Environmental Education in the Public Sphere: Comparing Practice with Psychosocial Determinants of Behavior and Societal Change

Chris A. Bolt
St. John Fisher College, cab02692@sjfc.edu

How has open access to Fisher Digital Publications benefited you?

Follow this and additional works at: https://fisherpub.sjfc.edu/education_etd

Part of the Education Commons

Recommended Citation

Please note that the Recommended Citation provides general citation information and may not be appropriate for your discipline. To receive help in creating a citation based on your discipline, please visit http://libguides.sjfc.edu/citations.

This document is posted at https://fisherpub.sjfc.edu/education_etd/320 and is brought to you for free and open access by Fisher Digital Publications at St. John Fisher College. For more information, please contact fisherpub@sjfc.edu.
Environmental Education in the Public Sphere: Comparing Practice with Psychosocial Determinants of Behavior and Societal Change

Abstract
Environmental education of the general public is widely practiced by a variety of types of organizations. Dedicated environmental groups, nature centers, zoos, parks, and other entities work on issues ranging from local threats to air, water, and habitat to global problems such as climate change and deforestation. A great deal of those efforts focus largely on providing information and raising awareness. Behavioral research and change models, however, suggest other factors are important in order to effect change on an individual, regional, or societal level. An analysis of environmental education in practice, examining methods and materials in use, showed the degree to which there were alignments between the content and psychosocial determinants of change, as well as how actions related to change theories. This mixed-methods study of groups doing environmental education in the public sphere compared their practices with the factors shown to help predict pro-environmental behavior, why people change their actions and habits. Through this survey research and multiple case study, increased knowledge and understanding can help inform future efforts at change on critical local, national, and world environmental problems. It can also lead to further research into environmental education, using behavior and change theories.

Document Type
Dissertation

Degree Name
Doctor of Education (EdD)

Department
Executive Leadership

First Supervisor
Julie A. White

Subject Categories
Education

This dissertation is available at Fisher Digital Publications: https://fisherpub.sjfc.edu/education_etd/320
Environmental Education in the Public Sphere: Comparing Practice with Psychosocial Determinants of Behavior and Societal Change

By

Chris A. Bolt

Submitted in partial fulfillment of the requirements for the degree Ed.D. in Executive Leadership

Supervised by
Dr. Julie A. White, Ph.D.

Committee Member
Dr. Ellen T. Wayne, Ed.D.

Ralph C. Wilson, Jr. School of Education
St. John Fisher College

August 2017
Biographical Sketch

Chris A. Bolt is currently News and Public Affairs Director at WAER Public Radio, Syracuse, New York. Mr. Bolt attended Syracuse University from 1987 to 1989 and graduated with a Bachelor of Sciences degree in 1989. He attended Syracuse University from 1990 to 1995 and graduated with a Master of Science degree in 1989. He came to St. John Fisher College in the summer of 2015 and began doctoral studies in the Ed.D. program in Executive Leadership. Mr. Bolt pursued his research in environmental education and change under the direction of Dr. Julie A. White and Dr. Ellen T. Wayne, and received the Ed.D. in 2017.
Abstract

Environmental education of the general public is widely practiced by a variety of types of organizations. Dedicated environmental groups, nature centers, zoos, parks, and other entities work on issues ranging from local threats to air, water, and habitat to global problems such as climate change and deforestation. A great deal of those efforts focus largely on providing information and raising awareness. Behavioral research and change models, however, suggest other factors are important in order to effect change on an individual, regional, or societal level. An analysis of environmental education in practice, examining methods and materials in use, showed the degree to which there were alignments between the content and psychosocial determinants of change, as well as how actions related to change theories. This mixed-methods study of groups doing environmental education in the public sphere compared their practices with the factors shown to help predict pro-environmental behavior, why people change their actions and habits. Through this survey research and multiple case study, increased knowledge and understanding can help inform future efforts at change on critical local, national, and world environmental problems. It can also lead to further research into environmental education, using behavior and change theories.
Table of Contents

Biographical Sketch ........................................................................................................... iii
Abstract .............................................................................................................................. iv
Table of Contents ................................................................................................................ v
List of Tables ................................................................................................................... viii
List of Figures .................................................................................................................... ix
Chapter 1: Introduction ....................................................................................................... 1
  Problem Statement .......................................................................................................... 2
  Theoretical Rationale ...................................................................................................... 3
  Statement of Purpose ...................................................................................................... 6
  Research Questions ......................................................................................................... 7
  Potential Significance of the Study ................................................................................. 8
  Definitions of Terms ....................................................................................................... 9
  Chapter Summary ......................................................................................................... 11
Chapter 2: Review of the Literature .................................................................................. 13
  Introduction and Purpose .............................................................................................. 13
  Literature Review .......................................................................................................... 14
  Knowledge Gap ............................................................................................................ 14
  Environmental Education Issues and Practices ............................................................. 23
  Behavioral Research on Pro-E Behavior ...................................................................... 38
  Theoretical Principles for Study Analysis .................................................................... 49
Chapter Summary ......................................................................................................... 56
Chapter 3: Research Design Methodology ........................................................................ 58
  Introduction and General Perspective ........................................................................ 58
  Research Context ....................................................................................................... 67
  Research Participants ................................................................................................. 68
  Instruments Used in Data Collection .......................................................................... 70
  Data Collection and Analysis .................................................................................... 71
  Summary of Methodology ......................................................................................... 78
Chapter 4: Results ........................................................................................................ 80
  Findings .................................................................................................................... 83
  Multiple Case Study ................................................................................................. 91
    Case Study 1 ........................................................................................................... 91
    Case Study 2 ......................................................................................................... 101
    Case Study 3 ......................................................................................................... 110
  Conclusion ................................................................................................................ 117
Chapter 5: Discussion .................................................................................................. 119
  Introduction ............................................................................................................... 119
  Implications ............................................................................................................... 121
  Limitations ............................................................................................................... 128
  Recommendations ................................................................................................. 129
  Conclusion ............................................................................................................... 132
References .................................................................................................................. 136
Appendix A .................................................................................................................. 143
# List of Tables

<table>
<thead>
<tr>
<th>Item</th>
<th>Title</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>Table 1.1</td>
<td>Application of theoretical components of study</td>
<td>5</td>
</tr>
<tr>
<td>Table 2.1</td>
<td>Importance of EE activities</td>
<td>26</td>
</tr>
<tr>
<td>Table 2.2</td>
<td>Empathic Concern &amp; attitude, norms &amp; intentions</td>
<td>43</td>
</tr>
<tr>
<td>Table 3.1</td>
<td>Data sources &amp; collection</td>
<td>61</td>
</tr>
<tr>
<td>Table 4.1</td>
<td>EE Importance by respondent type</td>
<td>87</td>
</tr>
<tr>
<td>Table 4.2</td>
<td>Topics and issues as reported by survey respondents</td>
<td>88</td>
</tr>
<tr>
<td>Table 4.3</td>
<td>Importance of EE by respondent type.</td>
<td>90</td>
</tr>
</tbody>
</table>
## List of Figures

<table>
<thead>
<tr>
<th>Item</th>
<th>Title</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>Figure 4.1</td>
<td>Content of Environmental Education for Awareness</td>
<td>84</td>
</tr>
<tr>
<td>Figure 4.2</td>
<td>Content of Environmental Education to Change Attitudes and Actions</td>
<td>86</td>
</tr>
</tbody>
</table>
Chapter 1: Introduction

Many environmental issues threaten human health, ecosystems, air and water quality, wildlife, agriculture and other aspects of our world. Some are global, such as the impacts of climate change, adding to drought, sea-level rise and disease migration (Climate Change Report, 2014; Pope Francis, 2014); or the accumulation of plastics and other trash in the oceans (U.S. Environmental Protection Agency, 2016b), with the potential to impact many people, communities and nations, as well as wildlife and ecosystems. Other problems are more regional or local, examples include water pollution from a specific source in a New York town endangering health (Lyons & Seiler 2016) or the destruction of wetlands or other habitat due to development threats on Long Island (Protecting Wetlands, 2016).

Information exists about the issues and their consequences in scientific and government agency reports, mainstream media, alternative media, and other sources. These studies often indicate dire threats; one government report lists the loss of coastline property and increasing storm-damage risk, or potentially deadly increases in extreme heat, flooding and disease from climate change (U.S. Environmental Protection Agency, 2016a). Entire segments of major media organizations are devoted to information about issues from climate to deforestation to nuclear waste (Energy & Environment, 2016). Despite the availability of information, environmental problems and consequences lack cogency with the general public. Concerns over air pollution, global warming, and pollution of drinking water all declined in the US from 2014 to 2015 (Jones, 2016).
Many groups attempt to raise awareness about such problems but efforts to spread information often fall short of causing positive change, creating a gap between increased awareness and changes in behavior or attitudes (Kollmus & Agyeman, 2002). The field of environmental education (EE) can be characterized by a variety of tasks and goals, ranging from activism to teaching stewardship and an ethical relationship with nature (Fraser, Gupta, & Krasny, 2014). The effectiveness of EE has been called into question for not focusing on problem solving abilities or strategies (Hungerford, 2010).

This study will examine EE practices as well as the knowledge gap described above. It will review the various types of groups engaged in EE and the factors that have been shown to help predict behavior and change. Models for change consider someone’s readiness for change, as well as different levels on which change can occur, individual, community or societal-level change. Better understanding of how current EE addresses or mirrors some of the change factors and behavior concepts can add to the knowledge within the field and perhaps spur future research.

**Problem Statement**

Many types of organizations are involved in public education around environmental issues. Zoos, nature education centers, community groups and dedicated environmental groups all hold events and campaigns to raise awareness on climate change, pollution and other issues (Ardoin & Heimlich, 2013). Actions such as recycling, conservation, and low-impact transportation choices, cannot easily be predicted by any simple set of experiences, attitudes or education. Nor can support for climate change policies, backing alternative energy, or voting for candidates with pro-environmental platforms (Kollmus & Agyeman, 2002). Environmental education (EE)
on such topics and problems, some research suggests, lacks focus that limits the effectiveness of both formal, school-based curricula, as well as non-formal educational activities aimed at the general public (Fraser et al., 2014).

Environmental groups’ and other EE efforts in the public sphere can play an important role in connecting people with information on sometimes complex topics. When the scope and consequences of environmental problems are considered along with the purpose and practices of EE, such campaigns and programs present a path to change that could stimulate pro-environmental (pro-E) actions. Certain psychosocial factors can help predict that behavior, including personal values, societal norms and perceptions of success in effecting change (Bamberg & Möser, 2007; Schultz, 2005). The problem exists in the disconnect between EE efforts and the factors, barriers and attitudes that prohibit people from taking effective pro-E actions (Crowell & Schunn, 2014). Much EE focuses on knowledge and awareness without advocating for change, which makes it difficult to bridge the awareness-behavior disconnect (Levy & Zint, 2012). As local and global environmental threats continue, examining connections between pro-E behavior change and the work of groups doing EE should prove to be valuable.

**Theoretical Rationale**

The theoretical framework for the study borrows from several models regarding change and behavior. The theory of planned behavior (TPB) lays out specific concepts that help predict change among individuals. Value orientations, subjective norms, and perceived behavioral control (PBC) correlate with someone’s intention to take action (Ajzen, 1991). The concepts give structure to the research questions, around which the mixed-methods study is designed. The trans-theoretical model (TTM) offers an
explanation of how ready someone might be to accept information and adopt a change based upon that information (Prochaska, Velicer, Guadagnoli, Rossie, & DiClemente, 1991). Social ecology theory breaks down levels of change, identifying how change can occur at micro-, exo-, meso-, and macro-levels, with one state often influencing another. The theory can help with analysis of EE as conducted by a range of groups in the public sphere (Bronfenbrenner, 1977; Lejano & Stokols, 2013).

The theory of planned behavior has been utilized in a number of behavioral studies that attempted to find why people adopt pro-E behaviors. One found people’s attitudes and the influence of social norms had positive impact on the actions people took (Masud et al., 2015). Another found environmental emotions, an affective factor in attitude, influenced behavior, as did perceptions of effectiveness, related to the behavioral control concept in the TPB (Carmi, Arnon, & Orion, 2015). Valuable comparisons can be made between these concepts and the activities of groups doing EE.

The Table 1.1 illustrates how each theory offers components of the theoretical structure to be applied to this study.

The trans-theoretical model has most often been applied to health behavior and habit change. One study examined people’s willingness to adopt smoking cessation practices, finding that the readiness-for-change factors in the model helped predict whether they would change (Prochaska et al., 1991). Another showed an increase in people’s willingness to bicycle instead of using cars as their attitude went up the model’s levels, from pre-contemplation to action to habit (Forward, 2014).
Table 1.1

*Role of Behavior and Change Theories in Study*

<table>
<thead>
<tr>
<th>Theory</th>
<th>Description</th>
<th>Role in Study/Dissertation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Theory of Planned Behavior</td>
<td>Three antecedents of behavior:</td>
<td>• The concepts of attitude, subjective norm, perceived control and behavioral intention are more effective targets as goals of EE.</td>
</tr>
<tr>
<td></td>
<td>• attitude,</td>
<td>• Comparing these concepts to the materials, campaigns, activities of public sphere educational organizations can show links between their efforts and likelihood of change.</td>
</tr>
<tr>
<td></td>
<td>• subjective norm,</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• perceived control,</td>
<td></td>
</tr>
<tr>
<td></td>
<td>help predict:</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• behavioral intention,</td>
<td></td>
</tr>
<tr>
<td></td>
<td>which is best predictor of:</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• behavior</td>
<td></td>
</tr>
<tr>
<td>Trans-theoretical Model</td>
<td>An individual’s readiness for change, or readiness to act, is variable,</td>
<td>How each level might relate to EE:</td>
</tr>
<tr>
<td></td>
<td>described by one of six levels:</td>
<td>• Pre-contemplation and contemplation – address attitude.</td>
</tr>
<tr>
<td></td>
<td>• Pre-contemplation,</td>
<td>• Preparation and action – a specific step or activity would be helpful.</td>
</tr>
<tr>
<td></td>
<td>• contemplation,</td>
<td>• Maintenance and termination -- provide support, establish norm.</td>
</tr>
<tr>
<td></td>
<td>• preparation,</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• action,</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• maintenance,</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• termination (established habit).</td>
<td></td>
</tr>
<tr>
<td>Social Ecology Theory</td>
<td>A structure for analysis that suggests strata, or levels of change:</td>
<td>Level of change concept can help analyze EE.</td>
</tr>
<tr>
<td></td>
<td>• Micro: Individual level</td>
<td>• Does a group or activity focus on individual, social, community or societal change – or multiple levels?</td>
</tr>
<tr>
<td></td>
<td>• Meso: Family/social level</td>
<td>• Change at one level impacts the ability, willingness to change at another.</td>
</tr>
<tr>
<td></td>
<td>• Exo: Neighborhood or community level</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Macro: Societal or political level</td>
<td></td>
</tr>
</tbody>
</table>
Analysis of EE using the trans-theoretical model will be helpful in relating content to an individual’s or society’s readiness for a new behavior or a new policy.

The goal of an organization’s EE might be to change people’s behavior on recycling or energy use, to get a business to stop polluting water in a community, or to change a law related to environmental protection. Social ecology theory helps clarify the different levels of change, which might be appropriate for a campaign or initiative, and how they might interact with each other. Social ecology was applied to sustainability, finding an individual’s ability to adopt some change might be influenced by societal structures that act as barriers or facilitators (Lejano & Stokols, 2013). Environmental issues fit well into a social ecology analysis, given that laws and societal norms can have an impact on individual behaviors.

**Statement of Purpose**

The purpose of this study is to examine connections between environmental education in the public sphere and the factors shown to help predict behavior change. If a goal of educational efforts around serious environmental problems is to effect change, it is valuable to assess whether those educational activities align with principles that empirical research has shown are likely to predict change. Past research has identified a gap between raising awareness and actual behavior change. This research can help show, through examples and analysis, where groups are going past simple knowledge and awareness to address factors more closely linked to behavior, and how those efforts align with change models.

The mixed methods study will help set a baseline of descriptive data on the materials, campaigns and events groups utilize for their specific EE goals. It will also
produce in-depth qualitative data of the practices of several organizations to add a greater level of understanding. The study’s purpose, therefore, is to increase understanding for the benefit of practitioners and educators, as well as add to the body of knowledge for researchers to examine EE, its practice and effectiveness.

Research Questions

Research noted above suggests EE that is focused solely on information to raise awareness is insufficient to lead to change. The main phenomenon of interest in the study is to see to what extent environmental organizations, nature centers and other groups are design materials and activities to have more impact. The theoretical principles of behavior and change utilized herein create a way to make that investigation.

The mixed-methods study will be guided by one main question and three sub-questions: How does environmental education in the public sphere address psychosocial determinants shown to affect pro-environmental behavior at the individual and societal level? Three sub-questions will operationalize the over-arching question:

- How do environmental organizations and nature groups target value orientations shown to predict pro-environmental behavior?
- How do environmental organizations and nature groups target subjective norms shown to predict pro-environmental behavior?
- How to environmental organizations and nature groups target perceived behavioral control shown to predict pro-environmental behavior?

The methodology was chosen to seek broad, descriptive answers to the questions from the survey portion, enriched by in-depth case study analysis to add richer
understanding. Participation in the survey and access to the content of organizations’ EE materials will be key factors in the success of the research.

Potential Significance of the Study

The impacts of environmental problems discussed above can be widespread and have tremendous impact on health and well-being, the economics of agriculture, housing and disaster response, as well as the natural world and wildlife (Energy & Environment, 2016; Climate change indicators, 2016). Groups conducting various types of environmental education of the general public play a critical role in helping to avoid or adapt to the consequences. Their success in going further than simply raising awareness will be crucial to making progress on any of the issues. A better understanding of factors leading to behavior change can help align educational and advocacy efforts for change with some of those concepts. A review of EE practices in various types of organizations and connections to the antecedents of pro-E behavior will show how much connection there is in the materials, activities, displays, media and other efforts to things that actually lead to change. This comparison can identify best practices, help organizations innovate, and perhaps have more successful impacts, whether they are working toward local, societal or global goals. Past research suggests EE focused on awareness only does not address factors that lead to or predict change.

The research will be relevant to practitioners who might be interested in the findings as they design educational materials, displays and campaigns. Case study data will provide an opportunity to compare their methods against those detailed in the study. Practitioners can also consider theories of change as they relate to EE, in order to increase effectiveness if such change models fit the topics they are addressing. Environmental
groups or nature centers might find better ways to address their EE goals of changing people’s behaviors and views, changing laws or policies, or asserting the effectiveness of certain actions or behavior norms.

Researchers can utilize expanded knowledge and understanding in the field from the specific cases, especially related to EE in public settings as it relates to the behavioral antecedents. The social ecology and trans-theoretical model applications to the area of EE in this study can be utilized in future research in this field and others. Social ecology’s levels of change concepts align with many environmental problems that have impacts at an individual or local level, as well as at a larger societal or policy level. Meanwhile, people’s readiness and willingness to adopt new behaviors and viewpoints can be affected by knowledge, values, socioeconomic, and political factors.

On a societal scale, any improvements in EE practices, especially if they impact behavior more successfully, can have tremendous value, given the level and seriousness of some of the environmental threats.

**Definitions of Terms**

The terms below are utilized a number of times in the dissertation. Descriptions are offered as to how they are utilized in this study.

*EE*: an abbreviation for environmental education. The acronym is widely used in research and practice within the field. This study examined educational materials, written content, webpage and social media content, displays, materials for public presentations, meetings and other communications, all used of EE purposes

*Pro-E Behavior*: Abbreviation for pro-environmental behavior. Usually refers to behavior, but could be used for attitudes, policies, actions, etc.
Environmental education in the public sphere: For this study, the term refers to education done by groups, nature centers, parks, museums or other organizations, aimed at the general public, not in a school setting aimed at students. It could range from public information campaigns, public lectures and media outreach to static displays at a park or interactive materials within a setting or online.

Environmental groups: Non-profit and other non-governmental organizations (NGOs) dedicated to environmental issues. For the purposes of this study, groups within New York State not including the New York City metro area were targets for the survey and case study research, which could include a local organization or local/regional branch of a national group.

Nature Groups: Any organization, park, zoo or other nature or science center that provides public access to nature in some way. For this study, such an organization would also had to do some sort of EE through displays, presentations, publications, or other outreach methods.

Value orientations: Attitudes or preconceptions about issues related to environmental topics or actions. They could include man’s relationship to the earth or to nature, political ideals, or altruism versus self-enhancement, for example.

Subjective norms: Societal beliefs or practices that could influence someone’s behavior because it seems normal, what others normally do; or perceived societal expectations that someone should act in a particular way.

Perceived behavioral control or PBC: The degree to which someone feels they have control or ability in a specific setting to undertake a pro-E action. Also the perception that a behavior would have some effect or impact.
Knowledge, awareness, behavior model, KAB: A theory of change that suggested increased knowledge would raise someone’s awareness and lead to some behavior based on that information. Subsequent research suggested raising awareness alone does not predict behavior.

Theory of planned behavior (TPB): A behavioral theory that posits that three factors – value orientation, subjective norms, and perceived behavioral control – help predict behavioral intention, which is the best predictor of actual behavior.

Trans-theoretical model or TTM: A concept of change that helps predict whether someone will adopt a new behavior. The model suggests six categories or levels or readiness: pre-contemplation, contemplation, preparation, action, maintenance, termination (habit).

Social ecology: A theory that identifies levels of change: micro, meso, exo and macro. An intervention might target one or more levels; they can also work together or inhibit one another, for example how individual change can be influenced by community structures or policies.

Chapter Summary

Environmental education is a diverse field, conducted by a variety of groups with varying goals. A wider range of contemporary issues has resulted in a flood of information often generated by environmental groups and other concerned organizations, on issues such as cancer-causing water pollution in New York cities, the impact climate change is having on agriculture and local lakes, ongoing air quality impacts on health, preservation of wilderness lands and habitat threatened by overuse, or invasive species impacts on native plants and animals. Research suggests that knowledge and awareness
are not enough to change behavior in issue areas such as these, nor does EE as practiced focus on effective problem solving. Behavior research has identified areas that could be useful to target in EE design. This mixed-methods study brings the concepts together to examine the degree to which they are aligned among groups doing EE.

The literature reviewed in Chapter 2 provides support for the different elements of the study. Past research covers analysis and criticisms of EE as practiced. It has identified a gap between awareness and behavior change, meaning most education focused only on raising knowledge will not effectively change attitudes and actions. Empirical studies test concepts that help predict behavior. Other past research examines models of change that can help with analysis of this study.

The methodology in Chapter 3 describes a mixed-methods study to examine the research questions: How does environmental education in the public sphere address and target the psychosocial determinants shown to affect pro-environmental behavior, along with the specifying questions. The study targets organizations that offer environmental education to the general public. The research described includes a survey of different types of groups in Upstate New York, followed by a multiple case study of three organizations to address the research concepts in more depth.

Findings displayed in Chapter 4 reveal the survey results regarding the practices and importance of EE among respondents. It also includes the case studies of three organizations.

Chapter 5 covers implications and recommendations based on the findings, as well as limitations of the study and suggestions for future research.
Chapter 2: Review of the Literature

Introduction and Purpose

A range of organizations performs environmental education (EE) of the public, informing people about topics ranging from pollution and climate change, to water quality and habitat loss for wildlife. Information and educational activities come from dedicated environmental groups, nature centers, parks, zoos, museums and other entities (Ardoin & Heimlich, 2013). Their goals range from raising awareness to influencing attitudes and possibly behavior (Fraser et al., 2014). Much of those EE efforts focus on knowledge, informing people of the existence of a problem, as well as describing often-complex issues and their impacts. But offering the public knowledge largely falls short of having an effect on attitudes or behavior (Kollmus & Agyeman, 2002, Tilbury & Wortman, 2008).

