ENVIRONMENT IDENTITY DEVELOPMENT: EXPLORING THE FORMATIVE EXPERIENCES AND MENTAL MODELS OF TEACHERS ENGAGED IN ENVIRONMENTAL EDUCATION

by

HILLARY MARIE MASON

B.S., University of Nebraska-Lincoln, 2000

B.S., Peru State College, 2003

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Hillary M. Mason

has been approved for the

Environmental Sciences Program

by

Bryan Wee, Chair

Brad McLain

Katie Navin

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Mason, Hillary, M. (M.S., Environmental Science)

Environment Identity Development: Exploring the Formative Experiences and Mental Models of Teachers Engaged in Environmental Education

Thesis directed by Assistant Professor Bryan Wee.

ABSTRACT

This investigation explores the formative experiences and mental models teachers engaged in environmental education attribute to the development of their relationship with the environment, and how these factors might shape teachers’ environment identity. Environment identity has been shown to be an important antecedent of environmental preferences, intentions and behaviors; yet, environmental education has taken only minimal efforts to include theories of identity into its research. This study suggests that teachers engaged in environmental education have an environment identity that is shaped by the experiences they consider formative to the development of their relationship with the environment and the mental models they use to conceptualize the environment. Participants of this case study included three teachers at an urban Early Childhood Education (ECE)-8 school who actively utilize some form of environmental education as part of their everyday classroom instruction. Identity theory was used as a theoretical framework to further understand how teachers’ formative experiences and mental models might shape their environment identity, or the set of meanings they attach to themselves in relation to the environment. Methods used to elicit this information included online survey, autobiographical narrative, semi-structured individual interview, and focus group discussion. Data analysis followed an interpretive approach where relevant themes and categories were allowed to emerge from inductive coding processes. The findings of this
study revealed similarities in the types of formative experiences and mental models teachers attributed to the development of their relationship with the environment. Furthermore, teachers’ formative experiences and mental models shaped their environment identity by assigning significance to certain meanings for how they viewed themselves in relation to the environment. These shared meanings included being connected to, aware of, and responsible for the environment. The results of this study inform environmental education by illuminating elements and processes of environment identity development. Additionally, the theoretical and practical implications for supporting environment identity development through environmental education are discussed.

The form and content of this abstract are approved. I recommend its publication.

Approved: Bryan Wee
DEDICATION

I dedicate this work to my family, friends, and mentors who provided unconditional support during my master’s degree experience.
ACKNOWLEDGMENTS

I would like to thank my committee advisor and mentor, Dr. Bryan Wee, for making this thesis possible. Dr. Wee spent an incalculable amount of time and energy devoted to helping me reign in my own thoughts on the complex concept of environment identity. Not only did he challenge me to think beyond my own realm of knowledge, he believed in me at times when I didn’t believe in myself. For this I am eternally grateful, and I hope to pass along this “academic genealogy” to my own graduate students one day.
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CHAPTER I
INTRODUCTION

Background

"After many years of scientific domination of the decline of environmental quality, environmental issues are now increasingly recognized as legitimate social and global issues with distinct implications for children's education" (Hart, 2003, p. xiii-xiv).

Environmental and social problems, at one time possibly considered abstract and far removed from our daily lives, continue to evolve into complex, interdependent issues of personal relevance. At the heart of these problems are the human-environment relationships that provide the context and capacity for environmental sustainability and human well-being. It is in the different ways individuals and communities construct their relationship with the environment, and the meanings they attach to themselves in relation to the environment, that have implications for an environmental education that ensures a healthy, just, and resilient planet (Kyburz-Graber, 2013).

Central to environmental education efforts is the production of knowledgeable and aware citizens who are motivated to actively engage in environmental decision-making and problem solving (Stapp et al., 1969). In some cases, traditional educational approaches used to support this vision attach importance to ecological knowledge transfer and behavior change (Coyle, 2005; Hungerford & Volk, 1990), while neglecting individual and social perspectives. As environmental problems make their presence felt in our daily lives, it is not only knowledge but also our environment identities that determine our motivation to know and act. Specifically, the way that we identify
ourselves in relation to the environment influences what we perceive to have meaning and shapes our response to environmental changes.

