<td></td>
</tr>
<tr>
<td>I am concerned about the effects of global climate change.</td>
<td>1 2 3 4 5 6 7</td>
<td></td>
</tr>
<tr>
<td>I donate money to organizations that advocate solutions to global climate change</td>
<td>1 2 3 4 5 6 7</td>
<td></td>
</tr>
<tr>
<td>I donate time to organizations that advocate solutions to global climate change.</td>
<td>1 2 3 4 5 6 7</td>
<td></td>
</tr>
</tbody>
</table>
Appendix H: Study Two Phase I Intent Scale

Keeping in mind that people tend to overestimate their likelihood to do certain things, **How likely would you be to do each of the following activities?** If you are extremely unlikely to do the activity you would circle a 1, if you are extremely likely to do the activity you would circle a 7. If you are somewhere in the middle you would circle a 3, 4, or 5.

<table>
<thead>
<tr>
<th>Activity</th>
<th>Extremely Unlikely</th>
<th>Extremely Likely</th>
</tr>
</thead>
<tbody>
<tr>
<td>Volunteer my time to an organization whose purpose is to advocate solutions to the problem of global climate change.</td>
<td>1 2 3 4 5 6 7</td>
<td></td>
</tr>
<tr>
<td>Donate money to an organization whose purpose is to advocate solutions to the problem of global climate change.</td>
<td>1 2 3 4 5 6 7</td>
<td></td>
</tr>
<tr>
<td>Pay more for a product made in an environmentally friendly way.</td>
<td>1 2 3 4 5 6 7</td>
<td></td>
</tr>
<tr>
<td>Go out of my way to purchase products that were made in an environmentally friendly way.</td>
<td>1 2 3 4 5 6 7</td>
<td></td>
</tr>
<tr>
<td>Seek out more information about global climate change</td>
<td>1 2 3 4 5 6 7</td>
<td></td>
</tr>
<tr>
<td>Seek out more information on what I can do to help the situation regarding global climate change.</td>
<td>1 2 3 4 5 6 7</td>
<td></td>
</tr>
<tr>
<td>Tell other people I know about global climate change.</td>
<td>1 2 3 4 5 6 7</td>
<td></td>
</tr>
</tbody>
</table>
Appendix I: Study Two Phase I Demographics

Please tell us more about yourself:

<table>
<thead>
<tr>
<th>Are you (Circle 1):</th>
<th>Education level (Circle one)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Male</td>
<td>High school/GED or less</td>
</tr>
<tr>
<td>Female</td>
<td>Some college</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Age (Circle one):</th>
<th>Education level (Circle one)</th>
</tr>
</thead>
<tbody>
<tr>
<td>18-24 25-34 35-44</td>
<td>College degree</td>
</tr>
<tr>
<td>45-54 65-74 75+</td>
<td>Some graduate work</td>
</tr>
<tr>
<td></td>
<td>Graduate/Post-graduate degree</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Household Income (Circle one)</th>
<th>Ethnic origin (Circle one):</th>
</tr>
</thead>
<tbody>
<tr>
<td>Under $25,000</td>
<td>African American</td>
</tr>
<tr>
<td>$25,000 – 49,999</td>
<td>Asian or Pacific Islander</td>
</tr>
<tr>
<td>$50,000 – 74,999</td>
<td>Caucasian or European-American</td>
</tr>
<tr>
<td>$75,000 – 99,999</td>
<td>Latino or Hispanic</td>
</tr>
<tr>
<td>$100,000 – 149,999</td>
<td>Native American</td>
</tr>
<tr>
<td>$150,000 – 199,999</td>
<td>Other</td>
</tr>
<tr>
<td>$200,000+</td>
<td></td>
</tr>
</tbody>
</table>
Appendix J: Study Two Phase II Statements

Egoistic

Water pollution affects your life!

The consequences of water pollution can affect your lifestyle, your health, and your future. The availability of clean drinking water is critical to your survival. Pollutants that are in water can enter the fish that live in the water, which would then be passed on to you when eating the fish. Similarly, drinking polluted water can expose you to viruses and bacteria that are potentially fatal. As water pollution increases finding or creating clean drinking water becomes more expensive; a cost that you will end up paying in your water bill.