A behavioral model suggesting that knowledge will raise awareness and lead to behavior change (KAB model) has been shown to be insufficient when it comes to pro-environmental behavior (Crowell & Schunn, 2014; Robelia & Murphy, 2012). Research shows other factors influence behavior more strongly, including: value orientations and attitudes, the pressures of social norms, and control beliefs that any actions one might take would be effective in addressing a specific environmental problem (Bamberg & Moser, 2007; de Leeuw, Valois, Ajzen, & Schmidt, 2015; Klockner, 2013; Masud, et al., 2015; Schultz, 2005). Yet many EE campaigns and activities follow the KAB model and
are mostly aimed at knowledge and raising awareness (Ardoin & Heimlich, 2013; Littledyke, 2008).

The impacts of EE on the public might be seen in personal attitudes and behavior, but might also impact policy through public opinion or voting behavior on a local or societal level (Lejano & Stokols, 2013; Levy & Zint, 2012). The impact of any EE strategy or activity can also be influenced by someone’s readiness to accept, understand or act on information (Forward, 2014). People’s behavior and the indicators of that behavior have been studied, as have the practices of groups doing environmental education in the public sphere. A comparison of EE activities with research on pro-environmental (pro-E) behavior can add to the body of knowledge, reflecting how such practices align with personal and societal factors shown to influence people’s actions.

**Literature Review**

This review of literature will examine what has been called the knowledge gap in EE, as well as the practices and criticisms of groups and their EE efforts. It will discuss the research done on pro-E behavior, identifying antecedents linked to such behavior. The review concludes with relevant theories that help understand behavior change and its impacts, as related to environmental issues. The past research supports a study of the practices of groups that do environmental education in the public sphere, using a theoretical framework that helps describe behavior, along with personal and societal change.

**Knowledge Gap**

The main phenomenon of interest in the study is how environmental education addresses the question of why people do not act on widespread information regarding
environmental concerns. Despite impacts on their immediate surroundings, nature, world health conditions, global weather, wildlife, air and water quality, people do not change their behaviors, habits, voting, purchasing or lifestyle from increased knowledge. Literature discusses this knowledge gap, suggesting there is a disconnect between knowledge and behavior change, without other factors motivating such change (Kollmus & Agyeman, 2002). The role of knowledge has been studied regarding the awareness of consequences of environmental issues, how raising knowledge helps understanding of complex scientific issues, and how the spread of information can influence perception of public norms (Hansla, Gamble, Juliusson, & Garling, 2008; Witzling, Shaw, & Amato, 2015). The examination of knowledge as a concept is important because the majority of EE is focused on raising knowledge, a strategy that research shows is insufficient to change behavior (Ardoin & Heimlich, 2013; Littledyke, 2008).

Kollmus and Agyeman (2002) set out to synthesize a number of earlier theories and models that tried to explain why people might act in a pro-E manner. Their analysis, referenced in many subsequent behavior studies, was key in defining the central problem of trying to predict behavior through increased knowledge and awareness. The authors’ central argument is that early models that suggest environmental knowledge will change environmental attitudes, then dictate pro-environmental behavior, are too simplistic. This so-called information-deficit model, which they contend is wrong, nevertheless was used as a basis for information campaigns of most non-governmental environmental organizations.

Kollmus’s and Agyeman’s qualitative review covered a range of theories and models that introduced more complex determinants that might predict behavior, which
they synthesized into a final model. They noted personality factors and situational factors as predicting or limiting behavior (Hines, Hungerford, & Tomera, 1986). They also included the theory of planned behavior, which introduced the concepts of social norms and perceived behavioral control (Ajzen & Fishbein, 2000), along with notions of altruism and empathy (Borden & Francis, 1978), and the concept of pro-social behavior (Eisenberg & Miller, 1987). They further considered consequences and incentives for environmental behavior (Feitkau & Kessel, 1981), as well as people’s value orientations that could be classified as biospheric or egoistic (Stern, 1993).

Kollmus and Agyeman (2002) teased out commonalities, contradictions and omissions from the collected theories they studied. They developed three themes that influence the knowledge gap: demographic factors (education, age, income); external factors (economic, social and cultural norms, political and structural realities such as availability of public transportation); and internal factors (values, knowledge, motivation). Their resulting model suggests internal factors that result in an environmental consciousness, interact with the main external issues, such as infrastructure, political and social influences, to influence behavior. The result for an individual or community is then mitigated by such potential barriers as lack of options, negative or insufficient feedback, and old behavior patterns, before pro-E behavior change can take place.

The work of Kollmus and Agyeman most significantly introduced the influences of value orientations of an individual, as well as societal barriers and facilitators, which influence behavior more than knowledge alone.
One particular area of knowledge is awareness of consequences, such as the severity of a particular environmental problem or how a present practice is damaging the environment (Hansla et al., 2008). Hansla et al. operationalized three concepts: awareness of consequences for self, awareness of consequences for humanity, and awareness of consequences for the earth. They joined these with three sets of beliefs: environmental concern for self, environmental concern for humanity, and environmental concern for the earth. They hypothesized that the beliefs and attitudes would correlate with specific value-belief norms, which included universalism, benevolence and power. The theory holds that beliefs and attitudes are biased, wherein individuals generally believe in concepts congruent to their value orientations.

The researchers surveyed Swedish residents (N-1,965) selected from taxpayer records, from which they received 494 usable responses. The reliability of the survey portions for environmental-concern factors was high (α .87-.91), moderately high for values (α .70-.74), but not as robust for awareness of consequences (α .56-.64).

The results showed, as predicted, the value of personal power had a negative correlation with environmental concern for earth (-.08) and negative correlation with both consequences for humanity (-.06) and consequences for earth (-.20). Their value concept of universalism showed positive correlations with environmental concerns for humanity (.32) and for the earth (.35), as well as consequences for humanity (.37) and for earth (.34), but negative correlation for consequences for self (-.13). The benevolence value meanwhile also showed positive correlations for concern for humanity (.34) and earth (.31), as well as consequences for humanity (.39) and earth (.28).
This study takes the concept of knowledge, in this case of consequences of environmental problems, and relates it to value orientations. Values underlie attitudes, and by extension, the likelihood to develop intention to act or change behavior relative to the environment.

The relationship between knowledge and effective discourse about environmental problems is at the center of a study conducted by Robelia and Murphy (2012). They agree with past researchers that the knowledge-awareness-behavior model is insufficient (Kollmus & Agyeman, 2002) for environmental literacy, which they describe as a level of knowledge necessary to inform decisions or actions. They argue more complex models still show knowledge is an important factor in leading to intention to act (Bamberg & Moser, 2007).

Robelia and Murphy undertook a qualitative comparison of results amassed from government surveys assessing knowledge on a variety of issues over diverse groups, noting that the different surveys ask slightly varying questions about similar issues. They also suggested local issues impact the level of knowledge of one population over another. The surveys included yearly assessments from the National Environmental Education Foundation, as well as state surveys in Louisiana, Nevada, Pennsylvania, Kentucky and Minnesota. Most of the surveys weighted data to approximate equal sample representation over age and gender, using random digit dialing.

They found respondents across most of the surveys have substantial knowledge of some issues, such as definition of a renewable energy resource and where trash ends up. The survey participants identified batteries as hazardous waste correctly between 67% and 88% of the time, and correctly related habitat destruction with animals becoming
extinct, with 70% to 74% in national and state surveys. The authors note many of these issues were popular topics of public education and media campaigns over decades.

Robelia and Murphy (2012) found generally low understanding regarding issues of climate change, water quality and energy production. A summary of all the data showed about half of respondents correctly identified causes of climate change; percentages in state surveys ranged from a low of 44% to a high of 56%. When asked how is most energy generated, the highest rate of correct responses came from Minnesota at 56%, with other states answering correctly 38% in Pennsylvania and 28% in one of the national surveys. The collected surveys showed only about half of respondents appeared to have scientific understanding of the mechanisms behind climate change, in spite of the profound impact it could have on people’s lives.

Understanding the impacts of power generation and other climate change drivers on the planet and on human health could inform decisions on energy policy, voting and behavior. Knowledge about water quality, how it becomes polluted and how to keep it clean, they added, could become more important as drought makes fresh water a scarce resource. Robelia and Murphy (2012) suggest these discrepancies can help inform future EE efforts, in community education and lifelong learning contexts, to improve understanding of specific problems and basic scientific literacy.

Carmi, Arnon, and Orion (2015) contend emotions work along with knowledge to engage people in pro-E actions and behavior. They proposed a model that would link knowledge about an environmental issue with behavior, only after such knowledge is mediated through environmental emotions. Such emotions are affected by value
orientations, connectedness to nature, biospheric concerns and commitment to environmental improvement.

They administered a computerized survey to a group of students at a university in Israel (N=1,014) to measure objective knowledge using 18 questions about environmental issues, subjective knowledge, a rating of their perceived level of knowledge, environmental emotions, and self-reported behaviors. Questions also rated social reliability, termed social norms in other studies, as well as perceived control, the ability of the respondent to perform the behavior.

They used a structural equation modeling analysis to show the mediating role of emotions between knowledge and behavior. Subjective knowledge had a significant effect on environmental behavior ($\beta = .322$), the majority of which was indirect, due to the emotional effect ($\beta = .222$). The specific factors that influenced environmental emotions were: connectedness to nature ($\beta = .58$), biospheric concern ($\beta = .45$), and commitment to behavior ($\beta = .85$). The correlations between study elements also show support for the role of emotions as being necessary in addition to knowledge. While subjective knowledge related most strongly to objective knowledge (.63), the relationship with behavior was strongest with environmental emotions (.54).

Carmi et al. (2015) conclude merely knowing about environmental problems and their consequences does not evoke action, but once the affective element is introduced, behavior change is much more likely. In their structural equation modeling study, knowledge had a negligible effect on behavior ($\beta = -0.014$); understanding showed a moderate effect ($\beta = 0.322$); and affect, or environmental emotions, had the strongest effect on behavior ($\beta = 0.545$). This lends further support to the idea that providing
knowledge is not enough, that EE needs to address values, and the related concept in this study of environmental emotions, if it is going to stimulate action.

Witzling, Shaw, and Amato (2015) examined information in a different way, trying to measure the method of communication and how it transferred knowledge and asserted social norms. Their survey research involved boaters and the spread of invasive species in lakes. Respondents (N = 267) were all people who had taken a boat on more than one lake, deemed the riskiest population to spread invasive species.

Methods of communication included fishing clubs, signs about invasive species, media and interpersonal communications. Knowledge among boaters correlated most strongly with media (.35), while norms related highest with signs (.25). Further analysis showed that signs were the most effective, accounting for a moderate increase in knowledge (R² = .22), while media reports on invasive species and practices to reduce their spread caused the most change in norms (R² = .22). The authors made one curious finding, that interpersonal communication in conjunction with information from media or fishing club presentations actually reduced perceived knowledge. They attribute that to confusion of getting information from multiple sources, making it harder to know which source was reliable.

Witzling et al. (2015) suggest increased knowledge had an impact on compliance for invasive species control methods, though knowledge of the problem alone was a poor predictor of behavior. Various information strategies performed differently, affected by context of the source and of the location. The findings emphasize the importance of a clear information strategy if it is going to be a facilitator of knowledge and behavior.
Not everyone agrees with the knowledge-gap premise. Jensen (2002) suggests knowledge can play a key role in pro-E behavior. The author makes the distinction between basic knowledge, that does not motivate action, and action-oriented knowledge, which can be a factor in motivating pro-E action.

Jensen analyzed a series of actions that arose from a school project in Denmark, ranging from letters sent to government departments on environmental issues ($n = 18$), to articles placed in local newspapers ($n = 10$), to students in a demonstration against traffic safety and pollution ($n = 150$). The project resulted in a range of environmental changes, including a city council investment in traffic pattern changes, planting of trees along municipal bicycle paths, and city compost receptacles. Jensen posits that knowledge as it relates to environmental problems can be divided into four dimensions, which allowed the school project to have some success. His model includes coupling knowledge with factors that can lead to action.

1. Knowledge about effects of an environmental issue that can help answer, ‘what kind of problem is it?’
2. Knowledge about root causes that addresses, ‘why does this problem exists?’
3. Knowledge about strategies for change, covering the area of, ‘How do we change things?’
4. Knowledge about possible strategies, actions and vision, helping to answer, ‘where do we want to go?’ (Jensen, 2002; pp. 329-332)

Jensen’s work suggests a broadening of the concept of knowledge, where EE inclusive of all the above types of knowledge is more likely to relate to the intention to take action or change behavior. The author concludes a “concept of action competence” (p.333) should
serve as underpinning for EE efforts to improve the role of knowledge in both awareness and behavior.

Knowledge and how it relates to EE and pro-E behavior has been investigated in a number of ways. The knowledge gap ideas showed that information alone is not enough to lead to behavior change. Knowledge of consequences, when matched with values, correlated with changing attitudes that could motivate action. Environmental emotions were another kind of value that could work with knowledge to create pro-E behavior. The concept of action-oriented knowledge was also introduced. Just knowing about an environmental problem was less effective than someone gaining knowledge about options and strategies for change, which could motivate action.

**Environmental Education Issues and Practices**

Researchers have studied both the content and the practices of groups doing EE. Recommendations from studies suggest a need for more context and focus (Brody, 2005; Cagle 2013, Littledyke, 2008). Literature also examines the role of public settings for EE, including nature centers, parks and museums, places that attract visitors, where education about issues is more passive (Ballantyne & Packer, 2005; Katz-Kimchi & Atkinson, 2014). Other studies have delved into the value of getting the public involved to increase engagement with environmental issues and solutions (Middlemiss, 2010; Sickler, Cherry, Allee, Smyth, & Losey, 2014). Research into settings and practices of EE is relevant in establishing a basis for case study comparisons of groups doing environmental education in the public sphere and how they align with behavioral antecedents, that will be examined later in the literature review.
Focus of EE. Educators and practitioners describe different purposes for educating the public about environmental issues. While all EE activities inform the public, some might focus on awareness, others might highlight problem solving, while others have a goal of advocacy for specific solutions or actions.

There is criticism about the direction of EE courses of study, in both school settings and community education. Fraser, Gupta, and Krasny (2015) suggest the debate centers on the degree to which EE becomes advocacy of a certain position versus reasoned problem solving, and if information comes from a perspective of behavior change or from sound science (p. 777). The authors sought to find out what practitioners of EE thought about its purpose and focus. They wondered whether in addition to dominant narratives of advocacy and problem solving, there were other perspectives or beliefs that guide practitioners’ efforts.

The researchers used Q-methodology, having participants rank a set of statements about issues that might describe the outcomes of EE, such as: sustainability, placed-based understanding of environmental issues, cognitive understanding of nature, or collectivist values about community actions to improve living with the earth. Environmental educators (N = 41) participated, recruited through professional networks and referrals from non-profits, government agencies, and other organizations that undertook EE projects. Participants sorted a list of 35 statements, then researchers did a factor analysis to see what themes might emerge.

Five distinct themes emerged. The theme of fundamental coexistence suggests EE focuses on sustainability and environmentalism for the greater good, rather than for humanistic benefits. A second, spiritual instrumentalism, focuses EE on belongingness in
nature with a spiritual dimension. A theme of moral stewardship emphasizes connection with nature and ethical responsibility. The fourth, skilled community activism, is the most pragmatic, teaching critical skills to solve problems and act on a civic level. The final theme, social-ecological ethicists, refers to teaching a bond between all life forms.

Fraser et al. (2015) found comparisons of the statement rankings across the themes showed some similarities. For example, the statement “commitment to solving environmental problems” was ranked second or third across three of the themes. Similarly, the statement “understanding that everything is connected through nature” was ranked first in two themes and second in another. The authors suggest some of these commonalities might help bridge differences in an ongoing debate about the focus of EE and its effectiveness. The idea that EE content and design could be more relevant and useful to the target audience aligns with the research questions of this dissertation’s study.

Educators and practitioners in organizations can use different methods and have different perspectives on the purpose of EE. One group of researchers wanted to find out how education, communications and outreach were employed by environmental non-governmental organizations and government agencies (Ardoin & Heimlich, 2013).

Their mixed-methods study included three elements: telephone interviews, an online survey, and discussion groups. They suggested triangulation of the various results would reduce bias of one data-collection method over another. The survey portion included 7-point Likert-style questions, negatively to positively coded (4 being neutral), on educational tactics, subjects, barriers, and importance of EE activities within their organization or agency.
Survey results showed educators \((n = 423)\) and practitioners \((n = 233)\) chose the same top five activities as important, by mean scores, shown in Table 2.1.

The biggest difference in responses was over importance of influencing national policy, which educators graded slightly negative \((M = 3.63)\), and practitioners saw more important \((M = 4.50)\).

### Table 2.1

**Importance of EE Activities**

<table>
<thead>
<tr>
<th>Activity</th>
<th>Educators</th>
<th>Practitioners</th>
</tr>
</thead>
<tbody>
<tr>
<td>Influencing beliefs and attitudes and encouraging environmentally responsible behaviors</td>
<td>(M = 5.96)</td>
<td>(M = 5.61)</td>
</tr>
<tr>
<td>Designing and implementing education programs to engage key audiences</td>
<td>(M = 6.15)</td>
<td>(M = 5.21)</td>
</tr>
<tr>
<td>Using media and outreach to promote organization’s work</td>
<td>(M = 5.55)</td>
<td>(M = 5.36)</td>
</tr>
<tr>
<td>Implementing communication strategies to engage key audiences</td>
<td>(M = 5.43)</td>
<td>(M = 5.33)</td>
</tr>
<tr>
<td>Involving local communities in stewardship and resource management</td>
<td>(M = 5.31)</td>
<td>(M = 5.45)</td>
</tr>
</tbody>
</table>

The interviews uncovered barriers each group faces, from limited funding to lack of staff, that reduce the attention that can be paid to education and developing materials. The discussion group participants thought case studies could be a helpful tool to develop effective materials, if they included information about social strategies and challenges. Survey, interview and discussion participants also agreed social strategies to engage people and encourage dialogue around conservation were important and in need of improvement.
Ardoin and Heimlich (2013) conclude educational and communication activities are broadly varied, which impacts how people receive, process and apply such learnings. Several findings of the research lend support to the proposed study, including the suggestion of case studies as being helpful, as well as the value of affective strategies in EE.

**EE practices and materials.** The methods and materials of an education effort can influence the degree to which the recipients understand and accept the content. Negative thoughts toward presenters or ineffective practices in EE will limit the engagement of participants (Littledyke, 2008; Peffer, Bodzin, & Smith, 2013). Identifying inhibiting or facilitating factors can improve the education activities.

Littledyke (2008) suggested a way to help get past the awareness-behavior gap identified by Kollmus and Agyeman (2002). The author posits a vision for environmental education that has a stronger underpinning of science understanding. He notes science is seen by some as contributing to environmental problems, not just as a way to solve them.

In Littledyke’s meta-synthetic article, he identified negative reactions to science, such as the “scientist as egghead,” or the “mad scientist” stereotype, gleaned from qualitative research involving students who were asked to draw pictures of scientists working. Semiotic analysis uncovered negative attitudes that limit science understanding and by extension, problem solving. A white lab coat to some connotes activities unrelated to real life; test tubes and Bunsen burners might produce negative results with dangerous implications; scientists wearing glasses indicate the entire subject is hard and difficult to understand. He concluded these negative images of science make it hard for
people to engage in studying it, with the implication that they will not have scientific knowledge necessary for understanding of the world.

Littledyke identified a combination of cognitive and affective strategies and goals for science education. Effective concepts could include methods of science that help people understand the world, helping them connect learnings to the real world, and critically evaluate social and environmental impacts of the application of scientific ideas (p. 5). In addition, affective features of science education could include fostering enjoyment in science and awe for the environment, tied to deeper understanding of humans’ place in the world. In contrast, he found methods of science education in practice work counter to understanding environmental concerns. Terminology can be confusing; a lack of connection between a program of study and people’s experiences can lead to alienation from science. Further, with no connection to an environmental ethic such as sustainability, EE about issues and problems can seem irrelevant.

Littledyke (2008) suggests a post-modernist approach to science, using pedagogy that includes active learning. Experiential and real-life lessons could join cognitive learning with affective responses. Such principles, he argues, can build knowledge better, while also developing a relationship to the environment that can lead to more pro-E behavior.

Peffer, Bodzin, and Smith (2013) examined a different aspect of education and how it might aid learning about environmental topics. They specifically focused on non-formal environmental education professionals (NFEEDPs) and their use of technology to engage general-public audiences through education in community settings. The researchers had three main research questions:
• What technology tools are used in non-formal environmental education?
• How prevalent is their use?
• What influences non-formal environmental education professionals’ decisions to incorporate technology?

After survey development and a small-sample validation trial, participants were sought through a number of civic and science educational organizations, and referrals. The online survey was a 15-question instrument of Likert-scale responses to create a measure of technology attitudes, perceptions and support (TAPS), with internal reliability reported (Cronbach’s α = 0.809).

The responses (n = 406) yielded descriptive statistics of percentages of the NFEEPs who used certain types of technology:

• 96% used some sort of productivity technology ranging from word processing to database software;
• 94% utilized presentation technology such as photography and video or a public kiosk; a smaller percentage,
• 78%, used some form of learning technology, which could be computer modeling of data, specific topic-oriented computer programs, virtual field trips, etc.

The overall TAPS scores of opinions on using technology to teach EE, on a 5-point Likert scale, showed a moderately positive outlook on technology use (sum M = 3.61). The strongest individual measures were for: their comfort using technology (M = 4.18), use of technology is engaging (M = 4.15), technology can help comprehension of environmental concepts (M = 4.06), and participation in development or training (M =
4.05). The lowest scores represented reasons for resistance in technology use, such as: use of technology requires more planning (\( M = 2.53 \)), students learn more through hands-on exercises without technology (\( M = 2.82 \), item was negatively coded), and increased use of technology reduces emotional connections to the environment (\( M = 3.07 \)).

The survey provides evidence of general support for the use of technology to help understanding of complex environmental topics and the underlying science. Peffer et al., (2013) suggest more training could increase and enhance the use of technology. The authors also reassert the importance of EE in the public sphere to educate citizens in non-formal settings about critical and changing issues.

Cagle (2013) also chose to study displays and materials in nature centers that were used for EE purposes. She sought to gauge the effectiveness of educational and outreach materials written by curators of exhibits. She noted the visitors have the choice to interact with whatever EE materials they choose, while the educators and curators are gatekeepers, determining what is there to observe, study or discuss.

Cagle invited more than 1,800 educators from nature centers in parks, arboretums and other wildlife and land preserves to participate in a survey. The eventual responses (\( n = 563 \)) described the types of written materials offered, as well as the outside texts to which they referred. The survey also sought to gauge level of engagement with the audience through the use of local connections and context.

The author found the top uses of written materials were: brochures (91%), handouts (88%), books (85%), permanent displays (82%) and web sites designed for the organization (79%). About two-thirds (66%) cited outside reference sources, which the author suggests can stimulate a desire to research topics further. A small minority made
connections with local authors or issues. Examples of local ties included: a visit/lecture by author (7.1%); local authors utilized in materials (5.9%), presentations by a founder or employees (5.3%), regional scientists’ presentations (3.9%), regional connections in the content (2.5%), or local connections (2.3%).