**Statement of the Problem**

Environmental education is intended to engage humanity to make informed decisions and take knowledgeable actions to address complex, multi-faceted issues such as climate change, biodiversity loss, land degradation, urbanization, ecosystem mismanagement, and overconsumption of natural resources (UNESCO, 1997). Embedded in this and other visions for environmental education is the importance of conceptualizing the environment in its totality such that it represents “a complex of natural, built and social components in the life of humanity” (UNESCO, 1978, p. 26).

Environmental education is designed to enable all people to construct their own understandings of how they view the environment and environmental problems in order to make useful contributions to the world around them (UNESCO, 1978). Consequently, it is under the premise of these foundational principles of environmental education that further explorations into the link between identity, environment, and education can progress.

The intentions of environmental education become problematized upon the realization that each of us possesses distinct identities with attributes that regulate how we situate and perceive ourselves in different roles and contexts (e.g. in the environment, as a researcher, as a teacher, as a learner). The following sections briefly illuminate some tensions that exist when considering identity in specific roles relevant to environmental education.
Identity and the researcher in environmental education. Identity is a multidimensional concept that reaches across disciplines of environmental psychology, environmental sociology, environmental science, and environmental education. Current literature in these different disciplines acknowledges the reciprocal relationship that exists between identity and the environment (Blatt, 2013; Clayton, 2012; Stets & Biga, 2003). Given the interdisciplinary nature of identity research, however, there are just as many ways to investigate identity and the environment as there are identities. For example, from an environmental psychology perspective, research on identity and the environment might emphasize internalized attributes of moral and emotional identity to assign significance to an individual’s relationship with the environment (Clayton, 2003). Environmental sociologists might focus on the social component of identity development in certain environments or within specific groups of people (Stets & Biga, 2003). While not as prevalent in the literature, environmental science education researchers may combine approaches from both natural and social sciences to understand how learners develop an identity in relation to the environment and how this identity is applied in environmental problem solving (Blatt, 2013). Despite similar research objectives, the variation of different approaches used to explore relationships between identity and the environment result in the fragmentation of relevant literature. This presents a challenge for environmental education researchers to be clear in their intentions and to consider a plurality of epistemologies, ontologies, and methodologies when exploring environment identity (Dillon & Wals, 2006).
**Identity and the teacher in environmental education.** Concepts of identity resonate not only with environmental problem solving approaches, but also with the approaches we use for environmental teaching and learning. In a recent survey asking environmental education researchers what they believed were the most relevant topics in environmental education, Ardoin et al. (2012) identified an increasing interest in culturally embedded learning and its implications for identity and capacity building within the framework of environmental sustainability. The way we construct knowledge and understanding about the environment (and education, for that matter) is a product of social processes, experiences, beliefs, ideologies, and history. These factors influence not only teachers’ conceptualizations of the environment, but also the meanings they attribute to themselves in relation to the environment, or their environment identity. Consequently, teachers tend to choose, design and shape their environmental education efforts in alignment with their own identities and, ideally, the identities of their students. If teachers attach certain meanings to how they perceive themselves in relation to the environment, then their behaviors and actions will likely reflect these meanings in the classroom. This presents the need for additional inquiries on the link between identity and environmental teaching in environmental education.

**Identity and the learner in environmental education.** Declines in environmental quality have long been interpreted within traditional science paradigms advocating a discourse focused on observable facts (Gough, 2013; Hart, 2003). In these paradigms, the way we interpret the environment and our relationship to the environment is subject to objectification, where environmental problems are reduced to generalizable ecological principles with minimal to no accounting for individual realities or different
ways of knowing (Lundholm et al., 2013). The mechanization of science presents a challenge for understanding how diverse learners establish the competencies and capacity to act for a healthy and sustainable future. Environmental problems and issues are becoming increasingly complex, and scientific knowledge is often uncertain and contested. If, as Clayton (2012) suggests, our experiences and perceptions shape the identities that we inhabit and acquire over time, then engaging learners in environmental education will require acknowledging how they conceptualize the environment and how they perceive themselves in relation to the environment. This presents the need for additional inquiries on the link between identity and environmental learning in environmental education.