The good news is that there are a number of things that you can do to help prevent or reduce the amount of water pollution. Finding out more information about the causes and potential solutions to water pollution is a good first step. There is a lot of information regarding water pollution online, at your local library, or through local groups dedicated to improving the health of local watersheds. Telling your friends, relatives, and community members about the effects of water pollution is another step you can take to help create awareness of the problem. Joining or supporting a group whose purpose is to reduce the amount of water pollution can also help to solve the problem. Finally, you can choose to financially support companies that are taking steps to reduce their impact on the environment by purchasing their products over similar ones created in a less responsible manner.

You will personally benefit from preventing or reducing water pollution.
Altruistic

Water pollution affects everyone!

Your neighbors, your children, and future generations will be affected by the consequences water pollution. The availability of clean drinking water is critical to the survival of all humans. Pollutants that are in water can enter the fish that live in the water, which are then passed on to humans that eat the fish. Similarly, drinking polluted water can expose people to viruses and bacteria that are potentially fatal. As water pollution increases finding or creating clean drinking water becomes more expensive; a cost that all people will end up paying in their water bill.

The good news is that there are a number of things that you can do to help prevent or lessen the impact of water pollution. Finding out more information about the causes and potential solutions to the impacts of water pollution is a good first step. There is a lot of information regarding water pollution that can be found online, at your local library, or through local groups dedicated to improving the health of local watersheds. Telling your friends, relatives, and community members about the effects of water pollution is another step you can take to help create awareness of the problem. Joining or supporting a group whose purpose is to reduce water pollution can also help to solve the problem. Finally, you can choose to financially support companies that are taking steps to reduce their impact on the environment by purchasing their products over similar ones created in a less responsible manner.

People locally and around the world, including today’s children and future generations, will benefit from preventing or reducing water pollution.
Biospheric

Water pollution affects all living things!

Plants, animals, fish, and birds are affected by the consequences of water pollution. The availability of clean drinking water is critical to the survival of all living beings. Pollutants that are in water can enter the fish that live in the water, which are then passed on to creatures that eat the fish. Similarly, drinking polluted water can expose animals to viruses and bacteria that are potentially fatal. As water pollution increases, all living things must invest more time and effort in finding clean drinking water. Plants too are adversely affected by consuming or living in polluted water.

The good news is that there are a number of things that you can do to help prevent or lessen the impact of water pollution. Finding out more information about the causes and potential solutions to the impacts of water pollution is a good first step. There is a lot of information regarding water pollution that can be found online, at your local library, or through local groups dedicated to improving the health of local watersheds. Telling your friends, relatives, and community members about the effects of water pollution is another step you can take to help create awareness of the problem. Joining or supporting a group whose purpose is to reduce water pollution can also help to solve the problem. Finally, you can choose to financially support companies that are taking steps to reduce their impact on the environment by purchasing their products over similar ones created in a less responsible manner.

All living organisms will benefit from preventing or reducing water pollution.
Control

Water pollution occurs when chemicals or other harmful substances enter our waterways. Polluted water is not safe to drink. Polluted water can contain viruses and diseases. An increase in the amount of polluted water may lead to water shortages.

The good news is that there are a number of things that you can do to help prevent or lessen the impact water pollution. Finding out more information about the causes and potential solutions to the impacts of water pollution is a good first step. There is a lot of information regarding water pollution that can be found online, at your local library, or through local groups dedicated to improving the health of local watersheds. Telling your friends, relatives, and community members about the effects of water pollution is another step you can take to help create awareness of the problem. Joining or supporting a group whose purpose is to reduce water pollution can also help to solve the problem. Finally, you can choose to financially support companies that are taking steps to reduce their impact on the environment by purchasing their products over similar ones created in a less responsible manner.
Appendix K: Study Two Phase II Involvement Scale

The following statements regard your current perceptions of your behavior and knowledge regarding water pollution.