Cagle (2013) concludes many nature centers utilize printed materials of some sort to help explain exhibits and environmental issues. However, she notes the vast majority did not make personal connections to authors, regional scientists or other local sources, which she suggests could have stimulated engagement. She also found that a significant number (34%) did not cite reference materials or quote from outside sources, a practice which could enhance credibility. Citations and local connections might stimulate desire for further learning, though the study data was only descriptive of the materials and did not test for interactions with visitors. The researcher cited the elaboration likelihood model that posits when communication promotes thinking it is more personal and persuasive. As with other studies in this review, Cagle emphasizes the importance of nature centers to EE for the general public. Such locations can provide context for conservation issues and engaging experiences.

**Role of place in EE.** The importance of place necessarily adds to the direction and focus of EE to allow people to connect on personal and emotional levels. Most of society, if it is going to learn about complex topics, will do so in some free-choice learning experience (Ballantyne & Packer, 2005; Katz-Kimchi & Atkinson, 2014). People might attend an event or lecture, go to a nature center or park, or learn through public information campaigns to which they pay attention (Mullen, Newman, & Thompson, 2013). Research has examined the role of location and setting in EE.
One such study sought to find how informal education settings can contribute to changing attitudes, while helping people understand key environmental and sustainability issues (Ballantyne & Packer, 2005). The authors reviewed past research on factors that contribute to successful learning in such settings. Their synthetic review used examples to support how people’s experiences in specific settings can prove valuable in learning and behavior change.

One qualitative study they reviewed of visits to an aquarium and a national park found visitors ended up rethinking their positions and behaviors related to regional environmental issues after having a personal experience with exhibits at each center. Other research into ecotourism found it enhanced understanding and could change the commitment of people to issues such as wildlife well-being and habitat threats. Museum displays on mining and sustainable futures allowed visitors to interact with the exhibit, in some cases challenging their views on issues such as the impact mining activities have on the environment.

Ballantyne and Packer tied the free-choice and informal learning experiences to learning theories to emphasize their importance. Past studies show enjoyment of a topic leads to emotions being attached to the subject matter. Emotional learning experiences, they assert, motivate the individual to learn more and to get involved more deeply in a topic. The authors refer to learning theories by Eich and Schooler (2000) and Boler (1999) that describe importance of emotions in learning. Emotions were shown to motivate people to explore and to stimulate curiosity. Other past research they reviewed by Krapp (1992) and Pekrun (1992) found emotion increased attention and memory.
Ballantyne and Packer (2005) conclude educational opportunities in public settings provide a different and more engaging learning experience. They developed three themes that can come from such activities: (a) arousing emotions, (b) challenging beliefs, and (c) enhancing environmental conceptions. An experience of someone’s choosing coupled with some affective result can help change attitudes and beliefs about a species, a regional issue, habitat, or a conservation behavior, as well as improve levels of basic knowledge. Two concepts of the research questions are value orientations and social norms, both of which are related to Ballantyne’s and Packer’s (2005) study on how setting affects attachment to information.

Another study found museums and nature parks are good settings to cover the often-controversial topic of climate change (Katz-Kimchi & Atkinson, 2014). The authors’ case study examined the exhibit, “Hot Pink Flamingoes: Stories of Hope in a Changing Sea” at the Monterey Bay Aquarium in California. Their longitudinal study utilized multi-modal analysis to categorize reactions to the exhibit, which displayed examples of climate change impacts on animals in the oceans. Critical discourse analysis was used on texts, videos, and other displays.

The researchers discovered two primary themes from their qualitative study, which observed reactions over 18 months of the exhibit. First, the variety of displays, images and materials had woven through them a theme that made certain assumptions about the issue of climate change, while making the information accessible to the visitors through the aquarium’s elaborate displays. Some were engaging using popular marine mammals, while others were more somber, such as a coral graveyard that showed the impact of warming oceans due to climate change. Second, information delivered on a
personal level focused on solutions, consumer-oriented choices, and individual actions over collective or political actions. One display entitled “Heroes at Home” highlighted such individual actions.

Katz-Kimchi & Atkinson (2014) suggest information had to include a cognitive and affective component to be engaging, especially given that many visitors might come with predispositions about the controversial issue. They also point out that societal norms were supported by the displays, made more effective if people made a personal connection with the exhibit. The one criticism they level at the exhibit is the lack of any challenge to the convenience of consumption habits that is part of the typical American lifestyle.

**Participation and engagement.** The likelihood of engaging citizens on environmental topics can be enhanced in parks, museums and nature centers because attendance is a free-choice learning experience, while also likely to be enjoyable, as detailed above. The success of EE in the public sphere depends on engagement on social or political levels (Levy & Zint, 2012; Middlemiss, 2010, Sickler, et al., 2014). Understanding the nature of participation can inform an EE strategy.

Levy and Zint (2012) wanted to take a look at elements of why people might participate in a pro-E activity, movement or behavior. They compared environmental activism with general political participation. The authors touched on concerns and factors highlighted in other articles in this review, that people are more likely to get involved in some sort of environmental action if they value it over economic self-interest. They also examined efficacy, which suggests people are more likely to engage in environmental political participation if they believe the actions make a difference.
The authors reviewed research on experiences that boosted feelings of efficacy. They define external efficacy as the sense that actions can lead to change, while internal efficacy is the sense that the individual has the knowledge and ability to participate in a meaningful way. Participation in even small activities that led to actions had a positive effect on efficacy. Knowledge and learning were also determinants, whether reading or having a chance to discuss critical issues with others. However, negative or confusing information was shown to have the reverse effect.

Levy and Zint (2012) first reviewed a number of studies that measured political participation through measures of political efficacy. One voting analysis they cited by Becker (2004) used regression analysis \( (n = 2,052) \), with an effect size of (.169). Another regression analysis by Pollock (1983) on participation \( (n = 1,404) \) also showed efficacy measures positively increased voting participation (.343). Likelihood of contacting officials in a study by Herliner (1992) was also increased with improved sense of efficacy. Others showed positive results for political activism and media use.

The researchers developed a model that begins with: learning about and discussing issues; identifying with politically-oriented groups; and then taking part in democratic decision-making experiences. Those factors feed determinants of political interest, internal and external political efficacy, and can eventually lead to increased political participation on an issue. A modified model connecting the factors with environmental issues, the authors suggest, would lead to more participation. They argue educators could find ways to involve individuals in interest groups and in decision-making activities around local issues that would, based on their model, improve interest and efficacy and increase environmental political participation.
Middlemiss (2010), also focusing on participation, studied a church ecological group and how the group’s activities might stimulate change within the entire organization, including those not participating in the group. She was interested in using the research to address the issue of individual responsibility for sustainable consumption and other pro-E behaviors versus society’s role in providing the infrastructure to support it. The author wanted to make a connection between environmental behavior and justice.

Middlemiss’s case study showed different types of participants experienced different types of change. Participants that were engaged with the group long-term found the activities were reinforcing, leading to intensification of pro-E behaviors and attitudes. For participants identified as recently engaged with the group, the behavior and attitude changes were more in the areas of increased knowledge and action, as well as introduction to an issue, such as fair trade. For church members who were not engaged in the ecological group, it still provided an introduction to sustainable living practices; one such participant called the church group a main source of information on environmental and ethical issues. One other finding noted by the researcher was a disconnect of other church members not involved with the group. They did not see the connection between the church’s fair trade policy and other ecological and sustainability issues.

Middlemiss’s (2012) theoretical model identified three provisions that led to increased action and participation: information should be locally tailored; information should be personally tailored; information about activities should be integrated into larger sustainability and justice goals. She reported the findings related to enhancing acceptance of sustainability. One unengaged participant, for example, took part in activities because other church members were doing so, showing introduction to an issue.
and supporting a social norm. She also identified a factor from her interviews she called infrastructural capacity, basically support from the institution or community. In her research, the larger church body was not supportive of the ecology group, limiting its effectiveness and the involvement of other church members.

If citizens are going to be engaged in conservation issues, they have to feel effective and somewhat knowledgeable. Sickler, Cherry, Allee, Smyth, and Losey (2014) studied the experience of participants in a citizen science project as a form of environmental education that provides engagement, which they suggest stimulates lifelong learning on environmental issues. The researchers used online surveys in a pretest-posttest design to gauge learning gains and measures of the experience. Posttest-only measures sought responses on motivation and attitudes toward citizen science. The convenience sample ($n = 353$) of people that had visited a citizen science website was contacted via e-mail and invited to participate. The researchers note the possibility of participant bias of people interested in taking part in such a project.

The initial results showed an increase in basic knowledge over nine questions about scientific aspects of the project pretest correct answers ($M = 6.65$) to posttest correct answers ($M = 7.99$). More importantly to the broader questions about desire to participate, respondents on a 7-point scale said they would like to find out more about what scientists are discovering ($M = 6.16$) and agreed scientists appreciated their contributions ($M = 5.69$). Most felt their contribution was taken seriously ($M = 5.59$). Participants felt less strongly that they had increased their confidence in overall scientific knowledge about the world ($M = 4.75$). The researchers also noted people’s reasons for participating were important. On a 7-point scale, 71% answered 6 or 7 that they wanted
to contribute to conservation. The same level responded they participated to contribute to science, while 66% answered 6 or 7 that they took part because they were interested in nature (means not reported).

Sickler et al.’s (2014) findings emphasized the strong desire to contribute to conservation and science holds promising signs about people’s willingness to engage in conservation issues, which inherently include scientific knowledge and the need to learn. The researchers further suggest the importance of continued communication with participants about progress and results. The concept that someone’s actions are making a difference, in this case through the citizen-science project, support the role of perceived behavioral control, which is a main research theme, and will be examined further later in this review.

The research presented so far in this review has focused on EE practices, the importance of EE in the public sphere, locations that the public might visit, and public participation. Interestingly, the various studies have touched upon the main themes of the research questions: value orientations, social norms, and perceived behavioral control. Research focused on behavior will further explain those concepts, while showing their value in trying to predict pro-E behavior.

**Behavioral Research on Pro-E Behavior**

Much of the research into pro-E behavior, and trying to figure out why people might change their actions or lifestyle, utilizes the theory of planned behavior (TPB) (Ajzen, 2011). The main tenets of the theory are that three factors indicate whether someone will act in a certain way. Attitudes and values, coupled with influences of social norms join together with the level of perceived control or effectiveness to help
predict someone’s intent to engage in a behavior. Behavioral intention, the theory suggests, is the strongest predictor of actual behavior. In the environmental context, simply raising knowledge and awareness does not address the three concepts above that help predict behavior change.

Researchers have examined the TPB concepts as they relate to guilt, political orientations and ideas about stewardship or empathy for the earth. Others found how much pressure social norms around pro-E actions can play on intention and behavior.

Chao (2012) set out to validate whether the TPB concepts gave the strongest indications of pro-E behavior, comparing them to another popular behavior model. He conducted research on self-reported environmental behavior and other-reported environmental behavior on a group of students in dorm settings ($n = 180$). The questionnaires included elements of the theory of planned behavior (TPB) and the responsible environmental behavior (REB) theory, to test which might have a stronger predictive ability for actual behaviors.

The author developed measurements of the TPB concepts of attitude, perceived behavioral control and subjective norm, along with behavioral intention, which in the model is predicted by the previous three. The study also had measurements of the REB concepts of knowledge of environmental issues, knowledge of action strategies, locus of control, personal responsibility and environmental attitude.

The most significant factors that correlated with behavioral intention of the participants were positive attitude toward the behavior (.68), and perceived behavioral control (.70), both concepts within the TPB. Less powerful, but significant were knowledge of issues (.49) and environmental attitude (.40), concepts of the REB model.
The self-reported behavior correlations also seemed to lend stronger support of the TPB. Attitude toward behavior (.74) and perceived behavioral control (.66) related strongest with actual behavior. Knowledge of issues had a milder correlation (.41) and was the most significant of the REB items.

Chao (2012) notes the specificity of the components of each model might have affected the ability to predict pro-E behavior. Each model also suffered a degree of weakness due to one of the model components being problematic as a predictor, the subjective norm in the TPB and the knowledge of action strategies in the REB. However, a regression analysis suggested the TPB outperformed the REB in variance of predicting behavioral intention ($R^2 = .69$ vs. $R^2 = .37$). The basic predictors in the TPB model, therefore serve as factors worth pursuing for EE efforts, at least as suggested in this limited sample.

Masud et al. (2015) applied the antecedents of attitude, subjective norm and perceived control specifically to the issue of climate change to see if they facilitated intention and behavior. They had a goal to inform public awareness campaigns. The researchers polled Malaysians ($n = 385$) in a proportional sample of the country’s nine regions to account for regional bias.

They found relatively high awareness of climate change (74%), as well as moderately- strong agreement that it is a problem (70%). They also found a high level of general knowledge that CO$_2$ emissions were a major cause in Malaysia (77%) and that rises in greenhouse gas emissions would further contribute to climate change (92%).

Masud et al.’s (2015) structural equation modeling found attitudes toward climate change had a strong effect on behavioral intention to adopt pro-E behaviors ($\beta = .451$)
and subjective norms showed a moderately strong effect on intention ($\beta = .230$).
Perceived control as a predictor did not show a significant impact on intention ($\beta = .091$).
As in other models using these antecedents, behavioral intention proved a strong predictor of actual behavior ($\beta = .42$). The composite analysis of the factors showed taken together attitude, norms and perceived control predicted 60% of the behavioral intention, while the three concepts accounted for 56% of the actual behavior. The research lends more support to the idea that effective EE efforts should address attitudes and norms as facilitators of behavior change.

The same concepts of attitudes and norms were examined in a study that introduced guilt as an influence on value orientations (Arpan, Opel, & Lu, 2013). The researchers studied the values and norms that might motivate pro-E behavior and public education messages, comparing them to perceptions about being the cause of environmental problems. Specifically focused upon energy conservation and efficiency measures, they found public campaigns about energy use and environmental behavior were not framed in a way that resonated with the recipients of those messages.

Arpan, Opel, and Lu chose to study individuals’ behavior related to their political orientations, liberal world views vs. more conservative views. They sought to test three hypotheses: (a) political orientation will affect perceptions of energy-use-related risks, (b) those with more liberal world views should report greater self-transcendent motivations for reducing energy use, and (c) political orientation will moderate the effect moral norms and guilt might have as motivators. The study sample ($n = 409$) came from a web program to represent the U.S. population. Relevant descriptive demographics included: 73.8% White, non-Hispanic; 61% having attained some college or a degree, and perhaps
most importantly, 34.5% identifying as Republican, 32.5% identifying as Democrat, and 21.3% saying they were independent.

Tests of the first hypothesis showed those defined as liberal had a higher perception of risk on questions about crises in energy and the environment on a four-point scale ($M = 2.33, SD = 1.64$) than conservatives ($M = 1.32, SD = 1.69$). Similar results were reported on liberals’ responses to climate change risk on a two-point scale ($M = 1.81, SD = .51$) compared with conservatives ($M = 1.03, SD = .92$). The second hypothesis could not be supported. The authors report there were not significant differences in self-transcendent behaviors or desire to avoid guilt through conservation or efficiency behaviors. Finally, hypothesis three was supported. Liberal respondents’ relation to moral norms was positively, though minimally, predicted in multiple regression analysis, ($\beta = .09$) compared with conservatives ($\beta = -.04$). It also predicted stronger motivation to avoid guilt among liberals ($\beta = .19$) than conservatives ($\beta = .00$).

Arpan et al. (2013) note that each group might have engaged in energy conservation behaviors, but for different motivations. Value orientations here, tested as conservative or liberal self-identification, associated with perception of risk and with behavior motivation to avoid guilt. Moral norms mildly influenced attitudes and motivations, which relate to behavioral intention that aligns with other studies.

**Values and their link to behavior.** Several other works focused on beliefs and attitudes, aligning with the TPB concept of value orientations. One looked at empathic concern, how one’s level of empathy might impact attitudes and behavior (de Leeuw et al., 2015), while another tested harmony with nature and stewardship values to see how they might impact actions (Li & Ernst, 2014).
de Leeuw, Valois, Ajzen, and Schmidt (2015) wanted to test how much preconceived beliefs influenced predictors of behavioral intention, as defined by the TPB. Students from nine high schools ($n = 602$) were issued questionnaires to find their beliefs on a range of pro-E behaviors, how normative such behaviors were, and beliefs about their perceived control for such actions. These were compared against respondents’ scores on a scale to test empathy, adopted from the Interpersonal Reactivity Index (Davis 1980). Questions on propositions such as “feelings about people less well off” or how much “the bad luck of others...affects me” formed an empathic concern measure.

Controlling for empathic concern was shown to elicit higher responses on certain values, behavioral intention, and ultimately behavior. Table 2.2 shows students with higher empathic concern (HEC = score above median) differed on most measures from those with lower empathic concern (LEC = score below median).

Table 2.2

Empathic Concern vs. Attitudes, Norms and Behavioral Intentions

<table>
<thead>
<tr>
<th>Attitude or action beliefs (from questionnaire)</th>
<th>HEC = score above median</th>
<th>LEC = score below median</th>
</tr>
</thead>
<tbody>
<tr>
<td>Positive attitudes toward pro-E behavior$^a$</td>
<td>$M = 4.40, SD = .75$</td>
<td>$M = 3.90, SD = .74$</td>
</tr>
<tr>
<td>Felt more pressure due to normative beliefs$^a$</td>
<td>$M = 4.36, SD = .96$</td>
<td>$M = 3.87, SD = .96$</td>
</tr>
<tr>
<td>Had stronger feelings of perceived control$^a$</td>
<td>$M = 4.17, SD = .91$</td>
<td>$M = 3.75, SD = .92$</td>
</tr>
<tr>
<td>Had stronger intentions$^a$</td>
<td>$M = 4.22, SD = 1.00$</td>
<td>$M = 3.63, SD = 1.07$</td>
</tr>
<tr>
<td>Likelihood to take action$^b$</td>
<td>$M = 2.48, SD = .56$</td>
<td>$M = 2.28, SD = .57$</td>
</tr>
</tbody>
</table>

Note. $^a$ Means on six-point scale. $^b$ Means on five-point scale.
When analyzed as a predictor, empathic concern did not explain a significant amount of behavior ($\beta = .087$). Empathy did have a moderately strong impact on beliefs about pro-E behaviors ($\beta = .453$) and on normative belief about such behaviors ($\beta = .270$). The composite of behavior measures, beliefs, norms and perceived control, explained a relative high level of behavior ($R^2 = .299$). The researchers acknowledge the limited choices of possible pro-E activities might not have been representative of normal actions one might adopt.

Aspects of the study give moderate support for the role empathy might play in the attitudes and normative beliefs young people have when thinking about pro-E actions and habits. As with others, it does not identify empathic concern as a critical component of intentions or actions, though it is an element that could be addressed in educational or other interventions.

Li and Ernst (2014) took a cross-cultural approach to examining value orientations of the human-nature relationship. They tested the concepts on urban youth in Minneapolis, Minnesota and in Guangdong, China. They chose urban youth because they suggest that such young people become distanced from nature, and by extension lose concern for protecting it. The researchers’ concurrent triangulation strategy collected qualitative and quantitative data to compare outcomes, as well as to aid comparisons between the two sample populations.

The qualitative portion of the study included drawings and writings, asking participants their views on the relationship between humans and nature or the earth. The drawings were converted into text descriptions, which were shared with the students for accurate interpretation. The results were inductively evaluated, allowing five themes to
emerge: humanistic, interdependence, stewardship, use, or dominion over the earth. The highest representation in the Minneapolis sample \((n = 59)\) was stewardship \((71.2\%)\), with interdependence second \((10.2\%)\). The Guangdong sample \((n = 51)\) also graded highest on interdependence \((40.0\%)\), with stewardship second \((37.8\%)\). The quantitative portion included a number of questions to test for values: subordinate to nature; harmony with nature; or dominion over nature. The researchers found the data aligned with the quantitative findings. The Minneapolis sample strongly favored harmony with nature \((82.8\%)\), while the Guangdong sample agreed \((76.5\%)\).

Li and Ernst (2014) note one aim of environmental education from the Tblisi Declaration of 1978, an international environmental summit, was to develop values and feelings of concern for the environment. The results show a majority of young people hold such feelings, which could be capitalized upon through education.

**Behavior and subjective norms.** Another concept within the behavioral research shows how social norms can influence pro-E behavior. The concept, referred to in previous studies in the review, has two dimensions. A societal norm, the normal behavior of others, might influence someone’s behavioral intention or actions. One might also be influenced by perceptions of what others expect as normal behavior (Arpan, Opel, & Lu, 2013; Klockner, 2013; Masud, et al., 2015; Schultz, et al., 2005). Research using the TPB shows social norms as an antecedent of behavior, and therefore a topic of interest in EE.

Schultz, Gouveia, Cameron, Tankha, Schmuck, and Franek (2005) tested how certain value orientations might reflect on norms and action. They examined three categories of attitudes: egoistic, biospheric, and social-altruistic value orientations. The
authors posit that pro-E actions might be likely from each value, though could be
motivated by different factors, including whether people see it as a societal norm to focus
on others or the earth overall, rather than personal gain.

The researchers used samples from six different countries (each $n \geq 113$
participants), having them fill out a four-part questionnaire. Environmental behavior was
gauged by questions about past actions, graded from never to very often. The New
Environmental Paradigm instrument determined the degree to which respondents viewed
people as part of nature. Another set of questions set orientations of egoistic (concern for
self), altruistic (concern for others) or biospheric (concern for earth) concerns of
participants.

Correlations of the three value concepts with measures of self-transcendence or
self-enhancement showed consistent results across all cultures. Participants whose values
aligned with self-transcendence correlated positively with the biospheric concerns for all
six-country samples (.14 to .35), while they had negative correlations in all six countries
with egoistic concerns (-.05 to -.28). The self-enhancement-rated participants showed
positive correlations with egoistic concerns (.02 to .21), while that group had universally
negative relationships with biospheric concern (-.16 to -.21). A second level of analysis
sought to compare values with pro-E behavior to test for norm activation. The strongest
results from a regression analysis showed self-transcendence moderately predicted pro-E
behavior ($\beta = .18$); awareness of consequences predicted behavior ($\beta = .18$); and
ascription of responsibility led to behavior ($\beta = .15$).

Schultz, et al. (2005) conclude a normal view that includes concern for others and
for the earth is an important component of predicting pro-E behavior, as are biospheric
and egoistic values. The relationships between how people see themselves and their level of environmental concern provide insight into motivations that can be addressed in efforts to educate or motivate behavior around environmental issues.

Klöckner (2013) also found evidence that the factor of norms, both personal and societal, could be a facilitator for intention to take environmentally-beneficial actions. His study also used TPB constructs to show behavioral intention as a predictor of pro-E actions. The researcher utilized a structural equation modeling approach on a meta-analysis of 56 studies, with sample sizes of the pooled correlations ranging from 1,283 to 17,560. The study included measures of habit strength and new environmental paradigm scores, that test overall environmental attitudes.

The strongest correlations were between attitude and personal norm (.64) and attitude and intention (.62). There were also relatively strong relationships between personal norm and intention (.59) and between intention and behavior (.55), mirroring other studies that show intention is the strongest predictor of behavior. The author found slightly weaker relationships between the value-oriented measures of awareness of consequences and personal norm (.49) and awareness of responsibility and personal norm (.48). Klockner went on to develop a predictive model that showed personal norm, along with attitude and perceived control was a strong predictor of intention (R² =.55), while intention, habit and perceived control moderately predicted actual behavior (R² =.36).