**Significance of the Study**

Identities are developed and shaped by the different experiences that influence how we perceive and relate to the world around us. Once the meanings attached to any particular identity are understood, predictions can be made for the behaviors tied to that identity (Burke & Stets, 2009). For example, as Reitzes & Burke (1980) conclude in their study of college students, if a person understands the identity of a student or ‘student identity’ to be academically responsible, intellectually curious, sociable, and personally assertive, then we can assume that this person will exhibit these behaviors as a student. The larger assumption is that these behaviors are characteristic of the identity of other students as well (Burke & Stets, 2009).

Operating under this premise, the aim of this study is to explore different characteristics that define the environment identity of teachers engaged in environmental education. Given that people have a tendency to act in alignment with their identities in
any given situation (Burke & Stets, 2009), explorations of teachers’ environment identities might further elucidate not only how teachers share their knowledge and perceptions of the environment with students in the classroom (Desjean-Perrotta et al., 2008), but also how students interpret teachers’ perceptions to construct their own environmental understandings and whether or not they possess/express environment identities similar to their teacher. Additionally, this is helpful for schools seeking to emphasize environmental education in their curriculum because it provides administrators with insights into the teaching philosophies of their teachers’ vis-à-vis the environment, as well as relevant information on the kind of structure teachers need to support new practices consistent with their beliefs.

Environmental education requires that teachers and students have an understanding of ecological concepts such as systems and interdependence (NAAEE, 2010). It also requires the infusion and integration of social sciences and the humanities. Research in environmental education has historically proceeded with only a limited inclusion of human dimensions that include how people come to know, interpret, interact with and seek meaning in their relationship with the environment. Acknowledging the diversity of social contexts from which different individuals and communities perceive and attach meaning to the self in relation to the environment facilitates the broader approaches needed for environmental education research and practice to evolve (Hart & Nolan, 1999). By exploring characteristics that define the environment identity of teachers engaged in environmental education, this study acknowledges the significance of the personal and social surroundings in which the environmental perspectives of different individuals and communities are developed and materialized.
Research Questions

Identities are developed and shaped by the different experiences that influence how we perceive and relate to the world around us. The broad scope of this study targets the relationship between identity and environment in environmental education. A narrower and more explicit focus for this study explores the formative experiences and mental models that contribute to the environment identity of teachers engaged in environmental education. With these aims in mind, this study is guided by the following research questions:

1. What formative experiences do teachers engaged in environmental education attribute to the development of their relationship with the environment?
   a. How might these formative experiences shape teachers’ environment identity?

2. What mental models do teachers engaged in environmental education attribute to the development of their relationship with the environment?
   b. How might these mental models shape teachers’ environment identity?

Conceptual and Operational Definitions

Identity is “a set of meanings attached to the self that serves as a standard or reference that guides behavior in situations” (Stets & Biga, 2003, p.401). Identity theory posits that each of us has multiple identities that are developed and activated in different places, social structures, and relationships. The set of meanings we attach to each identity operates as an individual point of reference or “true north” that guides how we perceive and respond in different situations.
Environment identity is “the meanings one attributes to the self in relation to the environment” (Stets & Biga, 2003, p.406). These meanings are reflected in environmental behaviors and actions. Environment identity is viewed as one type of identity that operates across various roles and social situations. It is also representative of one’s core identity, or sense of self in relation to something else. Acknowledging a core identity fosters feelings of authenticity, such that one is being true to oneself (Burke & Stets, 2009). Environment identity should not be confused with how one places the self in relation to the environment. It should be viewed as how one perceives the self in relation to the environment.