**How strongly do you agree with the following statements?** Scale of 1-7 (strongly disagree-strongly agree)

<table>
<thead>
<tr>
<th>Statement</th>
<th>Strongly Disagree</th>
<th>Strongly Agree</th>
</tr>
</thead>
<tbody>
<tr>
<td>I am knowledgeable regarding the effects of water pollution</td>
<td>1 2 3 4 5 6 7</td>
<td></td>
</tr>
<tr>
<td>I attempt to reduce my contribution to water pollution</td>
<td>1 2 3 4 5 6 7</td>
<td></td>
</tr>
<tr>
<td>(examples include buying products made in an environmentally friendly way, not using fertilizer and pesticides, and not littering)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>I am concerned about the effects of water pollution.</td>
<td>1 2 3 4 5 6 7</td>
<td></td>
</tr>
<tr>
<td>I donate money to organizations that advocate solutions to water pollution</td>
<td>1 2 3 4 5 6 7</td>
<td></td>
</tr>
<tr>
<td>I donate time to organizations that advocate solutions to water pollution</td>
<td>1 2 3 4 5 6 7</td>
<td></td>
</tr>
</tbody>
</table>
Appendix L: Study Two Phase II Intent Scale

Keeping in mind that people tend to overestimate their likelihood to do certain things, **How likely would you be to do each of the following activities?** (extremely unlikely–extremely likely)

- Volunteer my time to an organization whose purpose is to advocate solutions to the problem of water pollution.

- Donate money to an organization whose purpose is to advocate solutions to the problem of water pollution.

- Pay more for a product made in an environmentally friendly way.

- Go out of my way to purchase products that were made in an environmentally friendly way.

- Seek out more information about water pollution.

- Seek out more information on what I can do to help the situation regarding water pollution.

- Tell other people I know about water pollution.
Appendix M: Study Two Phase II Demographics

**Are you (Circle one):**
- Male
- Female

**Age (Circle one):**
- 18-24
- 25-34
- 35-44
- 45-54
- 55-64
- 65-74
- 75+

**Do you consider yourself:**
- Democrat
- Republican
- Other__________

**Household Income (Circle one):**
- Under $25,000
- $25,000 – 49,999
- $50,000 – 74,999
- $75,000 – 99,999
- $100,000 – 149,999
- $150,000 – 199,999
- $200,000+

**How far is the nearest nature area from your house:**
- Just outside
- 5 minute walk
- 15 minute walk
- 15 minutes by car
- 30 minutes by car
- 30 minutes by bus
- 1 hour by any means
- 90+ minutes by any mean
Appendix N: Study Two Phase III Statements to Sort

Three statements to be laminated separately and placed in order of preference order by the participants:

I am concerned about the well being of the environment for myself. For the sake of my future, my health, and maintaining my lifestyle, I would like to find out more information on what I can do to conserve our resources and prevent environmental problems.

I am concerned about the well being of the environment for others. For the sake of children, others in my community, and future generations I would like to find out more about what I can do to conserve our resources and prevent environmental problems.

I am concerned about the well being of the environment for all living things. For the sake of humans, plants, animals, marine life, and birds I would like to find out more about what I can do to conserve our resources and prevent environmental problems.
Appendix O: Study Two Phase III Interview Script

Hello, my name is Victor and I’m a graduate student at The Ohio State University. For my dissertation I’m trying to find out more about what people think regarding how we communicate environmental issues. To do this I’m conducting brief interviews with visitors who are over the age of 18. Would you be willing to spend about 10 minutes speaking with me today?

If No – Thank you, have a nice visit.

If Yes – Proceed to script below:

OK, thank you! First I would like to tell you that you are not obligated to answer any of the questions that I will ask you and you may choose to end the interview at any time. I will not be collecting any information from you that could be used to identify you at a later time.

1) Could you please read these three messages and place them in order of how strongly you agree with them from the message you prefer the most to the one you prefer the least? (Researcher will have laminated statements framed by environmental concern. Researcher will hand these to the participant and allow them to place them in the order of preference.)

Record order here

Preferred one –
Preferred two –
Preferred three –

2) For each statement the researcher will ask the participant “What comes to your mind when you read this statement? What words stick out to you and why? Are there things you dislike about any of the messages?”

Preferred one –
Preferred two –

Preferred three –

3) Are you concerned about any environmental issues?  
   If so what are they and why are you concerned:

4) Are you currently involved with any groups attempt to solve or reduce environmental  
   problems? By involved I mean donating time or money or other active means of support.

5) How did you become involved with this issue? (Only asked if it applies).

6) Lastly I would like to see if you think that being here at COSI has an effect on the  
   preferences you stated for these messages. Imagine you are at the mall shopping and you  
   have just found a great sale on a number of items that you were looking for, would you  
   change the order of these statements in any way?

   If they would: why do you think that is (What is the difference between you being here at  
   COSI being out shopping at the mall and seeing these messages)?