Klöckner (2013) also wanted to find out what went into the personal norm value. A group of seven variables – societal norms, perceived control, awareness of consequences, responsibility, self-transcendence values, self-enhancement values (negative relation), and the new environmental paradigm scores – strongly predicted
personal norm ($R^2 = 47$). The importance of personal norm is another facilitating factor that can be a focus of EE campaigns, since it strongly relates to attitudes and further helps predict behavior.

A meta-analysis on energy conversation behavior tested the degree to which someone’s neighbors influence behavior (Delmas, Fischlein, & Ascensio, 2013). The analysis of 59 studies examined four hypotheses: Information on past energy use will reduce future use; Information on conservation strategies will reduce use; Information on costs versus savings will result in reduced use; Information on peer consumption will result in reduced use. The researchers utilized meta-regression analysis to combine study sample sizes. The dependent variable of effect size – in this case energy usage – was compared against the independent variables from the four hypotheses.

The descriptive statistics show past energy-use information was the most prevalent, in 75.6% of observations, with average effect of -8.5%. Conservation tips were noted in 72% of tests averaging a -9.6 percent effect. Monetary savings were present in 30.1% of studies, which showed -7.7% change in use. Comparative feedback or social norms was least present in studies, in 23.7%, but reported a -11.5% effect.

Delmas, Fischlein, and Ascensio (2013) note that energy-use reductions slightly diminished over time in the studies that included longitudinal data. They added that while social norm comparisons showed significant treatment effect, more than 11% reduction in energy use, the studies that measured it had small sample sizes. Information on individual usage, savings advice and asserting of norms could be valuable in energy reduction as a pro-E strategy to combat pollution and climate change.
Various studies show support for the TPB concepts, individually and collectively. The factors also show links to behavioral intention and actual behavior. Examining environmental education utilizing these concepts, as detailed in the research questions, should provide useful information regarding groups doing EE in the public sphere. The degree to which such education actually results in behavior change on a personal or societal level can be aided by joining the above theoretical concepts with theories of change.

**Theoretical Principles for Study Analysis**

A basic assumption of the study is that EE is done by various organizations for some purpose, more than just offering information. Those who create and display the materials indicate their chief goals include problem solving, and influencing attitudes and behaviors (Ardoin & Heimlich, 2013; Fraser et al., 2015). The main theory displayed in the research on behavior above, the theory of planned behavior, suggests the concepts of value orientations, social norms and perceived control help with the goals of EE. Two other theories help explain change and are important to the theoretical framework of the study.

The trans-theoretical model suggests individuals can be at different levels of readiness for change, and by extension, will be somewhere on a continuum from completely resistant to new information or actions, to interested, to accepting (Mmojieje, 2015). The model does not contradict the TPB concepts, but adds a layer of understanding that can help EE efforts, while explaining a range of reactions to educational campaigns and efforts. Social ecology theory describes change as happening on multiple levels; it can be change of an individual, in an immediate community, or on a
broader state- or national-policy level (Lejano & Stokols, 2013). Both theories are
intended to help with analysis of EE in the multiple case study, along with the relation of
information to the TPB concepts in the research questions.

Mmojieje (2015) conducted a comparative study of learning styles and models to
consider how they could be applied to and improve public environmental campaigns.
She contends EE needs to diversify to account for different learning styles, as well as the
levels of readiness stated in the trans-theoretical model.

The author considered Curry’s education model (1983) which includes
personality traits, information processing differences, and environmental or instructional
preferences that all can influence the value of education. She compares that to the multi-
modal learning idea in Felder and Silverman’s learning model (1988), in which a model
was created employing visual, aural, reading and kinesthetic education methods (VARK).
Combined with easy-to-understand terminology, the VARK principles lend themselves to
engaging a student or civic target audience on scientific or environmental topics. Kolb’s
experiential theory (2005) relates to the VARK concepts, including four learning
elements: experiencing, reflecting, thinking and acting.

Mmojieje (2015) analyzed the above education models in concert with theories of
behavior change. The trans-theoretical model includes six stages to describe someone’s
readiness for change: pre-contemplation, contemplation, preparation, action, maintenance
of action and termination of motivation, which is self-sustaining action. For education on
environmental behavior change, she noted the various stages of readiness should be taken
into account when designing learning strategies or experiences. Based on her research of
learning and behavioral models, Mmojieje advocates multidisciplinary approaches in EE
campaigns in order to address the needs of individuals, based on past learning models and behavior theories.

A study on social marketing utilized the trans-theoretical model to point out how a public environmental-information campaign is less effective due to differences among segments of the audience (Corner & Randall, 2011). Their multiple case study looked at a climate change campaign in the United Kingdom and a public transportation campaign in Australia to help reduce greenhouse emissions. The researchers found targeted social marketing to reach a specific group could also be a reason messages fail to promote a broader environmental ethic, which they deem necessary for a large-scale attitude shift on climate change.

Corner and Randall linked the readiness phases of learning and adoption in the trans-theoretical model with social marketing principles of behavioral differences of audience groups, ability to target messages to each group, and audience segmentation for tailoring of messages. The UK marketing campaign “Act on CO2” involved a television ad campaign, along with targeted piecemeal pro-E behaviors, attempting to addressing individual concerns with different audience segments. For example, social media marketing might appeal to one group to drive less to reduce emissions, while another group might be asked to turn off lights and turn down heat to save money. They also found appeal on one basis, for a given audience, did not spillover to other pro-E behaviors or values. The Australian case “Travelsmart” sought to reduce car usage by 10% in a suburban area of 100,000 homes. In this case, segmented marketing took the form of individual travel plans for each household to detail less-polluting options, tailored to specific lifestyles and needs. The initiative reduced car usage by 14%,
maintained over 18 months. Social marketing in this case, due to tailored messaging, was more successful.

Corner and Randall (2011) conclude social marketing can be effective in creating and supporting social norms and social networks, suggesting people who identified with an environmental social network would be more likely to act in a pro-E manner. One weakness of the study findings is they cite a lack of empirical research on evidence of spillover behavior. Driving five miles less per week or turning off lights can be achieved through social marketing, though not deeper engagement on values, based on the nature of the message and the receptivity of the audience. The authors do make a comparison between the segmented audience in social media and the readiness stages of the trans-theoretical model.

Forward (2014) combined concepts of the trans-theoretical model and the theory of planned behavior to explore bicycling behavior as a beneficial health and environment choice. A survey \((n = 399)\) used a 7-point Likert scale to determine respondents’ attitudes about cycling, perception of norms of cycling, and perceived control of biking among all participants. The participants also rated themselves on the trans-theoretical model receptiveness measures. Subjective norms were high throughout, indicating widespread acceptance of biking. However, as the trans-theoretical receptiveness measures increased, so did the Likert scores for perceived control, from \((M = 3.61, SD = 2.35)\) at the pre-contemplation level up to \((M = 6.84, SD = .54)\) at the maintenance level. The survey introduced intention to bike, which also showed growth through the trans-theoretical concepts from \((M = 1.75, SD = 1.44)\) at pre-contemplation to \((M = 6.59, SD = 1.01)\) at the maintenance stage.
Forward (2014) suggests consideration of both the TPB concepts and the trans-theoretical model receptiveness levels when targeting groups for information on pro-E behavior. The author points out that even among those who change a behavior, motivations might be different, making lasting change a long-term process.

The final theoretical principle of the proposed study is social ecology, through which analysis of the case studies will be made. Social ecology posits change happens within and among different levels of society from individual to family to community to larger society. One of the theory’s scholars has termed the levels: micro, meso, exo and macro levels (Bronfenbrenner, 1977). Change can happen within or among these different levels. An environmental group, for example, might be advocating for personal change or trying to change a state policy on some issue. Assessing EE based on the social ecology principles can inform its content and context (Berkovich, 2014; Collins, Tapp, & Pressley, 2010; Glaser & Glaeser, 2014; Golden & Earp, 2012). Social ecology has not been applied to environmental issues as much as it has in the field of health care and promotion of healthy behaviors. But the issues share similarities, such as trying to influence behavior toward some benefit, while also relating to policy change.

Lejano and Stokols (2013) applied social ecology to sustainability and economics in a meta-synthetic article. One case they examined showed how the cap-and-trade policy of reducing carbon emissions into the atmosphere has a benefit in the location where carbon is kept from being emitted, though trades that for the release of a similar amount somewhere else. A social ecology perspective might examine the policy on a macro level, along with its impact on a smaller community, exo- or meso-level.
Stokols, one of the most widely cited authors on the theory, suggests actions or changes need to be considered “across differing scales and dimensions of activity within a particular ecosystem, irrespective of whether the multiple dimensions are coherent or dissonant” (p. 3). The authors assert activities, such as EE or an economic initiative, might be more or less effective depending on the consideration of fit across the different scales. This complements other research that shows pro-e behaviors, such as using less electricity to save money, do not have much impact on larger policies or changing social norms about energy use.

Health behavior interventions share similarities with campaigns to achieve environmental goals, in that both can have apparently obvious goals, though face barriers getting people to adopt them. Golden and Earp (2012) examined 20 years of health promotion. Their meta-analysis considered 157 articles on health interventions, rating them on a social ecology-level basis. They modified their coding system to rate interventions as: individual, intrapersonal, institution-level, community-level, or policy.

They found the activities suggested described individual behaviors more than 90% of the time, interpersonal 68% of the time and institutional-level interventions 40% of the time. Articles on nutrition included institutional-level suggestions 60%, while those for smoking cessation and exercise mentioned institutional change less than half the time. Fewer than 20% discussed community-level interventions, while fewer than 10% advocated for any policy change. Setting made a difference. Interventions for individuals in schools also included institutional suggestions more than half the time, while family-targeted ideas included individual and interpersonal suggestions 93% of the time. By contrast, interventions suggested for health care or community settings,
included institutional change less than a quarter of the examples. They also noted fewer than 10% of articles on interventions mentioned the social ecological model as a basis for the design.

The value of social ecology as a framework for analyzing these examples, Golden and Earp suggest, is that more enduring health improvements would come if structural factors were considered, in addition to the specific personal interventions.

Social ecology was used as a framework to examine social marketing for behavior change (Collins et al., 2010). The authors’ multiple-case study looked at three examples of marketing for change, where applying the different levels proved valuable.

A case of reckless driving among youth identified a racing culture as contributing to the dangers. They defined the various levels as follows:

- micro-system: the individuals and friends who saw racing as a status indicator;
- meso-system: the neighborhood and a youth center;
- exo-system: the social and economic impacts, along with negative portrayal in the media;
- macro-system: government and policy solutions.

The researchers discovered the most effective remedies to elicit change happened at the meso-system level, where the immediate community and neighborhood center could influence the reckless driving through alternatives. These worked better than messages solely about individual consequences or changes of law, micro and macro level ideas.
Another part of the case study examined lung cancer detection and poor treatment outcomes. Again the issue and solutions were segmented, this time in reverse order:

- macro-level, trying to change cultural stoicism and mistrust of government health information;
- exo-system, tackling issues such as proximity of services and wait times at doctors’ offices;
- meso-system, targeting smaller communities for tailored interventions;
- micro-systems, family units in which wives often had influence on family health matters.

The different levels presented different problems, but micro-level attention produced the most change, getting people to go for early detection and better treatment adherence.

Collins, Tapp, and Pressley (2010) believed such a breakdown of social marketing for change could be used as a model for other issues. It lends support to the idea that social ecology can help understand different levels of change that can be useful to consider when planning education for change. The concept has a natural connection to EE in the public sphere and goals or strategies that addresses change at various levels.

Chapter Summary

This review has presented evidence of research into environmental education, as well as a body of knowledge regarding a gap between raising awareness and actually changing behavior, which leads to the dissertation problem statement. Behavioral research presented here suggests there are concepts that help explain someone’s intention to act, ideas that can be useful to EE in the public sphere. The factors of value orientation, subjective norms and perceived behavioral control are at the center of the
research questions to be used in the multiple-case study portion of the mixed-methods study. Those factors come from the theory of planned behavior, which has been utilized in many studies on pro-E behavior.

Two additional theories, the trans-theoretical model and social ecology, help makeup the theoretical framework of the proposed research. Studies presented above using the trans-theoretical model point out how someone’s readiness for learning or adopting a behavior indicate how successful EE or other educational efforts might be. Analyzing change, especially lasting change, is also aided by social ecology, which shows how change can happen on a small scale or a large scale. The goals of groups doing EE in the public sphere might dictate whether they seek individual change or societal-level change, and how change can occur within or across the different levels. An understanding of the different levels can help inform those education efforts.

The research presented in this review covers a theoretical framework, behavioral aspects relevant to the study, and the field of environmental education itself. Collectively they are presented to help understand the study structure and methodology presented in the following chapter.
Chapter 3: Research Design Methodology

Introduction and General Perspective

Problem statement. Environmental education of the general public is widespread. Dedicated groups raise awareness about issues such as pollution of air and water, habitat loss and invasive species affecting natural areas, climate change and others. Museums, nature centers and zoos often have as a component of their activities information about environmental issues (Fraser et al., 2014; Peffer et al., 2013). Education might have a goal of raising awareness, changing attitudes and suggesting alternatives, eventually resulting in a change in behavior at an individual or societal level. Research, however, shows a disconnect that prevents people from acting on concerns over critical environmental issues based on awareness alone (Crowell & Schunn, 2014; Kollmus & Ageman, 2002; Von Borgstede, Andersson, & Johnsson, 2013). Other factors have been shown to have a stronger impact, including personal values, societal norms, and perceptions that behavior changes would be effective (Bamberg & Möser, 2007; Schultz 2005).

Much environmental education (EE) focuses on knowledge and awareness without advocating for change, which makes it difficult to bridge the awareness-behavior disconnect (Levy & Zint, 2012). Environmental education in the public sphere is not therefore designed to address factors that have been shown to be more effective in producing pro-environmental behavior change (Bamberg & Möser, 2007; Levy & Zint, 2012).
This chapter includes a description of research questions to address the knowledge-behavior disconnect problem, followed by an overview of research design and methodology, including participant selection, data collection, and analysis.

**Research questions.** This examination of organizations that conduct EE activities and campaigns shows how they align with psychosocial factors that help predict behavior. The main question for research was: How does environmental education in the public sphere address psychosocial determinants shown to affect pro-environmental behavior at the individual and societal level? Three sub-questions operationalized the over-arching question to investigate each of three key concepts shown in research to have impact. These areas guided data collection.

- How do environmental organizations and nature groups target value-orientations shown to predict pro-environmental behavior?
- How do environmental organizations and nature groups target subjective norms shown to predict pro-environmental behavior?
- How do environmental organizations and nature groups target perceived control shown to predict pro-environmental behavior?

The questions intended to compare the activities and efforts of various organizations that are engaging in environmental education in the public sphere with factors that research has shown are determinants of behavior change (Bamberg & Möser, 2007; Carmi et al., 2015).

**Research design.** This mixed-methods study featured a survey component that gathered quantitative data on activities and efforts of groups that do environmental education in the public sphere. The survey included questions covering EE practices of
the various types of organizations. Questions also addressed criteria of the study, including how each organization views its efforts related to the research concepts, namely which activities and materials might align with value orientations, societal norms, and perceived control of behaviors. Experts in the field, including an Environmental Education college professor/researcher, a University Sustainability Director, and a Director of a non-profit environmental group reviewed survey questions for wording and alignment with research questions. This research element provided baseline information explaining EE conducted by a range of organizations that is aimed at the general public. The descriptive statistics show types of EE materials utilized by the various organizations, media and events presented, environmental topics covered, and whether EE is a primary or secondary focus of each organization. Survey respondents also formed a pool from which case study subject organizations were drawn, for richer, in-depth examination of the research concepts.

A qualitative portion of the study followed the quantitative element. The multiple case study described the experiences and practices of several organizations doing environmental education in the public sphere. A group of three subjects was selected for in-depth analysis in the multiple-case study.

Suitable participants were those that engaged in activities, campaigns, written materials, online information, social media, lectures, policy memos, museum or park information displays, or other methods to share environmental knowledge and concerns. The study ideally would have included one dedicated environmental organization, one park or nature center, and one zoo or museum to maximize the value of the case study.
comparisons. Potential subjects were ranked as those meeting most of the criteria, and that were the best, typical cases of their type of organization.

Multiple organizations of each type met the criteria; convenience sampling was utilized in regard to willingness to participate and make materials available for research, as well as proximity to the researcher. Eventually an environmental group, a nature center, and a recreational membership group that focuses on conservation and stewardship were chosen as case study participants.

Study of the educational material content joined with semi-structured interviews of key contributors and designers of the educational materials and campaigns within each organization.

Data from each organization included interviews, information about events, written materials or displays, and electronic or digital media, including social media. No events were witnessed due to time and scheduling constraints of the research, though event planning and presentation materials were reviewed from two of the groups, and discussed during interviews with all of the groups. The study relied on multiple data sources within each case, including educational materials and interviews, as further described in Table 3.1.

The study’s theoretical framework helped guide the research to provide structure for the research questions. The framework drew on three theories relevant to pro-environmental behavior: the theory of planned behavior, the trans-theoretical model, and social ecology theory.
Table 3.1:

Data Sources & Collection

<table>
<thead>
<tr>
<th>Types</th>
<th>Description</th>
<th>Data collection</th>
</tr>
</thead>
<tbody>
<tr>
<td>Events &amp; Activities</td>
<td>Meetings, classes, lectures, presentations which include or are designed for EE.</td>
<td>• Non-participant observation</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Reflexive/analytic memos</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Thematic content evaluation</td>
</tr>
<tr>
<td>Written Materials &amp; Static Displays</td>
<td>Brochures, mailings, handouts at events, placards at museum, zoo or park locations with some focus on EE.</td>
<td>• Rich description</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Content analysis</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Elaborative coding</td>
</tr>
<tr>
<td>Electronic/Digital Media: Online Materials, Audio-Video Information &amp; Social Media</td>
<td>Web site articles, podcasts, videos, photo slide shows, social media messages and campaigns, e-mail newsletters or listserve distributions that include EE.</td>
<td>• Rich description</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Content analysis</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Elaborative coding</td>
</tr>
<tr>
<td>In-Person Interviews</td>
<td>Interviews with individuals responsible for design, writing, implementation of EE activities and materials.</td>
<td>• 2-4 people per site</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Semi-structured using thematizing approach (Brinkman &amp; Kvale, 2015)</td>
</tr>
</tbody>
</table>

Research using the theory of planned behavior identifies key concepts shown to be antecedents to action: the impact of social norms; perceived behavioral control; and value orientations (Bamberg & Moser, 2007; de Leeuw et al., 2015). The trans-theoretical model identifies stages of readiness for people to apply new knowledge and alter or adjust behavior (Forward, 2014). Social ecology theory posits that impacts and
change take place on several levels, from individual to community to societal (Collins et al., 2010). Past findings within these theories guided the analysis of content of the case study participants’ materials, helped form interview structure, and guided overall study findings.

Analysis of the data included reviewing educational materials and content within the thematic design. Elaborative coding allows for organization of content within themes from past research, while accepting new, emerging themes (Auerbach & Silverstein, 2003). In this study, elaborative coding used social norms, PBC and value orientations, along with emerging themes for each case study examination. Interview findings were coded using the same structure, in order to compare within each case and across cases. Emerging themes from the data added to the description of each case, specific to the context of each participant. For example, the environmental group actively engages the public on issues, while the nature center often offers information about issues within the context of its displays and on-site activities that people visit for recreation.

Presentation of results included illustrative anecdotes, detailed descriptions of each case, and analysis developed from the theoretical framework and new themes. Conclusions were presented within the context of each organization, using the lens of social ecology theory. Recommendations from the findings address the field of environmental education, as well as future research into the field.

**Discussion of methodology.** A mixed-methods approach was chosen for this study to describe the practices of organizations whose main or partial focus is environmental education in the public sphere. Yin (2009) suggests mixed-method studies produce more thorough examination of a topic and can “…permit investigators to address
more complicated research questions and collect a richer and stronger array of evidence than can be accomplished by any single method alone” (p. 63). The array of evidence collected in the study addressed the three primary research questions through quantitative and qualitative means.

In the study, a quantitative survey gave a broad, general understanding of EE practices. The qualitative approach added a deeper and richer description of selected cases to improve understanding, with both methods addressing the same research concepts. The qualitative component, a multiple case study, produced findings that directly addressed the intended result: determining the extent to which environmental activities, campaigns and efforts by these various organizations align with characteristics that might lead to personal or societal change. Past researchers have found information from a number of sources within each case will lead to a more holistic and credible study (Feagin, Orum, & Sjoberg, 1991).

Themes from analysis of written materials and events were coupled with interview analysis to provide a rich description of each organization’s EE. Semi-structured interviews focused on the key research factors, societal norms, value-orientations, and perceived control, in discussing an organization’s efforts. Such interview sessions mirrored Brinkman’s and Kvale’s (2015) notion of a conceptual interview, seeking “positions and links within a conceptual network (p. 177).” Using these themes as a structure for analyzing educational materials and events allowed for in-depth description of the degree to which each subject is addressing, directly or indirectly, the main concepts of the research questions.
More value came from examining three organizations with different structures, in this case an environmental non-profit, a nature center that people visit, and a recreational organization that promotes stewardship of nature among its members. Crowe et al. (2011) suggest multiple cases allow for replicating the propositions to bolster the evidence related to the research questions. Thus a triangulated view of the concepts resulted in more depth. Such case studies can improve understanding (Stake, 1995). The multiple-perspectives approach borrows from the constructivist interpretation of Charmaz (2006), who noted such a practice takes into account different realities of the various research targets. Even though Charmaz is most associated with grounded-theory research, the importance of viewpoint and perspective added to the case study value. Other researchers support the constructivist nature of case study research suggesting the collaboration between the research subjects, organizations, and the researcher allows participants to tell their unique stories and provide their understanding of the research concepts (Crabtree & Miller 1999).

Each organization approaches the issue of environmental education through its own lens, given its structure, mission and goals. Case study findings within individual contexts can be valuable because they seek knowledge in a real-world situation (Flyvbjerg, 2006), as opposed to trying to uncover universal truths. The field of environmental education itself can have various contexts, such as scholastic, consumer, general public, and policy arenas. Acknowledging such contexts within each case allows for deeper understanding (Yin, 2003), while leading to what Stake (1995) refers to as analytic generalization, how the results might be reasonably applied to other organizations and situations.
A key methodological feature was linking the structures of the organizations and their educational materials to the tenets of the study through the theoretical strategy. Brinkman and Kvale (2015) discuss rules of inference that can set parameters to reasonably associate findings within a field of observation and inquiry. Applied to this study, findings about educational practices of the organizations were compared with the behavioral antecedents targeted in the research questions: value orientations, societal norms, and PBC. The importance of a theoretical structure is supported by past researchers in selection of participants, description of cases, comparing and reporting results (Creswell, 2007; Yin, 2003). The theoretical structure here helped with content analysis of materials, as well as interview design. Themes created from the theoretical concepts served as a starting point for coding data. Analysis that begins with a thematic structure can also be open to emerging themes within each case (Saldana, 2016). The themes and their associations formed a basis for comparison across organizations. Elaborative coding fit with this structure, providing a method to analyze findings. Elaborative coding utilizes concepts from past research to form a basis of analysis of content (Auerbach & Silverstein, 2003). The technique includes selecting text of transcripts and other data relevant to theoretical constructs, while searching for text and data that can identify new themes.

Description of the various forms of information by the interview subjects, coupled with analysis of the materials and campaigns themselves, helped address the research questions in a meaningful way, adding to the existing literature. This analysis over several organizations proved more valuable than a single case study, improving external validity and generalizability. Conventions were adopted for field notes, materials
analysis, interview protocols, and coding. Creating similar approaches for use with each of the participants increases reliability of data (Flick, 2015). Such frameworks assisted content analysis and interviews. While they could also have guided field observations, the researcher was unable to observe any public events or presentations.