Formative experiences are those experiences identified as having a profound influence on the formation and activation of an identity. They influence the development of mental models teachers use to represent how they relate to the environment. In this case, a teacher’s formative experiences contribute to how teachers view themselves in relation to the environment and, subsequently, are viewed as one characteristic to describe the development of an environment identity.

Mental models are “internal representations of phenomena based on prior knowledge, existing ideas or conceptions, and past experiences” (Shepardson et al, 2007, p.330). They influence the way a person perceives experiences across time and space, as well as the degree of influence attributed to these experiences. In this case, a teacher’s mental model contributes to how they view themselves in relation to the environment and, subsequently, are viewed as one characteristic to describe the development of an environment identity.
*Meanings* refer to “the characteristics or attributes that individuals see as representing who they are, how they feel, and what they value” (Stets & Biga, 2003, p. 403). The meanings that an individual attaches to an identity are internalized and reflected in how one perceives the self in certain situations (e.g. social roles, membership in a group). In this case, the meanings that teacher’s attach to their environment identity are influenced by formative experiences and mental models, which in turn influence behaviors and actions.

**Thesis Overview**

This chapter presented an introduction to the study, background and problem statement, purpose, research questions and study significance. Chapter II presents a theoretical framework, defines concepts, explains philosophical foundations, and describes research design, site selection, participants, data collection methods and analysis. Chapters III provides an overview of relevant literature on formative experiences and mental models in the context of environmental education. Chapter IV presents findings and a discussion on the formative experiences and mental models contributing to the development of teachers’ environment identity. Chapter V is focused on the implications of this research for environmental education as well as directions for further study.
CHAPTER II
RESEARCH DESIGN AND STUDY CONTEXT

Theoretical Framework

“The key to understanding qualitative research lies with the idea that meaning is socially constructed by individuals in interaction with their world.” (Merriam, 2002, p.3)

The concept of identity recognizes how individuals see themselves in terms of the meanings they perceive from their affiliations and interactions in social structures and the roles they play within those structures (Stryker, 1980). As we act upon our identities, we influence the structure of society. Conversely, existing social structures tend to shape our identities (Burke & Stets, 2009). This mutual relationship helps to contextualize how individual identities are developed and how individuals in specific roles relate to the environment. In the most recent edition of the \textit{International Handbook of Research on Environmental Education}, leading EE researchers suggest a re-orientation of environmental education research toward the understudied areas of individuals’ worldviews, belief systems, and identities (Stevenson et al., 2013). Research approaches that offer broader insight into the connections between identity, environmental teaching and learning can open a pathway for new inquiries on how different aspects of an identity might influence individual courses of action in relation to the environment.

Environment identity is one aspect of environmental education that transcends the boundaries of what we know about human-environment relationships. Environment identity in the context of environmental education asks (a) how individuals see themselves in relation to the environment, (b) how the meanings attached to the self in this relationship might guide environmental teaching and learning, and (c) how this
learning might motivate participation in solutions to multi-faceted environmental problems. By exploring the environment identities of teachers engaged in environmental education, we get a glimpse of their personal perspectives on the environment and the motivations behind why they engage in environmental education.

Research with explicit links between environmental education and identity is limited at best. However, aspects of identity originating from different disciplines (e.g. environmental psychology and environmental sociology) use a variety of frameworks that can be consolidated to support efforts to explore environment identity and its implications for environmental education theory and practice. Identity theory as a theoretical framework allows for a purposeful exploration of the meanings that teachers give to their environment identity.

According to the identity theory presented by social psychologists Peter Burke & Jan Stets (2009), individuals possess standards, or sets of meanings, for how they define and characterize themselves in relation to other people, places and things. These identity standards are internalized and developed over time, serving as points of reference guiding behavior and promoting authenticity. Most important for this study, identity theory posits that people choose behaviors that are aligned with the meanings of their identities.