Research Context

A study design should take into account a variety of contextual factors, including time and place, political and social climate, that help create the bounded system for a case study (Flick, 2014; Saldana, 2016). A concern for case study research can be trying to answer a question that is too broad or has too many objectives for one study (Yin, 2014). To combat this potential problem, researchers suggest it is advised to bind the case by time and place (Creswell, 2003), time and activity (Stake, 1995) and by definition and context (Miles and Huberman, 1994). Qualitative research designs, such as case studies, require various contexts be taken into account in both design and analysis due to the specific and unique nature of each research subject (Saldaña, 2016). Such concerns guided the design of this study.

Target organizations for the proposed study were sought within New York State, outside of the New York City metro area, which impacts the political and policy context. Time represents another context, as laws and societal practices can change. The research took place in 2017. The participants in the study shared contextual issues within the field of environmental education, even though each organization operated within its own context given its structure and purpose. Topics of environmental education were closely connected to each organization and its particular audience. For example, a zoo might inform visitors about habitat concerns, while an advocacy group might work on a range
of environmental issues, such as pollution or climate change. Such contextual factors are important to take into account to provide some framing for interviews and other data gathering in otherwise boundless areas (Brinkman & Kvale, 2015).

Another context was the apparent target of EE. Each research participant has as part of its structure and mission a unique form of engaging the public, policy makers, or other stakeholders with information on environmental issues. Issues might also have broader regional, national or world concern, such as climate change or plastics bans, which would affect the context of the work they do.

The study took into account how each organization approaches environmental education in the public sphere, time and place of subjects, and each entity’s organizational context. Such factors influenced interview design and questions, and created a framework for chronicling and analyzing the educational materials and events. The individual case descriptions presented the contextual factors and other details of each participant organization for the best understanding of each circumstance.

**Research Participants**

The sampling strategy for participants in the study began by identifying organizations, and individuals within them, to receive the initial quantitative survey. From the survey respondents, cases were selected for the qualitative portion of the study. Purposive sampling was used to identify target organizations for the initial survey. The sampling strategy found subjects to best address the research questions, from which some numerical data was drawn, though with limited generalizability. Selecting typical cases within certain criteria and context help describe a particular field form those most familiar with it (Flick, 2014; Teddlie and Yu 2007). Organizations received query letters
via e-mail and survey instructions asked to have only one person per entity fill out the
survey. For the purpose of this study, criteria of organizations to target included:
organization type, as a non-profit, zoo, nature center, park or other; EE practices of some
type; engaging the public on some level, either for awareness, seeking behavior change,
or advocating policy change; and location in Upstate New York, including regional
chapters of national environmental organizations that met other criteria. Snowball
sampling was utilized or encouraged to maximize the reach of the survey.

Research participants for the multiple case study were drawn from respondents to
the initial EE survey. The focus was to find what Teddlie and Yu call “information rich
cases (2007).” Organizations and individuals that returned the survey indicated which
EE practices they utilize, identifying elements that can be data points of the multiple case
study. A variety of criteria indicated each organization’s materials and activities
including:

- Development and presentation of environmental education materials to the
general public in written form or displays at their location;
- Events, lectures or other live presentations on environmental topics offered to the
general public for the purpose of education;
- Efforts to inform or influence the general public through outreach activities
that could include mail, e-mail or policy positions.
- Digital communications such as website information, audio or video
materials, social media messages, etc.

Identifying organizations that meet a set of criteria are best able to inform an
understanding of the research problem (Creswell, 2007). Case study subjects for research
can also be selected for being extreme cases or representative ones (Stake, 1995). This study focused on typical cases that satisfy the most elements of the criteria, along with a willingness to participate.

The ideal group for the comparative case study included at least one dedicated environmental organization or non-profit, and at least one nature center, zoo or park that invites visitors in, while offering information on relevant environmental concerns. A selection of three organizations fulfilled the goal of multiple case study participants, each with multiple data sources to gain extensive detail. Replicating a structure using multiple data points, over several subject organizations, provides a study with rich descriptive data to enhance understanding (Creswell, 2007; Stake, 1995).

Within the chosen organizations, interview subjects were identified who have familiarity and understanding of the environmental education materials. Yin (2014) suggests events and opinions should be corroborated using more than one source. Two interview subjects were interviewed from each participant organization.

In summary, a survey has as its value high generalizability, though inability to consider context or deep description (Gable, 1994). A multiple case study excels in what Gable calls “explorability” and “representability,” testing research concepts at a deeper, more real-world level. The complex questions regarding pro-environmental behavior and how it is addressed can best be addressed from both perspectives, rather than just one approach. The research succeeded in collecting both types of data through its mixed-methods design.

**Instruments Used in Data Collection**
The main instrument for quantitative data collection was a survey sent to organizations in New York that met study criteria. The list was formed using experts in the field from parks organizations, an environmental group, and the State University of New York College of Environmental Science and Forestry, each of whom maintains lists of groups useful for this study. Internet searches and links within organizations’ webpages helped build the survey list. The survey (see Appendix A) had multiple choice and short answer questions to lay a groundwork of understanding for the study.

Instruments for qualitative data collection included field notes and analytic memos, transcripts of educational events, an interview protocol (see Appendix B) and the transcripts from the interviews, an elaborative coding thematic framework (see Appendix C), and a research documentation sheet for monitoring (see Appendix D). Some of the above items were tools for analysis.

Data Collection and Analysis

Data collection. An initial electronically-delivered survey (see Appendix A) collected baseline information regarding the activities of organizations that do EE. Information gleaned from organizations’ websites and from phone calls identified survey participants, one for each organization who could provide as complete an assessment as possible of their various EE activities. Respondents were asked to quantify their environmental education activities. They also noted the type and frequency of methods they use to inform visitors or other segments of the public about environmental issues and topics. They survey further gauged their organization’s level of effort toward EE, based on staff resources. Collection of descriptive quantitative data in what is otherwise a
qualitative study is supported through paradigmatic corroboration, using two approaches of data-gathering for the same topic (Saldana, 2016).

The responses to the survey helped with participant selection for the qualitative, in-depth portion of the study. Responses from a group of organizations indicated methods, tendencies and issues related to EE efforts. Such findings were further described in the case studies to corroborate findings, adding deeper understanding. Researchers caution against simply quantifying results from qualitative studies in mixed methods designs (Creswell, 2013; Vogt et al., 2014). This study did not take qualitative results and turn analysis into numbers; rather, it gathered descriptive statistics, then delved deeper into a select group of organizations in descriptive case studies.

A multiple-case study formed the qualitative portion of the research. Analysis in such studies is built upon the quality of data and analysis of each individual case, with any comparisons across cases being made afterward (Miles & Huberman, 1994). Data from several sources within each case assists in multiple-case studies (Creswell, 2007; Stake, 1995). The qualitative case study portion of this research project followed those concepts. It included examination of educational materials, review of multiple types of communications, including social media, and semi-structured interviews with key personnel in each organization who created and administered their environmental education materials. The data-collection strategy was applied similarly to each case, with comparisons made after each case description. Such strategy can help facilitate any comparisons and assist reader understanding (Flyvbjerg, 2006; Miles & Huberman, 1994; Yin, 2009).
Content from educational materials was described and categorized using themes from the research questions to assist each case and cross-case comparisons. Initial themes were created to begin coding around the central research questions, aligning content from written materials, audio-visual and digital sources with the psychosocial antecedents of behavior: social norms, PBC, and value orientations. Categorizing elements of the data under selected and other emergent themes can assist in database facility, allowing for searches within concepts across the different methods of data collection (Flick, 2014; Yin 1994). Those techniques assisted this study.

Educational activities were another set of data points. Non-participant observation can be used for description of interactions as they occur in the settings of the activities (Flick, 2014). Time constraints of the research did not allow for observation of any public events, however planning materials for some events were available for review.

A third method of data collection was semi-structured interviews. Individuals within the case study-target organizations provided goals and greater detail about the development of the materials and events. Thematizing is an approach to guide the interview by pre-determined research concepts (Brinkmann & Kvale, 2015). Such a method has also been shown to help guide an interview with expert sources through questions around a theme or themes (Flick, 2014), however, there can be pitfalls, such as the extent of the expert’s knowledge and blocking of information at the person’s discretion. Selection of interview subjects can help, making sure each has knowledge, or a role in creating, the EE materials. Bias and exclusion of information can be addressed by comparing responses with multiple sources within each organization, making sure not to create any tensions within the organization. Interviews for this study were guided by a
thematizing approach. Open-ended questions were followed by more directed questions to ensure coverage of the themes. Topical questions of this nature, while not comprising the entire interview, assist in covering anticipated needs for the study (Creswell, 2007; Stake, 1995).

Interviews were audio recorded and transcribed to have a text version for database search purposes. The interview recordings were transcribed by the researcher. The transcripts, written materials, and analysis of electronic and other EE content was manually coded, utilizing word processing formatting to note codes in margins adjacent to data.

The study design has to account for reliability and validity. The size and scope of a case study can add to its quality (Stake, 1995). Reliability of interview data is dependent on questions that are not leading or biased, consistent questioning of each subject, and the transcription and coding of completed interviews to maintain intersubjective consistency (Brinkmann & Kvale, 2015; Flick, 2014). Interviews for this study followed a consistent protocol, with questions designed to seek deeper understanding, not confirm pre-determined conclusions. Similar rigor was employed for the analysis of materials and transcripts. The thematic structure of questions and analysis assisted coding consistency, and by extension, reliability.

Data collection utilizing multiple data sources across several organizations should help with external validity (Stake, 1995; Yin, 2009). In the qualitative portion of this study, examining three organizations, each with multiple data sources, increased validity. External validity, the ability to transfer any findings to other examples or settings, can be tested by asking several questions:
• Are the characteristics of the cases fully described?
• Are boundaries and context of the cases described to lead to logical generalization?
• Is there adequate detail to assist in determining transferability?
• Is there a theoretical explanation consistent with findings?

(Miles & Huberman, 1994)

These questions are addressed in the methodology by including: presentations of each case, consideration of contextual factors, and the theoretical framework that guided the research.

**Monitoring.** Monitoring of each data-gathering activity was made through documentation sheets (see Appendix E), allowing for uniformity of each research occurrence. The record supports the possible replication of the research.

E-mail addresses and identities of the subjects were kept confidential, in locked filing cabinets at researcher’s home for three years. Field notes, memos, interview transcripts and other data will also be retained confidentially. Organization identifying information was stripped from the analyses, using generic or generalized terms to describe the type of organizations and the appropriate context for each case.

**Data analysis.** The mixed-methods study included data from the initial survey in the form of descriptive statistics, along with the case study qualitative data from written materials, event planning information, electronic and social media content, and in-person interviews.

Survey data showed percentages of groups that hold specific EE events, offer printed educational materials, engage visitors to their park or center with educational
displays, or offer electronic information through website articles, social media or other interactive media. Other questions indicated the degree of EE as a priority for different organizations and the frequency of different types of activities, reported as means. The relevant categories were segregated in some questions by each organization’s identification as an environmental group, a park, zoo or nature center.

The multiple case study component of the research project sought to create rich descriptions of the activities and materials around environmental education in the public sphere. Yin (2009) notes there is no standard way to analyze or present case study findings. He lists theory generation, detailed analysis, and rich descriptions as possibilities. The rich descriptions in this study will benefit from information generated from the content of activities, materials, and in-person interviews. Multiple data sources within each case can allow for an in-depth description, using themes of the study (Creswell, 2007).

The general methods of analyzing data were directed content analysis coupled with elaborative coding. The directed-content approach utilizes an existing theory to help guide themes for description, while allowing for new themes or categories that did not exist in the initial structure but emerge through data collection (Hsieh & Shannon, 2005). Elaborative coding of interview transcripts and other textual materials supports such analysis, using theoretical constructs for categorization, followed by refining of categories and themes (Auerbach & Silverstein, 2003). The coding method allows for selection of relevant texts from the research to be selected for analysis based on the theoretical constructs, while still being open to emerging themes. A thematic structure
was based upon the behavioral antecedents identified in theory of planned behavior research: value orientations, subjective norms, and PBC.

The priorities identified in intentional categorization help relate findings to the research questions, while also serving to select or reduce categories for eventual reporting and understanding by the reader (Flick, 2014). Analyzing data from each of the multiple cases within the same framework increases internal validity through what Yin (2009) terms pattern matching.

The final analysis presented each case study individually, as described earlier, with cross-case analysis to follow. Descriptions of each case within the theoretical framework aid comparison, allowing for any commonalities and differences to be drawn (Feagin et al., 1991; Miles & Huberman, 1994). The analysis emphasized the most significant aspects of each case – the extent to which the EE efforts of each organization address the concepts in the study framework – along with other main directions and themes that emerged from the data. In such analysis, the author has to demonstrate sufficient expertise through topic explanation and literature review to assure the reader of the quality of study (Yin, 2009). Organizations were kept anonymous, using only descriptive language regarding the type of entity, as it pertained to the study results and suggestions, while giving pseudonyms to the interview subjects of each organization.

Results of this type, multiple descriptive case studies, will add to the understanding of the field within the contexts of each individual case and organization, but can also help with broader understanding. While such results do not support causal or statistical generalization, they can give insight about other like organizations. Stake (1995) suggests analytical generalizations are valid if findings could be “reasonably
applied” to another situation. Such application has also been called theoretical
generalization (Feagin et al., 1991) and naturalistic generalization (Miles & Huberman,
1994), wherein reasonable judgment of findings, apparent to a typical reader, could be
applied to another situation or organization. The three participants in this study are
similar to many other organizations that conduct EE. The study findings therefore
support analytic, theoretical or naturalistic generalization, as described above.

Summary of Methodology

This study sought to learn more about the content and practice of environmental
education in the public sphere, through a lens of theoretical findings about behavior,
individual and societal change. A mixed-methods approach was appropriate to begin
with a descriptive basis from survey findings, followed by in-depth inquiry though the
multiple case study. Gable (1994) suggests the use of survey methodology in concert
with case studies allows for effective theory testing. Moreover, Yin (2009) adds case
studies are appropriate when studying contemporary events and issues. The theoretical
framework helped define the issues and assisted in describing each case in relation to the
research questions. The multiple case design lent more information about the issue,
while allowing for examination in the context of each subject organization. Hence, the
methodology should have been sufficient to address the research questions.

Stake provides an elegant method of presentation of the case studies, starting
with “a vignette from one of the cases, explanation of issues, extensive description of
each case, summaries with naturalistic generalizations, and conclusions, reminding
readers that this is a small set in a complex issue” (Stake, 1995). Each subject of the
multiple case study produced the content to support a description of the case, and analysis
of how the research questions were addressed within the case. Such presentation complemented the survey quantitative findings, laying the basis for comparative observations and implications. The social ecology framework helped position the findings within a personal, community and societal context.
Chapter 4: Results

Introduction

This study compared the environmental education (EE) practices of groups in Upstate New York with the psychosocial determinants of individual and societal change. The strategy of raising awareness about environmental problems and solutions is insufficient to effect change among the general public, as shown by past research (Kollmus & Agyeman, 2002). Behavioral research points to factors that help predict behavioral intention and subsequently changes in behavior (Bamberg & Möser, 2007; Schultz 2005). Change theories suggest people can be at different states of readiness for change, factors that could also help with effective education of the general public (Prochaska et al., 1991). The scope of an issue also can influence efforts to induce change, as actions might be needed on an individual, community, or policy level to be effective (Bronfenbrenner, 1977, Lejano & Stokols, 2013).

This mixed-methods study included a survey of EE practices sent out to environmental groups, nature centers, zoos, parks and other organizations, followed by a multiple case study. This chapter will present findings of the survey to help set a baseline of the types of activities groups do in their EE efforts. It will also give a sample range of topics covered by EE, as well as the types of issues on which they seek individual, societal or policy change. Three case studies will be presented, detailing how different groups handle their EE goals and practices, to seek richer understanding of those efforts in the context of seeking change.
The phenomenon of interest above was studied guided by the main research question: How does environmental education in the public sphere address and target the psychosocial determinants shown to affect pro-environmental (pro-E) behavior on the individual and societal level? Three sub-questions helped operationalize the over-arching question:

- How do environmental organizations and nature groups target value orientations shown to predict pro-E behavior?
- How do environmental organizations and nature groups target subjective norms shown to predict pro-E behavior?
- How do environmental organizations and nature groups target perceived behavioral control shown to predict pro-E behavior?

The results were also examined in consideration of change theories that address readiness of change among individuals, as well as levels of change on an issue. EE can take into account the TTM theory that some might be new to an issue or problem needing basic information, while others are more aware or already beginning to shift attitudes and actions to address the issue. Similarly, EE campaigns can be more effective addressing change on multiple levels. Social ecology suggests a group can be more effective in effecting change by including individual behavior along with community- or policy-level factors that would impact an outcome.

The quantitative portion of the study consisted of a survey to groups that conduct EE in the public sphere, seeking to learn more about their practices and methods, along with the main topics on which they work. The survey was sent to 188 potential respondents, with a 24% response rate ($n = 46$); all but one of the groups indicated that
they did environmental education. Respondents that do EE \( (n = 45) \) included 18 environmental organizations, 13 nature centers, three parks, two zoos, two museum/science centers and eight others with varying primary focus (transportation, conservation, community based organization, university outreach department, public health department, funding agency and clearinghouse for environmental information). Descriptive statistics will be presented on EE practices, broken down in some cases based on the type of organization.

Case studies of three organizations that perform EE complement the quantitative data with in-depth examination into actual practices and how each addresses the research concepts. The multiple case study will present each case holistically as a representative example of an organization doing EE activities in the public sphere.

The groups were selected from survey respondents that indicated a willingness to be part of the qualitative dimension of the study. Of those, three different types of organizations were sought that met most of the criteria of taking part in a variety of EE methods. The participants included a membership organization in Upstate New York that promotes environmental stewardship, preservation, and responsible use of wilderness areas; a local chapter of a national environmental organization that works on engaging the public on a number of issues and policy change; and a nature center in Upstate New York with outdoor recreation, including education about conservation and lifelong environmental stewardship.

Case study methodology included semi-structured interviews with two members of each organization, review of various written materials, and analysis of website, social media and other electronic means of communication and education. Interviews and field
notes from site visits were transcribed and coded; content analysis of printed materials, planning and presentation documents, and electronic communications completed the data gathering.

The findings relate to the research questions, identifying the ways in which EE activities address psychosocial determinants of change. Several other themes emerged that help explain the content and intent of each organization’s EE. Findings were also compared to the theories of change, social ecology and the TTM, to determine where those principles were being addressed, explicitly or implicitly. Multiple data points from each participant organization were sought to improve accuracy and validity of the findings, including the interviews, written materials, website content, social media content, static displays and signs in two cases, and video content in another case. The same interview protocol was followed for each of the interviews to further assist validity. Due to time restrictions and travel needs for the research, no public events were witnessed to add to the data.

Findings

The most relevant findings of the survey portion of the study included the type of EE activities and methods used, the importance of EE to the various groups’ missions, how different types of groups address education and communication, and the issues on which they seek change.

The most prevalent methods used by respondents for EE were electronic communication. Social media was named as the most widely used (41 of 45); information on a website followed (40 of 45), with special events (38 of 45) and speakers
from the organization going to other locations (36 of 45) named by the most groups. The least used were press releases or conferences (30 of 45) or materials mailed out (9 of 45).

Content of Environmental Education for Awareness

![Bar chart showing the content of environmental education efforts.](image)

**Figure 4.1.** Respondents were asked: Does the content of your environmental education efforts aim to inform or raise awareness of any of the following (topics listed).

- Consequences of environmental problems (pollution, climate change, habitat loss, etc).
- Local, state or national policies.
- The impact on others (the poor, animals, etc.) of damaging environmental behavior or policies.
- Local examples of environmental problems or threats.
- Growth and availability of new technology or options to minimize pollution, climate change, or other problems.
- Increased adoption of technologies, habits, viewpoints on environmental issues.
- Local examples of consequences or impacts from environmental problems.

Electronic communication was more prevalent and used more often than mail. A total of 36 of 45 respondents say they send out electronic messages – defined as social
media, e-mail or electronic newsletters - more than once a month, with 12 of those groups sending messages several times a week, and 14 others daily.

Each organization’s location and purpose – advocacy, recreation, or information - influenced the issues they focus upon, as well as the level of change they impacted. Consequences of environmental problems in general (41 respondents) and local threats (39) or impacts (37) of environmental problems were top issues about which organizations wanted to raise awareness (see Figure 4.1).

The top general area in which the groups seek to change attitudes or actions include suggestions to mitigate environmental problems, signaled by 40 of 45 survey respondents. Specific action steps to lessen degradation was indicated next most often (38 of 45). Information about green technologies (27 of 45) and habits (21 of 45) were less often the topic of educational messages (see Figure 4.2).

The questions on awareness and change were meant to tease out differences in whether the groups were simply providing information, as opposed to offering education on factors more closely linked to behavior change. Differences in the nature of the respondent groups uncovered varying approaches to EE.

Environmental groups responded similarly to other organizations (nature centers, parks, zoos, museums) on whether they sought to raise awareness about consequences of environmental problems, 89% to 100% respectively.

Similarly, awareness of local environmental problems was championed by majorities of both environmental organizations (13 of 18) and other groups (22 of 25).
Environmental Education Content to change Attitudes or Actions

Figure 4.2: Respondents were asked: Does the content of your environmental education efforts aim to change people's attitudes or actions in any of the following ways?

- Suggestions or options to mitigate environmental problems (e.g., reduce waste, use less energy, other lifestyle changes).
- The effectiveness of certain actions to mitigate, reduce or avoid an environmental problem.
- The impact on others of certain environmental problems (the poor, animals, other countries, etc.).
- The growth and availability of new technologies or options to minimize pollution, climate change, or other problems.
- The increased adoption of certain technologies, habits of viewpoints on certain environmental problems.
- Specific action steps to take that would have an effect on an environmental problem or issue.

That changed on questions about policy, new technologies or practices to minimize impacts, and adoption of pro-E behaviors or viewpoints. Table 4.1 shows other types of groups were less likely to include such information in EE, than dedicated environmental groups.
Content of EE to seek change showed similar differences. A majority of both types of groups responded that they offer suggestions of ways to mitigate environmental problems (Environmental groups 89% v. Others 95%).

Table 4.1

*EE Efforts to Raise Awareness vs. EE Efforts to Change Behavior.*

<table>
<thead>
<tr>
<th>Content Goal</th>
<th>Type of Content</th>
<th>Environmental Groups</th>
<th>Other Groups (nature centers, Parks, Zoos, Museums)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Awareness focused EE content</td>
<td>Consequences(^a)</td>
<td>89%</td>
<td>100%</td>
</tr>
<tr>
<td></td>
<td>Policy(^b)</td>
<td>72%</td>
<td>42%</td>
</tr>
<tr>
<td></td>
<td>New Tech/Mitigation(^c)</td>
<td>67%</td>
<td>21%</td>
</tr>
<tr>
<td></td>
<td>Adoption of Technology(^d)</td>
<td>72%</td>
<td>42%</td>
</tr>
<tr>
<td>Change-focused EE content</td>
<td>Suggestions/options of Pro-E behavior(^e)</td>
<td>89%</td>
<td>95%</td>
</tr>
<tr>
<td></td>
<td>Prevalence of pro-E behavior(^f)</td>
<td>67%</td>
<td>47%</td>
</tr>
</tbody>
</table>

Note. Awareness-focused and change-focused content from survey questions.

\(^a\)Consequences of environmental problems (pollution, climate change, habitat loss, etc.).

\(^b\)Local, state or national policies.

\(^c\)New technology or options to minimize pollution, climate change, or other problems.

\(^d\)The increased adoption of technologies, habits, or viewpoints on certain environmental issues.

\(^e\)Suggestions or options to mitigate environmental problems (eg. reduce waste, use less energy, other lifestyle changes).

\(^f\)The growth and availability of new technologies or options to minimize pollution, climate change, or other problems.

Environmental groups, though, were more likely to say they include content on how prevalent pro-E habits and technologies are (67%) than other types of respondents (47%).

Such information could support social norms and perceived behavioral control.
Table 4.2

Topics and Issues as Reported by Survey Respondents

<table>
<thead>
<tr>
<th>Topics reported in survey</th>
<th>Frequency</th>
</tr>
</thead>
<tbody>
<tr>
<td>Climate change and sustainable energy</td>
<td>6</td>
</tr>
<tr>
<td>Water quality in rivers and lakes</td>
<td>6</td>
</tr>
<tr>
<td>Animal habitat protection or species extinction</td>
<td>5</td>
</tr>
<tr>
<td>Invasive species prevention and mitigation</td>
<td>5</td>
</tr>
<tr>
<td>Sustainable buildings and institutions</td>
<td>2</td>
</tr>
<tr>
<td>Protection/expansion of parks and trails</td>
<td>2</td>
</tr>
<tr>
<td>Take actions – even if they are small</td>
<td>1</td>
</tr>
<tr>
<td>Preservation of the whitetail deer</td>
<td>1</td>
</tr>
<tr>
<td>Local citizen-science data collection</td>
<td>1</td>
</tr>
<tr>
<td>Biodiversity conservation</td>
<td>1</td>
</tr>
<tr>
<td>High fuel/electricity costs effects on Low- and middle-income communities</td>
<td>1</td>
</tr>
<tr>
<td>Infrastructure funding</td>
<td>1</td>
</tr>
<tr>
<td>Danger and environmental pollution associated with nuclear power</td>
<td>1</td>
</tr>
<tr>
<td>Funding for the Environmental Protection Agency</td>
<td>1</td>
</tr>
<tr>
<td>Urban forestry</td>
<td>1</td>
</tr>
<tr>
<td>Stopping construction of Northern Access Pipeline</td>
<td>1</td>
</tr>
<tr>
<td>Environmental justice</td>
<td>1</td>
</tr>
<tr>
<td>Degradation of resources from overuse</td>
<td>1</td>
</tr>
<tr>
<td>Soil contamination</td>
<td>1</td>
</tr>
</tbody>
</table>

Note. Participants asked, what are top 3-5 issues or concerns of organization?

The specific issues on which the groups educated the public varied widely, based in part on each organization’s structure and location. As displayed in Table 4.2, a few topics recurred through several of the groups, such as education on climate change and
sustainable energy \((n = 6)\); water quality in rivers and lakes \((n = 6)\); education around animal habitat preservation or species extinction \((n = 5)\); and invasive species \((n = 5)\).

Other issues mentioned in the survey ranged from sustainable development \((n = 2)\) to protection and expansion of trails \((n = 2)\), green infrastructure funding \((n = 1)\) to biodiversity \((n = 1)\) to, environmental justice \((n = 1)\), and taking pro-E actions even if they are small \((n = 5)\). The issues ranged from things that have local impacts, at a micro- or meso-level, to policy and global impacts, which would need exo- or macro-level change.

Collaboration and partnerships are widely utilized for EE campaigns and events, with 43 of 45 respondents saying they partner on projects with other organizations. Just over half, 24 of 45, say they hold educational events at least once-a-month.

Of the 45 groups that do EE activities and messaging, only two considered it ancillary to their main mission, as show in Table 4.3. Fewer than half of the groups are dedicated environmental groups (18 of 45), yet the majority (31 of 45) list EE as primary or integral to their mission. The data indicated that EE is an important function among nature groups, zoos and other locations that people might visit for recreational reasons. Those visits create an opportunity for the groups to present EE messages, while dedicated environmental groups have a more direct educational and advocacy purpose.
Table 4.3

*Importance of EE by Respondent Type.*

<table>
<thead>
<tr>
<th>Importance of EE</th>
<th>Environmental Groups</th>
<th>Nature Centers</th>
<th>Parks</th>
<th>Zoos</th>
<th>Museum/Science Ctr</th>
<th>Other</th>
<th>Totals</th>
</tr>
</thead>
<tbody>
<tr>
<td>Primary function</td>
<td>3</td>
<td>10</td>
<td>0</td>
<td>1</td>
<td>0</td>
<td>1</td>
<td>15</td>
</tr>
<tr>
<td>Integral to mission</td>
<td>9</td>
<td>1</td>
<td>0</td>
<td>1</td>
<td>1</td>
<td>4</td>
<td>16</td>
</tr>
<tr>
<td>Supports mission</td>
<td>5</td>
<td>2</td>
<td>2</td>
<td>0</td>
<td>0</td>
<td>3</td>
<td>12</td>
</tr>
<tr>
<td>Ancillary to mission</td>
<td>1</td>
<td>0</td>
<td>1</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>2</td>
</tr>
<tr>
<td>Total</td>
<td>18</td>
<td>13</td>
<td>3</td>
<td>2</td>
<td>1</td>
<td>8</td>
<td>45</td>
</tr>
</tbody>
</table>

*Note.* Respondents were asked to rate the importance of environmental education to their mission.

Survey results showed all types of respondents conduct EE in multiple ways and most found it primary or integral to their mission and goals, including the organizations that are not dedicated environmental groups. There were differences, presented above, in the content of EE as it relates to raising awareness, between different types of organizations. Similarly EE content to seek change also differed in some cases based on the type of organization. The most often-used methods included social media, information on websites, and public events. The groups responses suggested the content most included in EE messages was mitigation of environmental issues and threats and specific actions one might take to address problems. The groups work on a wider variety of issues, from localized problems to national and global issues. A large majority also reported using collaborations with other groups to help spread their EE messages.
Multiple Case Study

The multiple case study is intended to display three representative, typical examples of groups that conduct EE, either through direct activities or through passive education as people visit locations for leisure or recreation where educational materials exist. The cases are meant to provide richer understanding of EE as it is carried out and how well it addresses the research concepts in practice.

Case Study 1

A recreation organization in Upstate New York that promotes environmental stewardship, preservation, and responsible use of trails and wilderness areas was the first study participant. The group works to prevent degradation of natural places due to overuse, protection of fragile ecosystems, acquisition and stewardship of public lands, responsible recreation, and climate change. The organization has more than a dozen regular staff and hires seasonal staff, many of which have some role in EE efforts directly or indirectly. The group has several locations from which it facilitates recreation, holds educational programs, houses materials, and serves as an information center. Education practices include on- and off-site workshops; staff that meet people out in nature, on trails and in campgrounds to teach low-impact, safe hiking and camping; printed materials; information about issues and advocacy on a website; social media; a magazine sent to members and available to the public; and videos with educational information housed on the website and shared through social media. Interviews were conducted with a director and program coordinator, referred to here as “Lisa”, and a program and information manager, referred to here as “Carter” – both with integral roles in EE content. Data for the study was also collected by analyzing content from printed materials, the
organization’s magazine, website, social media, and internal materials about education and events.

The group connects with people through the above means and through membership in chapters of the organization around the state and region. Lisa suggested all types of interactions provide an opportunity for learning:

Education is at the center of everything we do. So, if we’re promoting responsible recreational use, we’re doing so through education . . ., an article in our magazine, a video about how to use a bear canister, or talking to someone or taking a class or reading a guide book. . . . (We’re) educating people about preservation, conservation issues and advocacy.

Carter added people have different levels of knowledge about preserving natural places. “… awareness is the first step toward stewardship. So, through education, through social media, through our programs, we can help them on that spectrum; we can help them be stewards, but first they have to know what’s out there.” Both linked activities in the wild, in which people get involved, with their willingness to learn and readiness to change.

What are the plants and animals that are around them? What are the really cool special eco-systems that are around them? Or, “How can I be recreating responsibly to preserve them for future generations?” So, we talk a lot about that; it starts with awareness, toward the end they take a more active role (Carter interview).

The other added, “We’re pretty much always trying to achieve goals that are both behavioral and knowledge based. We have . . . specific ideas of, ‘this is what we want people to understand and this is what we want people to do’ (Lisa interview).”
The organization is also conscious of the effectiveness and value of time and resources they might put into various activities that include EE. Lisa discussed presenting information at conferences or workshops held by other organizations.

We’re usually trying to make sure it’s not just one, but there’s a whole lot of people and you hand out a lot of brochures, but that they’re likely to act. The worst thing is to sit there and there’s no one coming, but the second worst is to hand out a lot of materials to people you know will never do anything with them at all (Lisa interview).

Carter noted information through the website or social media can be more effective, especially if it raises people’s awareness before they come to a wild area.

We know that educational message is better when people are at home than here.

“what do you mean, I need a bear-resistant food canister?” or “what do you mean I can’t have a fire in the Eastern High Peaks?” It’s better if we can get that information to them before they even come here (Carter interview).

How does the organization target value orientations shown to predict pro-environmental behavior? Information on the website, in written materials, and from the interviews indicated areas in which value orientations are directly or indirectly addressed. One webpage entry asked people to get involved protecting a specific wild area, “… its waters and shores must be protected as Wilderness. Anything less will allow … the noise and pollution of motor boats and floatplanes, the spread of invasive species and the loss of opportunity for quiet canoeing and kayaking (website).” Such information indicates organizational values, inviting others to share them, or for advocacy purposes. Another area of the website devoted to policy issues educated readers, while promoting values.
Wetlands provide critical services including acting as natural water filtration systems to protect water quality. Wetlands collect and filter storm water absorbing pollutants, such as pesticides, nitrogen, phosphorus and other contaminates before they enter drinking water supplies. By collecting and slowing storm water, wetlands also protect communities from flooding saving billions of dollars in property damage annually (website).

Part of the group’s published education plan indicated a goal of promoting values and environmental literacy.

Establish in the individual a sense of wonder, life-long curiosity, and a basis of knowledge to inspire an ethic of care, stewardship, and informed decision-making. . . . developing lifelong values about the nature of New York and motivating participants to act to protect it (internal planning materials).

The interview subjects found most people they interact with already have a complementary value orientation. “I feel like most people are receptive to these messages because I am largely interacting with people who recreate in the outdoors. So, they already ascribe some sort of positive value to the experience of being outside (Lisa interview).”

They’ve already had some amazing experience and they cherish that. And thinking that those places are special and those experiences are special. I think most of our clients have that just initial value in what we’re trying to do. And then if we can educate them, bring them just a little bit closer, the light bulbs start to click (Carter interview).
But they found not everyone is open to the conservation and stewardship messages. “People say, ‘I know those are the rules, but I’m not going to do it that way.’ It’s mostly people who don’t think about these wild places and don’t see it as any different than anywhere else (Lisa interview).”

**How does the organization target subjective norms shown to predict pro-environmental behavior?** The organization promotes environmental stewardship by interacting with people directly. Those face-to-face meetings, through training programs and initiatives that inform people on hiking trails, provided an opportunity to share common ways people behave in nature, while also asserting conservation policies that they support.

One of the organization’s programs utilized trained staff in sensitive areas of nature to greet and instruct hikers about preservation of sensitive habitat and endangered plants and ecosystems. Lisa said they try to find language that will best influence people’s behavior, such as being careful not to walk on plants in areas where the vegetation is fragile and sensitive. “You can always say, ‘Thank you so much for helping these plants by walking on the rocks.’ . . . you can slip it in and say, ‘feel free to spread that message to other people’ (Lisa interview).” They indicated they try to empower people to influence others in words and actions.

I saw [it] play out time and time and time again. A lot of times it was really fun to see; you have a family group or a scout group or a camp group and the kid is the one who comes up first. It’s fun to see kids share that message with adults, shared with their parents and kind of policed their parents. (Lisa interview).
One of the group’s publications emphasized the effectiveness of the program as it became more widespread. “[Program staff] have played an important role in furthering knowledge and understanding of the [wilderness area’s] Alpine Zone, from rediscovering species thought to be locally extinct to assisting in research that redefined the alpine area (magazine).” At the same time, Lisa said having visitors serve as good examples can get taken too far.

Nobody’s walking on the plants because they want to damage alpine vegetation. . . . So, you see this group and they’re so excited about the alpine plants and they see someone coming up and they step on them. And they start shouting at them. And then you have this problem that you have to defuse (Lisa interview).

The concept of spreading best practices regarding conservation and responsible recreation was also evident in planning signage and other materials.

We’ve been trying to develop better interpretive signs. We can’t always have physical people talking to folks about these issues. How do we get more passive education, so talking about the wording, how you phrase something in those interpretive signs? [For example,] “Most [area] hikers dispose of their waste properly.” Or how do you phrase it so that it seems like more of a social norm? So, that like, “everyone else is doing it that way, I need to do it.” They almost feel that peer pressure (Carter interview).

An article on the organization’s website emphasized the role policy plays in how people are able to enjoy the outdoors, suggesting the need for individuals to support such measures. “New York’s Environmental Protection Fund (EPF) has provided hundreds of millions of dollars to protect open space, revitalize waterfronts, support recycling,
preserve farmland, enhance water quality, and help connect New Yorkers with the outdoors (website).” In this case, there was evidence in the interviews, on the website and in the magazine that occasionally their EE lent support to the concept of subjective norms.

How does the organization target perceived behavioral control (PBC) shown to predict pro-environmental behavior? Many of the messages that touch on the concept of perceived behavioral control do so in an implicit manner in program, social media and website content. Carter explained that part of the organization’s philosophy includes demonstrating methods and choices, while including in EE information about outcomes. “Hopefully with that, . . . they are going to take ownership of the decisions themselves. I think that’s a lot more powerful to have that internal motivation and not saying, ‘you must do this, this and this to be responsible’.” Lisa recalled emphasizing the role individual actions take in larger issues, such as responsible recreation. “When we talk about recreation impacts, so much of it is couched in terms of cumulative impacts, you know this many orange peels over this many years. And think about what that does.” She gave as an example a program that was the brainchild of one person to save threatened mountain areas simply by encouraging hikers to walk on exposed rock, rather than on fragile plants.

So, one person, one action saved this ecosystem. When we look at the alpine zone, it’s such a clear example. So, we can say the difference of one person putting your feet here versus here adding up to all these people over time, it makes a huge difference (Lisa interview).
A different type of approach was offered in one of the organization’s publications, in which pro-E behavior was equated with recognizing and changing damaging practices. We all love our New York public lands, especially the popular challenging areas like the High Peaks of the Adirondacks and Catskills, but we are loving these wonderful places to death with unintentional behavior that creates great harm to the environment. Each of us can discover how to “Leave No Trace” and protect the places we love (Lisa interview).

The same impacts were echoed in a social media post, directly encouraging actions, supporting PBC. “[Staff members] spent a day last week cleaning up the summit of Cascade [Mountain]. You can do your part to protect places like Cascade by practicing the 7 principles of Leave No Trace (social media post)”

When the group sought direct involvement, EE included specific information that connected a task with evidence to validate the effort.

One of our Advocacy Department’s pretty successful programs is a backcountry monitoring program, where they’re enlisting volunteers to monitor for hemlock . . . and aquatic invasive species. Obviously there the science is very explicit. During their trainings they have scientists come in [for effectiveness] . . . (social media post).

A similar appeal was part of a social media message with information about conservation proposals on a state level, on which individual action could be useful.

You can join the effort to provide all New Yorkers with a constitutional right to clean air, clean water, and a healthful environment by amending the state’s Bill of
Rights. Take action and send a letter to your New York State Senator (social media post).

The organization utilized social media for supporting education that can have a direct impact, in one case a reduction of bear-human encounters that can result in the need for forced bear management. “[We] often experience wildlife. One way to keep black bears safe is to store our food properly and we can do that with . . . bear canisters (Video on web and social media).”

Another PBC link could come from empowering people through knowledge, including the link to the impacts of changing damaging behavior. Carter indicated it has lasting impacts. “So hopefully you’re educating for the next time. It’ll help change their behavior for the next time. But you’re not necessarily chastising them or saying you must do this right in the moment (Carter interview).” In this concept area, social media and video content implicitly targeted PBC, while interviews also reflected casual addressing of the issue.

Other Emerging Themes

EE activities of the group through both direct interaction and media communications, followed a theme of change, with examples that supported the TTM and social ecology. In one case, the group’s education around using bear canisters was backed up by a change in state policy, as a safety measure, but also to protect wildlife. “But again, if you look at then and now, it’s a really good example of education combined with regulation that forced the behavior, but it forced it successfully (Lisa interview).” This effort had changes on a micro level, with the individual, and a macro level through policy. EE through the organization’s magazine also supported the social
ecology change model, in talking about planning legislation that supports conservation.

“The benefits of [the measure] include water quality and wildlife habitat protection, increased quality of life, reduced sprawl, reduced infrastructure costs, reduced maintenance costs, reduced demand for publicly funded greenspace, and means for expanding public trails and greenways (magazine).”

Carter indicated a goal of change is behind many activities that focus on creating a connection between people and the natural areas of the state.

We are trying to drive people toward that stewardship piece, to get more involved, to feel ownership over the public lands in New York State . . . to feel you have some ownership and you want to continue to protect these places. I think through all these programs and the different avenues we communicate, I think that is, that’s part of that mission, try to get people from that awareness to that stewardship, to take an active role in protecting these places (Carter interview).

He added a specific concept they utilize touches on the concepts of values and perceived control.

[The concept called] authority of the resource that we use a lot. It’s an educational technique. So, we use that a lot from [outdoor programs] to our educational programs, to our naturalist, trying to be objective, trying to explain the why, giving people alternatives to their behaviors, and then hopefully instilling those values. But we know a lot of this has to do with personal ethics and we all come from . . . different ethical backgrounds, but through hopefully education and instilling this outdoor ethic, they can move in the right direction (Carter interview).
The variety of methods used to connect with people can give their EE activities greater reach and can increase their effectiveness, but are limited at times by how receptive the audience is and perhaps their readiness for change. That TTM concept was addressed in one EE training. “People cannot focus on the message that you’re trying to convey if they are hungry, cold, out of breath, getting wet, or being attacked by black flies. Visitors will not focus on your message if they’re busy enjoying the view (published training materials).”

Additionally, education about policies such as responsible recreation, preservation of habitat and wildlife, climate change and others, as well as the implicit suggestion that they should be supported, fits with the social ecology concept of macro-level change.

Case Study 2

This regional chapter of a national environmental organization focuses its EE on regional, national and global issues. The membership organization has several thousand people who contribute in support of the group’s local projects and national advocacy. The group interacts with the public through local events, rallies, social media, press releases to attract local media coverage, a website with educational information and event listings, and e-mail to members. Organizers indicated collaborations with other groups are also a key to spreading awareness about issues and initiatives. The all-volunteer organization has an executive council and action committees that make decisions about issues in which to get involved, as well as resource allocation from the local donations they receive.

A member referred to here as “Cheryl” helped with the group’s outreach activities and headed up a project that helped stop a fossil-fuel infrastructure development. She
found the public received her efforts well, in part because of the group’s national affiliation. “. . . having the organization behind me in name, helped with I think as far as that, it helped with recognition and being listened to by the media (Cheryl interview).”

One of the group’s board members, called “Hope” in this study, said education is a necessary step in their advocacy efforts. Taking a cue from the national group, she added positions on issues are backed up by science. “We have a number of scientists [as members] . . . . When we take positions, we always base it in science. We don’t make claims about things . . . if we’re not sure (Hope interview).”

Some of the organization’s EE efforts were focused on an issue, such as halting the fossil-fuel infrastructure project, while other efforts were meant to build awareness around national issues and policies. “. . . with climate change in general, that’s been the biggest obstacle is people just not being aware. Having the information they need to make wise decisions . . . and a lot of it unfortunately, is countering misinformation (Cheryl interview).” Their advocacy was meant to stimulate thought and action, “When it comes to Climate Change [sic], why do we do so little when we know so much (from web page)?” However, members said they do not want to be too heavy-handed in dictating behavior. “But I think what we’re trying to do is less influence the behavior and more influence the policy that influences the behavior (Cheryl interview).”

The regional group, which is all volunteer members, selected issues on which members and committees would work, largely dictated by the concerns and interests of its members. The national organization provided some influence on larger issues, while offering research, organizing and planning assistance. Individual members were able to
suggest an issue for the group to get involved with, choose to participate in any of the initiatives, or help collaborate with other groups on environmental issues and campaigns.

**How does the organization target value orientations shown to predict pro-environmental behavior?** The group’s activities and information took into account value orientation in several ways. Cheryl indicated they work with values, without necessarily trying to change them. “It’s, I think, the people we encounter are generally good people. We all want to be healthy and have a sustainable life on this planet. I think it’s more letting them know and educating them (Cheryl interview).” EE to increase awareness, Hope added, might motivate people out of a perception of apathy.

A lot of people we meet, I think, are pro-environmental, but don’t take action. So, if we’re going to categorize our population, you know, white middle-class, it’s stodgy old people. A lot of them are very educated and know what’s going on, but don’t do anything about it (Hope interview).

Videos on the organization’s website also touched on the concept, showing interviews of people discussing shared values and activities they were involved with (website content). Hope further explained how the group targets others in the community. “We really do focus on people who are active, people who understand but are not active, people who are maybe on the line [on an issue], and we just don’t deal with other people. There just isn’t time (Hope interview).”

The organization’s materials indicated an acknowledgement of varying value-orientations. One public presentation described varying orientations to the natural world.

**Different Views of the Natural World:**

- **EGO:** Human domination of nature,
- **Separate from nature,** Emphasis on Profits and Power, Reliance on Polluting
Fuels for Energy. Eco-centric: Human co-existence with nature, respect for nature, emphasis on common good, transition to nature’s clean energy sources.

(Public Presentation Power Point)

Nevertheless, EE activities have often been driven by the desire to inform and awaken values.

I think even with people who might butt heads with us and say, “you’re crazy, climate change isn’t real.” I don’t . . . I guess there’s the rare exception, and one of them is president right now, who does think that money is the most important think in the world. But I think, within the general public, it’s not necessarily values, but just not knowing (Cheryl Interview).

Different groups have different values or beliefs which was shown to influence how this organization goes about engaging them in an environmental campaign or collaboration. Hope noted she will approach an issue differently if trying to get people from a disadvantaged community or those from a religious congregation to take actions on an issue. “Part of it is to bring out people’s own stories that, I would think, in the process of bringing those stories out, they would understand what actions they could take.” She recalled how the Pope’s Encyclical on climate change tapped into values, “. . . suddenly religious people now have permission to talk about climate change. And if you look on line, every major religion now has a statement about climate change. And that’s been huge and it’s going down into the congregations (Hope interview).”

Website information from the organization, which was largely focused on education about policy issues, is less likely to explicitly take values into account. Similarly, social media posts included numerous shared posts on environmental topics.
such as climate change and alternative energy, implicitly supporting values, while not addressing directly different value-orientations (social media accounts).

**How does the organization target subjective norms shown to predict pro-environmental behavior?** The organization showed some support for the concept of norms in EE materials by highlighting examples and showing how viewpoints are supported by others. Materials on public presentations and in social media posts showed evidence of marches and rallies in support of climate change policies, alternative energy projects, and other issues, implicitly showing repeated actions in various locations in support of issues. Cheryl found common ground with people working on other issues over worries about water quality and safety in the group’s fight against a fossil-fuel project. The shared concerns among different organizations created more acceptance of each of the campaigns. “I realized there were a lot of water issues similar to what they were supporting with Standing Rock. Finding that common ground, they came on board and were very supportive [of our project] (Cheryl Interview).”

The group’s website included content related to opposition to a fossil-fuel project that failed to receive a permit. Information about the group’s successful protest showed this was something in which many got involved, aligning with the norms idea, “We Did It!! With So Many Supporters and Allies…Thanks You All!! [sic] (website)” Social media posts were less explicit in supporting the concept of norms, showing several examples of nearby wind-power projects, which could help to regularize the ideas (Facebook, Twitter pages).

An alternative energy tour the group did gave Hope a chance to show a pro-E technology that could become more common. “For example, we have geothermal energy
in this house and...when there’s a renewable energy tour, we have people come in and show them how the system works. . . . it’s not normal yet, it’s still an unusual thing (Hope interview).” Showing government support for a point of view was another way to regularize a viewpoint.

We support the full cleanup of one of Western New York’s most dangerous nuclear pollution problems. West Valley Nuclear Service Center is located 30 miles south of Buffalo, and contains hazardous waste material which poses a threat to water resources in Western New York and the Great Lakes watershed. Government reports express concern over major erosion on the banks of nearby streams, and exposure to very high radiation to unsuspecting future generations (website).

Cheryl said that there is some evidence that on environmental issues that receive a lot of public discussion, norms about involvement begin to change. “. . . people just a couple years ago, were thinking that environmental action was something for those environmentalists to do, which is still for many people true. But it’s becoming more accepted that we all need to become more conscious . . . (Cheryl Interview).” In spite of that observation and some of the messages in the group’s materials, Hope said the practice of pointing out how many others act or think in a pro-E way is not embraced.

If you talk about it more, it seems more normal. But I don’t think that’s been one of our strategies. Obviously, it works. If people become a member of the club, whatever the club is, if you have an electric vehicle, or you take your bags to the grocery store and don’t use plastic bags, the more normal [it seems], it influences others.
Social media and website content addressed subjective norms and some implicit alignment. Interviewees confirmed the idea is loosely addressed in some EE materials.

**How does the organization perceived behavioral control (PBC) shown to predict pro-environmental behavior?** The idea of letting people know that their actions have an impact was used in the EE of the group in specific ways. Many of the organization’s campaigns involved policy and Cheryl said she reinforced PBC by indicating the value of working on the fossil-fuel infrastructure opposition campaign.

If I’m asking people to write letters to, say, the Governor, I’ll give an example, there was a similar [project] that I . . . kept comparing to. This is what worked for this situation. Yes, writing these letters really does make a difference and here’s an example that shows it did (Cheryl interview).

Hope added that actions they have taken to get media coverage on a variety of issues offered another example to support PBC. “. . . the fact that it gets covered in the press, and it’s like you see the ripples. I guess if you have a press conference and nobody came you wouldn’t feel like you were actually having an impact (Hope interview).” Social media included information about a webinar that asked people to comment about a state proposal to discharge nuclear material into the environment, impressing upon people the difference it makes (Facebook page).

Another example occurred after collecting signatures for climate change policy in advance of the Paris Climate Talks of 2015. A scroll on which the signatures were printed made its way to the group’s national organization president, and then to the U.S. Secretary of State at the talks in Paris.
of course, that huge story [was] when we were able to describe to people, “look you signed this climate pledge and it’s gone all the way to the highest levels.” It’s a great story. So just going back to all those people and saying, “look you never know what’s going to happen, you never know. And to think you can have an influence like that.” It ripples and so it was very affirming (Hope interview).

The organization further supported the effectiveness of people’s actions through website and social media posts about a permit for a fossil fuel project being rejected partially from their opposition, (Facebook, website).

The PBC concept, asserting the value of people’s actions and involvement through EE, helped recruit participants for initiatives and collaborations with other groups.

So, I see where we move people from being kind of on the edge, peering in, but not feeling comfortable moving in, then really moving in and making an impact. And my assumption can only be that they and the people that they’re dealing with are doing the same thing. We’re building communities in that way (Hope interview).

Another EE project of the organization directly addressed the concept in relation to a specific issue, utilizing a social-media petition tool called Thunderclap.

A diverse group of citizens including the [organization] are involved in a campaign called Rise Up for Climate Justice. We’re looking to send a ‘Thunderclap’ of messages to President Obama calling for bold cuts in
greenhouse gas emissions at the UN Paris Talks to protect people and the plane through this link [link] (Public presentation, Facebook).

Electronic communications, public events, and other EE efforts specifically addressed the PBC concept. Interviews with the group members confirmed it was targeted more directly than the other areas in the study.

**Emerging themes about the organization’s EE efforts and practices.** The national organization has priorities and positions regarding issues on which to work. The local group, its volunteers and committees however, largely dictated the specific ways in which they dedicated their efforts and resources. “. . . within the parameters of what the national [organization] would approve of, and follow their general policies. But within that, . . . we pick the issues, not so much the issues, but we pick within climate change, renewable energy, etc., the projects that we want to do locally (Cheryl interview).”

Collaboration was a key aspect of the group’s decisions about EE efforts, with many of the members also participants in other groups. “The core group of 15 to 25 people is pretty tight and . . . each one of those people has contacts in other organizations that they bring back. I’d say it’s probably a really good model of a networked organization (Hope interview).” The various organizations and efforts informed one another, spreading awareness about events and initiatives more broadly, enhancing EE overall. Ultimately, however, the direction of the group was dictated by the fact that all members are volunteers.

We do what the people who are part of it are interested in. Nobody’s working for anybody. So, you can’t make anybody do anything. So, it’s more about organizing the interests and actions of people. And when people are more
interested and active on something, then they will make materials about it (Hope interview).

The group works on change on several levels, addressing individual behavior in some activities, while focusing on policy-level action on others. Some of the issues they work on, fossil fuel use reduction and toxics for example, allow them to include EE content on an individual-behavior level, as well as information about legislation. These activities fit with the social ecology principles. The group’s acknowledgement of value difference also has elements of the TTM concept of readiness for change.

**Case Study 3**

A nature preserve in Eastern New York conducted EE activities at its location as well as off-site through special events and presentations. This third case study participant has nature trails with educational signage, an indoor facility with displays about wildlife, habitat and other environmental issues, and other facilities for meetings, all to support a mission of promoting lifelong environmental stewardship. The private, non-profit organization has a paid staff of more than 20 full- and part-time workers; about a dozen have some role in education, research and communicating with the public.

EE activities included passive education as people visit the preserve and see signage or printed materials. Numerous on-site activities provided education to the general public, school groups, summer-camp participants, and others. Off-site activities included large public events to focus on preservation topics, smaller public presentations for the public or civic groups, and collaborations with other preserves and environmental groups to help educate the public. EE was supported through social media and
information on the group’s website, which included details of events as well as videos on specific conservation topics.

Content for the case study was collected from electronic sources, printed materials, presentations, a visit to the center to see signage and displays, and interviews with an education director referred to here as Sarah and a communications coordinator referred to here as Donovan.

**How does the organization target value orientations shown to predict pro-environmental behavior?** The nature center addressed values in direct ways, as well as more implicit messages that are part of communications and EE. One of the organization’s core principles is lifelong environmental stewardship, and was referred to in many educational programs, “... instill a love for the environment, positive attitudes toward conservation and environmental protection and a sense of personal civic responsibility (website).”

Sarah indicated that educational materials about habitat, plants and animals at the preserve are meant to make connections between preservation and human environmental management. “The story and the takeaway is that to protect the biodiversity you need to value the interactions in the habitat and not just one animal (Sarah Interview).” A connection was also made between conservation and other values visitors to the center or an audience at a public event might have.

A core value for them then is making the association between environmentalism and maybe their grandchildren, which they do care about deeply, or drinking clean water, or breathing clean air. These are values that people don’t realize are
directly linked to environmentalism, and I think engaging more in that way is something that we try to do with education (Donovan Interview).

The group made connections between environmental problems, their causes, and public policy that could address them. That linkage adds to the concept of how personal values can support preservation goals. For example, a public presentation on suburban forest problems showed how the lack of forest understory, ground-level plants, was linked to overabundance of deer and invasive species; the loss of biodiversity was linked to forest fragmentation from development and climate change (public presentation, April, 2017).

Other messages implicitly supported value-orientations. Content of a social media message capitalized on rainy conditions by making a positive association with what could be viewed as bad weather. “(the message) said, ‘we might not like the rain but the rain recharges everything here and recharges us.’ So, caring about the full streams is something we care about and sharing that value. I guess it’s more of the subliminal (Sarah Interview).” Online and social media videos of eagles, turtles and other animals, connected to the organization and its education, further promote the value of preserving wildlife, though in a more passive way (website, Facebook page).

The staff members both indicated that trying to shift or awaken people’s values was a specific goal. “That’s definitely part of our education framework is to move people . . . along the continuum; open them up to new ideas or if they’re already part of that idea, push them along (Sarah interview).” “We do talk about moving the needle. And we do that through an open door that we allow people to walk through at whatever point in environmental stewardship they may be (Donovan interview).”
Presentations, with direct interaction, were more focused on connecting with or shifting value-orientations, while electronic communications and signage at the center served as more passive support to the concept of value orientations.

**How does the organization target subjective norms shown to predict pro-environmental behavior?** Visitors to the nature reserve and attendants to public events were urged to follow the lead of the organization. “We’re a nature center and what we do is take care of the earth. When you leave here, that’s part of what we want. How can you take care of the earth? You know, what can you do? (Sarah interview)”

Some efforts helped to normalize an issue. “We’re not necessarily advocating for policy changes or advocating against certain lawmakers. . . . [the organization] still recognizes climate change as a scientific consensus and has presented it in that way in our communications (Donovan interview).” Keeping issues in the public eye served the same purpose, such as promoting and hosting events on electric cars, suburban forestry preservation, and protection of biodiversity (Facebook). Sarah suggested evidence of that is found in young people who attended the nature center and went on to college to get degrees in environmental science (Sarah interview). An event on suburban sustainability highlighted research underway in close proximity to urban and suburban areas, including habitat restoration and invasive species, connecting such issues to residents (public presentation materials).

A part of social norms can be highlighting what not to do, which the center tries to avoid, “. . . to not put environmentalism on this pedestal and to intimidate people with it and make them feel bad about their current actions. It’s more of an open, ‘here’s what you can do, if you want’ (Donovan interview).”
The norms concept was supported mainly by example, rather than as a targeted goal, according to data from both interviews and EE materials.

How does the organization target perceived behavioral control (PBC) shown to predict pro-environmental behavior? The organization addressed actions individuals can do, while more subtly reinforcing their effectiveness through examples of success from its programs and activities. Sarah offered an example of restoring habitat for bald eagles through policy and how people’s role by voting for proposals or politicians that support them is related. “We support having people in place that will change laws that are going to protect the environment more. . . . I think we come across as, ‘if everybody does a little bit there’s the possibility of change’ (Sarah Interview).” Donovan expanded on that idea, as it relates to messages in social media and other communications. “I would say a big part of it actually, is about the thing that the average person can do to make an impact in our community and that those small things are actually big things (Donovan).” A website article on a local lake gave members of the public specific actions they could take, as the lake shows impacts from people in its watershed. “Making sure that your septic tank is working properly, reducing/eliminating the use of lawn fertilizers, and reducing stormwater runoff are just a few ways that you can make a big impact on your own watershed (website).” Donovan added positive messages through social media and events can emphasize progress.

Our communication is very hopeful and is very engaged with the idea that the decisions that we make, that each individual makes, is a part of the larger scheme of things and is a lot of the reason [for example] why we held the electric car show (Donovan interview).
Examples were found in the signage on trails at the nature center. One indicated the need to support regional conservation, referring to the recovery of the bald eagle population to the extent it was taken off the endangered species list. Another suggested how forest management was important, “WITHOUT OUR CARE: no young trees, shrubs or wildflowers, overgrown with invasive plants, little wildlife. WITH OUR CARE: trees, shrubs, wildflowers thrive, a variety of plants and animals, a healthy forest.” The staff said they hoped that actions the group takes serve as an example of protection and stewardship that people can follow (Sarah interview). One portion of the nature center, an island that preserves endangered plant species, added to the idea of effectiveness. “. . . many of the species found on the island no longer occur in local forests. [These specimens could] . . . provide materials necessary to begin restoring their populations (Organization brochure).”

While not explicitly addressed, the group’s mission of lifelong environmental stewardship and numerous volunteer opportunities also support PBC, the notion that someone’s actions have an impact on the organization’s goals and the nature center itself.

**Emerging themes about the organization’s EE efforts and practices.** A portion of the organization’s EE effectiveness was its collaborations with other entities. Public presentations with other groups were conducted regularly on regional environmental topics. Other nature preserves coordinated research on protecting habitat or plant and animal species, with which this nature center was involved. An environmental alliance on monitoring of preservation goals was also created, “. . . a regionally-coordinated ecological monitoring network that informs sustainable management practices and natural resource conservation through scientific research while
engaging the public in environmental protection (website).” Sarah suggested how important collaboration is. “One of the greatest ways for us to accomplish our mission is aligning with other organizations that have similar missions and it’s a big thing that we do (Sarah interview).”

Communication with the public and EE supports change, touching on the models in the study, the TTM and social ecology. The organization noted it tries to attract people with varying values and levels of interest.

The only way to do that, to actually engage your community and to get that needle to move is to open up the possibility for someone to get involved in [the organization] at any stage that they may be in lifelong environmental stewardship (Donovan interview).

Meanwhile, suggesting people support policies that can have an impact could lead to exo- or macro-level change, such as educating about state funding for conservation of habitat, supporting wetlands preservation to improve water quality and protect biodiversity, and policies the protect specific animal species (nature preserve signage). Including these elements in their EE content coincide with the benefits suggested by the principles of social ecology and the TTM.

The nature preserve presented EE in a range of activities, programs, and communications, some directly participatory, while others were more passive as visitors come to the preserve. The research concepts of value orientations, subjective norms, and perceived behavioral control were addressed in some of those elements.
Programs directly addressed values, while they were implicitly supported in activities, displays, and messaging that support preservation through people’s affection for the center, the habitat and wildlife there.

Subjective norms were supported in a more indirect way. Public presentations or social media messages on a preservation topic might make it more normal, but do not support the norms principles of what other people do, and what others expect you to do.

The organization’s successes, along with information about policy changes, bolstered PBC, offering people evidence that their behavior has some effect. Social media, as well as public presentations provided evidence of this concept.

Conclusion

The mixed-methods study included a survey of various groups that do EE, followed by a multiple case study for in-depth examination. The survey results offered a baseline of information about the methods most widely utilized, the goals and content of some of the messages within their EE activities, and the importance of EE to their organizations’ missions.

The case studies examined a recreational organization that promotes responsible use of natural areas and conservation issues; a local chapter of a national environmental organization that works on regional issues of importance to members, as well as local actions to support larger causes; and a nature center that incorporates EE in programs, signage and materials for visitors to the preserve, along with on-site and off-site programming on regional and global environmental causes and habitat preservation. The findings from multiple data sources drew connections between their activities and the research concepts of this study.
The following chapter will draw on the findings to detail implications and make recommendations. The chapter will also reiterate the significance of study in this area, discuss limitations of the study, and suggest areas of future research.
Chapter 5: Discussion

Introduction

Few people are immune to the consequences of environmental issues. Local and regional problems such as pollution can foul air and water; habitat-related challenges such as invasive species or development can alter the balance of wildlife for native plants and animals; broader problems such as solid waste and climate change can have larger societal costs to agriculture, municipalities and individuals. Education addressing the awareness of such problems and their impacts is widespread in media and other public information avenues. Past research, however, has shown awareness of such issues is insufficient to motivate people to change their individual behavior, buying habits, voting tendencies or other support for actions or policies that might mitigate the problems.

The purpose of this study was to compare behavioral research on pro-environmental (pro-E) behavior with actual practice to find the degree to which environmental education (EE) by organizations addresses factors that influence people’s actions. The research and the specific methodology was intended to expand understanding of the practice of EE as it relates to change. The mixed-methods study included a survey that collected descriptive data about EE practices, followed by a multiple case study to delve deeper into the actual efforts and programs of three groups, a recreation and stewardship organization, an environmental advocacy group, and a nature center.
The examination sought to see how the psychosocial determinants of change identified in theoretical models were being addressed. Those factors were investigated within a framework that took into account someone’s readiness for change and the level of change possible, whether at the individual, societal or policy level.

The study was guided by the research question: How does environmental education in the public sphere address and target the psychosocial determinants shown to affect pro-environmental behavior, and individual and societal-level change? Three sub-questions operationalized that question within the case studies:

- How do environmental organizations and nature groups target value orientations shown to predict pro-environmental behavior?
- How do environmental organizations and nature groups target subjective norms shown to predict pro-environmental behavior?
- How do environmental organizations and nature groups target perceived behavioral control shown to predict pro-environmental behavior?

This chapter will first break down the study findings to discuss how they can inform practice of groups doing EE, the decision-making of such groups, and future scholarship in the area. Second, factors that limited the study will be reviewed, including those that impacted the depth of the data and the generalizability of findings. Third, recommendations will be presented for both the application of the findings and opportunities for future research. And finally, a summary of the study will return to its significance for environmental education in the public sphere and its practice.
Implications

The mixed-methods study found the participants did directly address the psychosocial determinants of behavior in some of their EE practices. The case studies also showed that other educational activities, on occasion, implicitly addressed the behavior factors. In still other aspects of EE, the behavioral factors were not addressed. Finally, the findings showed the extent to which the organization’s goals and practices aligned with the change models in the study, the trans-theoretical model (TTM) of readiness for change and social ecology that addresses levels of change.

The findings present an opportunity for leaders of such groups to focus and refine efforts around behavior and change principles that will facilitate their goals. The dedicated and committed people who work in nature centers or parks, zoos or museums, or volunteers of environmental groups share values with the organizations’ missions. Leadership authentically aligned with those missions would be effective. Giving employees, educators and volunteers who are at the point of contact such direction can help the EE practices by the organizations have more impact if they aligned more with the behavioral and change theories in the study.

Practices that address or align with research concepts. A number of the practices found in the case study data show that organizations are targeting the behavioral concepts of the TPB in some of their EE content. The study found direct links between practices and the research concepts more often than expected.

One example was the recreation and stewardship organization directly addressing subjective norms by making an intentional link between best practices in conservation behavior and specific actions on a trail or in policies that they support. That EE content
will help satisfy the behavioral antecedent of norms that indicates what others do and what others might expect.

In another example, the local chapter of the national environmental group explicitly details differences in value orientations of people and of different groups with which it collaborates. The group’s members used that information about values to customize the content of messages and campaigns to make sure their EE is most appealing and relevant. When connecting with a low-income group or a religious community about an environmental topic, “. . . we speak totally differently when we speak with those audiences. We try to speak in the language of that audience (Hope interview).” The organization members identified that members of different groups or populations, such as a religious community or a disadvantaged neighborhood, would have different values and priorities. One of their public educational presentations also showed that some people are more egocentric, equated with being internally focused and likely to act on individual wants, while others are more eco-centric, more likely to view the human race as a part of nature and therefore, see value in environmental preservation. The awareness of those differing viewpoints would address the research concept of value orientations as an antecedent of change.

Meanwhile, the nature preserve in the study utilized activities and EE messages to support perceived behavioral control (PBC). Success in preserving habitat that aided the recovery of bald eagles in the region was explicitly linked to policies that support such conservation. Those messages helped show that local residents’ support for a law, a movement, or a community leader can have a positive impact. The center also often shows the positive outcomes of simple actions that might preserve sensitive plants and
animals, thereby adding to successful conservation efforts. In both cases, making the connection between actions one might take and their outcomes supports the psychosocial determinant of PBC that would help influence whether someone takes action or changes a viewpoint.

The above examples showed that, on occasion, the EE practices of the organizations did target and directly address some of the psychosocial determinants of behavior and change.

**Research concepts implicitly addressed.** None of the groups indicated that they modeled their EE efforts after the psychosocial determinants of behavior in the study. There was however, evidence in the previous section that suggested alignment with the principles at times. The data also showed examples in which the concepts were referred to in tangential or indirect ways.

The nature center often included messages in its programs and social media that indicated the importance of biodiversity, the value of the preserve itself, nature and conservation in general, and an ethic of environmental stewardship. While this content does not seek to change someone’s values or make a connection between value orientation and specific behaviors, it does support an overall conservation viewpoint. The purpose, Donovan said, was to enhance the connection to those with complementary values about nature, clean water, and clean air. “These are values that people don’t realize are directly linked to environmentalism, and I think engaging more in that way is something that we try to do with education (Donovan interview).” The organization similarly offers implicit support to the notion of subjective norms. Visitors to the center, whether for recreation or a specific program, are made aware of practices and viewpoints...
that could support behaviors they might consider to be norms. Keeping issues of preservation, habitat, biodiversity, climate change and others in the public eye through the organization’s social media, off-site events, and other activities further helps normalize them to their participants and the general public.

Research also found activities and messages of the environmental group that casually addressed the concept of subjective norms in several ways. The group’s social media and website content showed people at rallies on environmental issues, as well as press coverage attracted by its activities. To the audience of those messages, this would support norms. Similarly, presenting information about government actions or policy decisions that align with the group’s advocacy efforts also sent a message that supports norms. Finding common ground with other groups on issues such as water quality and environmental preservation further added to the notion of what others think and do. These were not direct connections with the norms concept but implicitly fit with the idea. Additionally, data from interviews indicated that supporting subjective norms was not a specific strategy of the EE of the group.

The recreation and stewardship organization presented information about the consequences of actions in the areas of responsible recreation to minimize impacts on nature and in support of policies regarding nature conservation. Such content could be seen to support PBC, to the extent that someone might connect the consequences – positive and negative – to their specific actions. The group’s messages that simply support love of nature, the value of wild lands and wildlife might similarly enhance value orientations, either supporting those who already share such values or influencing those who do not.
These examples suggest subtle support for some of the research concepts, while not connecting with them directly.

**Data in which the behavioral determinants were not found.** Each of the behavioral determinants in the theory of planned behavior was addressed by all of the groups at some point, in some of their EE content. While past research suggests each factor has some impact on behavior, the three in concert are what most strongly predicts behavior and change. As stated above, the TPB was not a stated goal or guiding principle of any of the groups’ EE content. However, if an organization wanted to have the most likelihood of behavior change, they would try to take into account each of the determinants in their EE content. None of the groups was found to include or consider all the principles where they might apply to a campaign or program.

In practice, some activities might lend themselves to considering multiple aspects of the research concepts, while others do not. Social media messages on Facebook and Twitter are short, often including a picture to make a point. Many of these messages aligned with one or another research concept, though it would be difficult or inconsistent with the medium to cover more. By contrast, a public education project or campaign would have more opportunity to take into account how it addresses values, norms, and effectiveness.

Content analysis and interviews with the case study groups showed alignment with some of the concepts, at times intentionally addressing the ideas, while at others making connections more coincidentally.

**Where organizational goals for change align with the trans-theoretical model and social ecology.** The groups in the study confirmed most of their EE content has a
direct goal of influencing actions and viewpoints or at least includes a subtext of change. The two theories drawn upon for the theoretical framework of this research identify aspects of change and how an organization can be effective. The TTM identifies readiness for change, in which a person might be unaware of an issue, aware but inactive, or already starting to adopt a behavior and ready to make it more of a habit. Social ecology delineates levels of change, from individual or micro-level change to group (meso), societal (exo), and policy-level (macro). The organizations showed occasional connections to these theories and models in the design of some of their EE content and events.

The environmental group identified people at different stages of readiness for change as they think about the people they contact.

We do . . . talk about the role of both the underserved community and the wealthy community, of young, middle-aged, and older people, people that don’t really care about the environment, and people that care passionately. I think we recognize it’s a journey it’s kind of a path and that being able to pick someone up at any point they may be on that path is essential (Hope interview).

This consideration aligns with the TTM idea of readiness for change, in that someone passionate about an environmental cause does not require the same education or message as someone unaware or skeptical of a cause or campaign.

The recreational and stewardship organization also addressed the readiness for change idea of the TTM. The audience for a program or message, Lisa shared, has varying levels of knowledge. “We estimate that between a third and 40% of our visitors are first-time users. Many of them know very little about responsible recreation.
However, with [organization] members, they would self-report a pretty high level of knowledge and awareness (Lisa interview).” The group acknowledges that its EE materials usually try to suggest change on an individual level, as well as a larger level, which hints at the tenets of social ecology.

The nature center in the study made links between specific problems seen in the environment and polices that might affect them. One example was economic development and its impact on habitat and pollution; another was invasive species harming biodiversity in the region. Sarah offered an example that worked on multiple levels.

When we do (a public event), we support the protection of open space. We support having people in place that will change laws that are going to protect the environment more. And . . . people may feel their one little bit won’t do much, I think we come across as, “if everybody does a little bit there’s the possibility of change” (Sarah interview).

These are examples of connecting individual actions or suggestions with meso- and exo-level change, rather than just an individual action.

Again, social ecology and the TTM were not stated as principles that guided EE activities and content. The groups did, however, show they were acting within some of the principles of those models. Acknowledging the concept of readiness for change could help align messages and materials with different individuals to improve effectiveness, whether in written materials or educational events and campaigns. Similarly, considering change on different levels could expand the opportunity for change, especially when an
organization is addressing a problem that has personal-behavior implications, as well as necessary policy or community action to improve a problem.

**Limitations**

Several factors limited the depth and breadth of the research, including time and the diversity of the case study participant groups. The overall time available to complete the study reduced the number of data points used in each case study. The organizations have different structures and focus, emphasizing varying goals with their EE. However, the variety of group types enhanced the ability of the study to compare the research concepts in different settings, thereby better examining the research questions.

Time limitations for the research meant that no public presentations of any of the groups was observed. In two cases, materials from such presentations were available to use as a data point, though no content analysis could be done during actual public events. The Power Point presentations and notes that were available to review likely represented less than the actual presentation, especially information a presenter would add, such as examples and anecdotes that could directly enhance the research concepts of value-orientations, subjective norms, and PBC.

The fact that each organization has different mission and goals reduced cross-case analysis. One group is a chapter of a dedicated environmental group; another is a nature center; and the third is a recreation-focused preservation organization, all of which have their own purposes and regional priorities that guide the EE content. The research design took this into account and presented each case holistically, though that limited comparisons of similar activities, campaigns or other EE efforts.
Recommendations

The main goal of this study was to see what EE practices of different types of organizations align with predictors of behavior and change. The EE activities and content of the groups studied could be enhanced to improve the likelihood or effectiveness of change efforts. A number of EE activities, programs and messages reviewed in the study did address concepts that have been shown to lead to change. However, planning that considers predictors of change and the change models can reach better outcomes.

Recommendations stemming from the research address three areas: enhancing the content of EE activities the groups are already doing; examining existing programs and activities to find connections with the research concepts to improve the adoption of behavior; and planning that considers the change models. The findings also open up possibilities for future research, either to replicate the study or to delve deeper into some of the research concepts.

EE activities reviewed in the study could be enhanced to have a better likelihood of influencing behavior. The research data included examples of EE content that suggested certain behaviors and attitudes are normative. Others supported value-orientations and identified impacts of behaviors that could help satisfy someone’s PBC. The groups can build on these activities and messages to assert specific behaviors. For example, the recreation and stewardship organization has educational materials and videos about how best to relieve oneself in the wilderness to have minimal impact on both the environment and other hikers. “It has a social impact. We want everyone to have an awesome, positive experience when they’re out here. So, some of those impacts
drive those educational messages (Carter interview).” That content might subtly support PBC in how people can have control over that impact. Messages that include behaviors and their likely impacts are also opportunities to explicitly refer to social norms. Groups can point out that such actions are practiced by and expected by others. A stronger assertion of norms will enhance the effectiveness of messages that already include a link to PBC or values, in order to drive change.

Each of the organizations has opportunities to improve their EE efforts through the events, social media and other communications they are already doing to connect with their members and the general public. All of these existing interactions can help them assert one or more of the research concepts. For example, both the nature center and recreational organization in the study interact with people on trails, in forests, and elsewhere out in nature. Both active and passive EE materials, in a presentation or signage, can be an opportunity to suggest subjective norms – what people do and what is expected. Social media and other electronic communications are often visual, which subtly supports value-orientations. The nature center in the study takes advantage of that, but could also further assert the value orientation more explicitly, to make a connection that the nature and wildlife in the images are protected through their stewardship.

The study concepts present an opportunity for the leadership of organizations to design goals and activities, given a desire for those efforts to lead to change. Significant planning and research go into many of the EE activities and messages by the groups in the study. Explicitly pointing out what other people do or what others expect helps drive social norms and can be a guiding principle of EE content. Similarly, linking behavior to outcomes, whether individual actions, buying decisions or voting choices, validates
people’s perceived behavioral control, supporting the value of someone changing behavior. Acknowledging different value orientations can lead to addressing them within the context of a specific environmental issue or problem at the planning level. Leadership that emphasizes a shared goal could be effective in implementing such directions.

Planning of any type of EE activities or campaigns can be designed with models of change taken into account. When the recreational organization wants to promote responsible recreation in the wilderness, the TTM suggests some might be just learning these concepts, while others are more well-versed; each is going to relate to EE information in a different way. The group leaders acknowledged this, noting that many they interact with are novices. Capitalizing on that knowledge, the readiness-for-change concept provides a framework to design effective content for multiple, varied audiences. Education on local or regional environmental threats could be designed acknowledging the same concept. Such a campaign might then include basic awareness for someone new to an issue, while also engaging others who are further along a readiness-for-change continuum.

The social ecology concept of levels of change can also positively impact EE efforts by identifying barriers and facilitators of change other than just influencing individual behavior. A campaign by the environmental group in the study trying to increase adoption of alternative energy technologies is encouraging an individual, or micro-level, action. However, local zoning or state regulations might impact the ability of that change, requiring the group to address the issue on a meso- or macro-level as well. The effect of EE on such an issue would improve by realizing the levels of change
necessary and incorporating the social ecology principle. Any group hoping to engender change in its educational activities should consider the level-of-change notion, whether seeking to influence micro- or meso-level change, or if the topic requires exo- or macro-level change. Such an assessment would serve to focus the content toward progress on the problem or issue. The theoretical concepts that helped form the framework of this study could help to improve planning the content of an EE efforts.

The study also opens avenues for further research. A longer-term study could examine more content, such as social media, public information campaigns, and public events over time to find trends and test the research questions further. A concerted campaign using the behavior and change concepts above could be implemented along with a pre-test, post-test component to assess impact. Comparisons with different types of groups and their directors, in case study or in focus-group methods, might extend the findings as well. Finally, more applications of social ecology theory could further investigate change efforts and EE content, given the often complex topics on which change over multiple levels is necessary to be effective.

**Conclusion**

A wide variety of groups offers some sort of environmental education to the general public. Depending on the nature of group and its location, issues of interest to them might be local, regional or global. Each organization approaches EE messages, events, materials and campaigns differently, depending on its structure as a dedicated environmental group, a park or nature center, a recreational organization, or museum or science entity. These EE efforts vary from basic information about a topic that impacts
the environment to direct advocacy on an issue or policy, all seeking some improvement by changing awareness, attitudes and actions.

Providing basic information alone does not effectively change behavior (Kollmus & Agyeman, 2002; Crowell & Schunn, 2014). Behavioral research identified a break between awareness and behavior; people do not take actions on these issues or change their behaviors from being told about an issue, its consequences, or someone’s role in perpetuating the problem. Yet much of EE is focused on knowledge to raise awareness. Researchers suggest that what Kollmus and Agyeman (2002) called a knowledge gap limits meaningful action to solve environmental problems, alter damaging behaviors, or change relevant laws.

This study sought to examine how the activities and content of EE as done by various groups in Upstate New York aligned with principles that would more likely change people’s intention to act, to go beyond the knowledge gap (Bamberg & Möser, 2007; Carmi et al, 2015; Masud et al., 2015; Schultz, 2005). A mixed-methods study design looked at the types of methods and topics used by groups through a survey. A multiple case study followed to reach deeper understanding of the EE content of specific groups.

Each organization in the study wants to make a difference on the issues with which it is involved. The framework of the study therefore included change theories and models that provided an analytical lens of change on different levels, individual, group, or societal, and change among different individuals, who might be unaware of an issue, ready to consider some change, or already taking action.
The study found some alignment between the EE content of the participant groups and the theoretical concepts that help predict behavior. The theory of planned behavior suggests value orientations, subjective norms, and perceived behavioral control are antecedents of some adopting or changing behavior (Ajzen, 1991). In some incidences, the public events, educational programs, communications and social media included content that could address those factors. In other instances, materials and messages implicitly aligned with the concepts.

Findings were similar for the models of change in the study, the trans-theoretical model and social ecology theory. Some organizations’ messages and projects took into account factors of readiness for change (Prochaska et al., 1991). Other content in the study connected individual behavior suggestions with changes on group or policy levels that would be complementary (Bronfenbrenner, 1977, Lejano & Stokols, 2013).

If groups wanted to increase the impact of their EE efforts through the concepts of the TPB, this study’s recommendations include taking advantage of successes they are already having in connecting with people. Activities and programs that were found in the study that either directly or implicitly address one of the research concepts, could be modified to appeal to other TPB concepts. Leaders of organizations can develop policies and guide employees and volunteers to design EE content to take into account the change models that address readiness for change and levels on which change should occur.

Given the political context at the time of the research, in 2017, government policies and budgets deemphasized issues of preservation, conservation, environmental clean-ups, and environmentally sensitive polices around energy, transportation, manufacturing and mining. The shift in priorities makes EE done by recreational groups,
parks and nature centers, museums and science organizations, and environmental advocacy and activist groups more critical for those concerned with such issues. Environmental education that addresses behavior directly and works along with models of change can be. Similarly, additional research into EE content as it relates to change and behavior will also be worthwhile.
References


Appendix A

Environmental Education Survey

Default Question Block

Thank you for taking part in this survey for the research project: Environmental Education in the Public Sphere.

The study is intended to make comparisons between current environmental education practices and behavioral research about why people change their opinions or actions.

Please only one survey per organization; choose the person most knowledgeable about your education materials/activities.
Please fill out survey choosing answer that fits best, describing current practices.

All answers and data remain anonymous, including organization, e-mail or website.

Answers to these questions are part of a mixed-methods study. An opportunity to participate in an in-depth case study of your organization is at the end of the survey; information collected for that component will also be kept anonymous.

The survey should take 9 - 11 minutes to complete

Thank You for helping better understand and improve environmental education.
Q1 Which type from this list best describes your organization?

- Environmental Group (1)
- Nature Center (2)
- Park (3)
- Zoo (4)
- Museum/Science Center (5)
- Other (6) ________________________________

Q2 What is the primary structure/funding source of your organization?

- Federal Government (1)
- State Government (2)
- County (3)
- City/Town/Village (4)
- Non-profit (5)
- For-profit (6)
- Other (7) ________________________________
Q3 Does your organization employ means or methods of educating the public on nature or environmental issues (written materials, media, mail, social media, events, displays, presentations, or other?)

- Yes (1)
- No (2)

Q4 Which of the following methods does your organization employ for environmental education purposes? (check all that apply)

- Written Materials or brochures at your site (1)
- Written materials mailed out (2)
- Written materials on a website (3)
- Website links to other information or organizations (4)
- Social Media to distribute information on environmental issues or topics (5)
- Lectures, seminars, classes or other educational events on-site (6)
- Lectures, seminars, classes or other educational events off-site (7)
- Habitat, wildlife, trail or other outdoor educational events that address environmental issues (8)
- Press releases or press conferences on environmental issues or topics (9)
- Special public events, such as a panel, Earth Day event, movie screening or other (10)
Q5 Does your organization produce or distribute media (audio, video, etc.) that includes information about environmental issues or topics? (check all that apply)

- □ Audio for on-site education/information (1)
- □ Video for on-site education/information (2)
- □ Interactive computer displays with environmental education/information (3)
- □ Audio features on website on environmental topics/issues (4)
- □ Videos on website on environmental topics/issues (5)
- □ Other (please specify) (6) ________________________________________________
- □ None (7)
Q6 Does your organization distribute media produced by others that includes information about environmental topics/issues? (check all that apply)

☐ On website (1)

☐ Through e-mail (2)

☐ Through postal mail (3)

☐ Through social media (4)

☐ Through YouTube, Vimeo, Dropbox or other web link (5)

☐ No (6)

Q7 What is the frequency of postal mailings on environmental issues or topics, including printed newsletters?

☐ Once-a-week or more (1)

☐ 1-3 per month (2)

☐ Less than once-a-month (3)

☐ Once yearly (4)

☐ None (5)
Q8 What is the frequency of your electronic communications, including e-mail, social media, electronic newsletters, or website content updates, on environmental issues or topics?

- Daily (1)
- Several times-a-week (2)
- Once-a-week (3)
- Several times-a-month (4)
- Once-a-month (5)
- Several times-a-year (6)
- Once-a-year (7)
- Seldom (8)
- Never (9)
Q9 Does your organization enter into partnerships based solely or in part on educating the public on environmental issues or topics?

- Yes (1)
- No (2)

Q10 If your organization holds educational/informational events on environmental issues or topics, on-site or off-site, what is the frequency of events?

- Several times-a-week (1)
- Once-a-week (2)
- Once or twice a month (3)
- Several per year (4)
- Once-a-year (5)
- N/A (6)

Q12 Does your organization employ paid staff whose role, in whole or part, is to provide environmental education and/or create materials, media or displays for that purpose?

- Yes, 50%-or-less FTE (full-time equivalent) (1)
- 1 FTE primary job (2)
- 2-3 FTE primary job (3)
- 4 or more primary job (4)
- No (5)
Q14 How many volunteers does your organization utilize in a year, on average, for environmental education (for primary functions, events, materials, media, etc.)?

- 1-2 (1)
- 3-5 (2)
- 6-10 (3)
- 11 or more (4)
- N/A (5)

Q13 Rate the importance of environmental education to your organization's mission.

- Primary function (1)
- Integral to mission (2)
- Supports mission (3)
- Ancillary to main mission (4)
Q15 Does the content of your environmental education efforts aim to inform or raise awareness on any of the following? (check all that apply)

- Consequences of environmental problems (pollution, climate change, habitat loss, etc.) (1)
- Local, state or national policies (2)
- the impact on others (the poor, other countries, animals, etc) of damaging environmental behavior or practices (3)
- Local examples of environmental problems or threats (4)
- The growth and availability of new technology or options to minimize pollution, climate change, or other problems (5)
- The increased adoption of technologies, habits, or viewpoints on certain environmental issues (6)
- Local examples of consequences or impacts from environmental problems (7)
Q16 Does the content of your environmental education efforts aim to change people's attitudes or actions in any of the following ways? (check all that apply)

- [ ] Suggestions or options to mitigate environmental problems (eg. reduce waste, use less energy, other lifestyle changes) (1)

- [ ] The effectiveness of certain actions to mitigate, reduce or avoid an environmental problem (2)

- [ ] The impact on others of certain environmental problems (the poor, animals, other countries, etc.) (3)

- [ ] The growth and availability of new technologies or options to minimize pollution, climate change, or other problems (4)

- [ ] The increased adoption of certain technologies, habits of viewpoints on certain environmental issues (5)

- [ ] Specific action steps to take that would have an effect on an environmental problem or issue (6)

Q17 What are the top 3-5 environmental issues or topics of concern to your organization?

- [ ] Write in issue or topic (1) ________________________________________________

- [ ] Write in issue or topic (2) ________________________________________________

- [ ] Write in issue or topic (3) ________________________________________________

- [ ] Write in issue or topic (4) ________________________________________________

- [ ] Write in issue or topic (5) ________________________________________________
Q18 Would you like to share anything else that explains the environmental education activities, materials, events or efforts of your organization?

Q19 Would your organization be interested and willing to take part in the second portion of this study, an in-depth, qualitative study of your environmental education materials and practices?

- Yes (1)
- Maybe (2)
- No (3)

Q20 For more information on the qualitative portion of the study, enter contact information here. You will receive details regarding the scope of the project before making a decision on participation. The answers to above questions will remain confidential.

Q21 Thank you for taking part in the Environmental Education Survey.
Appendix B

Interview protocol: Environmental Education in the Public Sphere and Antecedents of Behavior

The semi-structured interviews will take place in person. Interview subjects will go through a pre-interview process to help review the materials and purpose of the questioning, as well as its contribution to the study. Interview questions will be grouped by theme, with the opportunity to divert from the list for follow-up and specifying questions to improve understanding. Suggestions for possible specifying questions follow each open-ended question. Many questions will have to be tailored to organization and its activities, events and materials; some questions therefore account for changes to make relevant to a specific interviewee and organization. With interviewee approval, sessions will be recorded for future transcription.

**General EE Questions about organization:**

1. What are the main ways the organization interacts with the public?

2. Who do you define as your public or target audience?

3. What role does education play in the activities and overall mission of the organization?

4. (other follow-ups based on responses, or direction/topic interviewee wants to go)

**Questions about EE materials:**

1. How were written materials developed?

2. What about static displays...what process goes into creation of the display and the information behind it?

3. What events do you hold within the organization or out in the public at other locations?
   -- how do such events come about – internal plan, external opportunity of a speaker or event?

4. How much information is developed for online and digital sources?
   -- what’s the process of developing that material?
   -- Any sense or feedback about how people use it?
5. Does any of your electronic material include media, such as video, audio or other interactive elements?

6. Is there a role for social media in the educational or informational activities?
   -- if so what kind of methods employed…and who/how developed?

7. (Other emerging follow-ups)

**Thematic Questions:**

1. How much of the information in your educational materials is strictly scientific facts?
   -- development of materials just for knowledge or awareness?
   -- How much do you think average person, visitor knows about (organization’s) topics, issues?

As you know, this study has a basis in past behavioral research that has developed some specific concepts, one of which is **subjective norms**…how much an idea is considered normal, widely held, or some practice normal or expected. An example might be using a smart phone, which is becoming more normal and accepted. Another might be a vegan diet, which is considered more normal now than a decade or so ago, and some restaurants or stores would promote that that’s so.

1. Given (specific materials, events), is there a role there to make seem more normal?
   -- if so, how do you see that being understood?
   -- part of the planning in any way…or byproduct?

2. What kind of content might fit into that idea of norms…and perhaps suggesting a viewpoint or behavior is normal or becoming more normal…based on (organization’s goals/focus)?

3. What kind of feedback do you hear in a formal or informal way that suggests how people are hearing or understanding those kinds of messages?
   -- reactions from staff, colleagues?

Another theme in the behavior research is how important **value orientations** are in any pro-environmental behavior, or changes in actions and decisions people might make.

1. Have you found you get a sense of people’s leanings when there’s some interaction with EE materials that people already have a mindset about (organization’s topics)?
   -- What might you observe or hear?
-- Do you sense a kind of black or white, accepting or skeptical? ...or more of a range, some extreme one way or another with others in the middle?

2. Are there ways you think you can do anything about that...to shift those preconceptions or ways people make sense of the world?
   -- Is (organization activities) a way to move people a bit?
   -- Why might you think so (if so)?

3. Other reactions and follow ups

The third concept that some say can help predict how someone might act is **perceived behavioral control** – which really speaks to whether people think something they can do at their level – individual or organization – really does anything makes any difference. This concept might be related to voting, where some feel it’s important and effective, while others think their one action is insignificant.

1. I realize it’s impossible to know how anyone who goes to (organization event) or sees (organization materials) has any thoughts about how much impact they can have...but can you see how your work might fit into this concept or idea?
   -- is it something you think about or have planned about at all to try convince people they can make a difference?

2. What kinds of things come to mind when we talk about this perceived control concept...whether people can make a difference?
   -- for example, are there ways you directly ask, in events or materials, for them to do something?
   -- what specifically are those things? (need prompt? ...donate, buy different, vote differently, etc.)
Appendix C

Coding Protocol: Elaborative Coding

Principle: Elaborative coding allows use of predetermined codes/themes to help structure interpretation, while remaining open to emerging themes of materials.

Themes from theoretical constructs: Subjective Norms; Perceived Behavioral Control; Value Orientations; Readiness for information or change adoption; Other emerging themes

Matrix with data sources for primary coding

<table>
<thead>
<tr>
<th>Data Source</th>
<th>Subj. Norms</th>
<th>Behavioral Control</th>
<th>Value Orientations</th>
<th>Readiness for change</th>
<th>Other Themes</th>
<th>Notes/observations</th>
</tr>
</thead>
<tbody>
<tr>
<td>Event observation</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Written materials</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Digital/elec materials (online, media, social media)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>In-person interviews</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
### Appendix D

**Research Documentation Sheet**

<table>
<thead>
<tr>
<th>Activity/Material: (written, electronic/digital, event, interview, etc)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Date of collection:</td>
</tr>
<tr>
<td>Location:</td>
</tr>
<tr>
<td>Data collection methods: (recording, notes, observation, etc.)</td>
</tr>
<tr>
<td>Name of participant(s):</td>
</tr>
<tr>
<td>Title/position in organization:</td>
</tr>
<tr>
<td>Relevant background, training &amp; experience:</td>
</tr>
<tr>
<td>Connection to Environmental Education:</td>
</tr>
<tr>
<td>Connection to study themes (subjective norms; perceived behavioral control; value orientations):</td>
</tr>
<tr>
<td>Special circumstances or factors:</td>
</tr>
</tbody>
</table>

____________________________________________________________________________

____________________________________________________________________________

____________________________________________________________________________

____________________________________________________________________________

____________________________________________________________________________

____________________________________________________________________________

____________________________________________________________________________

____________________________________________________________________________
Appendix E

Sample Survey Introduction Letter

Dear (prospective participant);

My name is Chris Bolt and I am a doctoral candidate at St. John Fisher College’s Wilson School of Education. My dissertation research focuses on environmental education in the public sphere. Due to the experience of your organization in educating the public about environmental issues, I would like your participation in a survey (find link attached). The survey should take 12-15 minutes to complete.

(SURVEY LINK)

I hope to collect information about the types of environmental education activities and methods employed by groups ranging from dedicated environmental organizations to nature centers, zoos, parks and museums. I would like to know the issues important to your organization, as well as the role environmental education plays in your mission. The survey will also include questions related to awareness, values, norms and behavior change.

Information will be aggregated and summarized for reporting, but each organization name will remain anonymous, as will all e-mail addresses and individual contact information. Some respondents will be contacted to see if individuals within the organization who have a role in environmental education would be willing to participate in an in-depth segment of the study.

I would like to get as much participation as possible among groups in Upstate New York, so I encourage you to forward the e-mail or survey link along to colleagues. I would however only like to have one online survey filled out by each organization.

Thank you for your participation in this research project. Please feel free to contact me with any questions or to receive results at the conclusion of the study.

Sincerely;

Chris A. Bolt
Candidate, Doctor of Education in Executive Leadership
St. John Fisher College
(XXX)-XXX-XXXX
CABOLT @XXX.XXX