Using Burke & Stets’ (2009) identity theory, Stets & Biga (2003) suggest that, “in order to predict how one behaves, we need to examine the identities that individuals claim and the corresponding meanings of these identities” (p.398). The meanings individuals attach to the self as a part of the environment, and vice versa, constitute their environment identity. Identity theory then, is an appropriate theoretical lens to frame the broad array of experiences associated with teachers’ environment identities in this study.
**Epistemological Foundations**

Qualitative research locates the observer in the world (Denzin & Lincoln, 2005). It involves using a set of practices and tools to represent the realities of the knower and the known, while attempting to make sense of the meanings people give to different phenomena. One objective for using a qualitative approach to inquiry is to “explicate the ways people in particular settings come to understand, account for, take action, and manage their day-to-day situations” (Miles & Huberman, 1984, p.7). The emphasis of locating teachers’ environment identity and the meanings they attach to this identity makes this study suitable for using a qualitative approach.

This study is grounded in a framework that is informed by Burke & Stets’ (2009) theory for identity. A guiding assumption of identity theory is that each of us develops internal standards, or identity standards, for how we perceive ourselves in different situations and interactions. These standards are arranged along a continuum of meanings that we use to define the identities we inhabit. For instance, in this study, teachers’ environment identity standards might be characterized by their formative experiences in the environment and their mental models for the environment. These standards might contribute not only to the range of meanings teachers’ give to their environment identity, but also the motivation to be engaged in environmental education.

Utilizing a qualitative approach to inquiry and a theoretical framework of identity theory to explore the environment identity of teachers engaged in environmental education positions this study for a case study research design.
Research Design

The research design used for this study was driven by its research questions to explore the formative experiences and mental models teachers engaged in environmental education attribute to their relationship with the environment, and how these experiences and mental models might shape the development of an environment identity. Case study methodology was employed using a purposive study sample of 16 teachers and a convenience sample of three teachers (cases) in one urban school. Teachers at this school engage in some form of environmental education every day, as it is a significant part of school culture and practice.

The use of case study in this research presented an opportunity to probe for deeper insight and understanding using a variety of methods (Yin, 2003). This flexibility allowed for the development of thick descriptions, or what Stake (1995) refers to as “what is perceived to be the case’s own issues, contexts, and interpretations” (p.450). Case study as an approach for exploratory investigations grounded in past research opens the door for previously unsuspected relationships that often accompany complex concepts, such as environment identity. Given the unique nature and context of this study, using a case study design ensured the richness and depth needed to understand the multiple perspectives implicit in the complex phenomenon of environment identity. The three participating teachers in this study comprised the individual cases, or unit of analysis, to explore environment identity. Each case was bounded by the formative experiences and mental models teachers’ attributed to the development of their relationship with the environment and the meanings they attach to their environment identity. The synergy between the self and environment was of utmost importance in providing a holistic
description of each case. Identity varies individually, and this research attempted to maintain focus on the integrity of each individual case while also making room for emergent patterns and potential comparisons across cases.

**Study Site**

To preserve anonymity and ensure confidentiality, pseudonyms are used for the school and study participants. This study was conducted at Tucker Green School in the Denver Public School District. Tucker Green School (TGS) is an Early Childhood Education (ECE)-8 neighborhood school situated in an urban area of a city with a population of approximately 600,000 (U.S. Census Bureau, 2010). The mission statement for TGS outlines a school culture that is focused on providing learning opportunities for its students to be leaders of a sustainable planet:

In partnership with our diverse urban community, [TGS] will provide a hands-on, brains-on experience that includes all students, staff, families and community, preparing all learners to lead the way toward a sustainable, bright green future. (retrieved online, October 2013).

At the time of this study, TGS was preparing for its 4th year since opening its doors to serve a socio-economically, linguistically, culturally, and academically diverse community. Student enrollment was approaching over 500 students from 18 different countries with a gender makeup of 52% male and 48% female. Ethnicity of the student population showed a profile of 42% Anglo, 27% Latino/a, 18% African American, 3% Asian, 2% American Indian, and 8% other. Additionally, 60% of the student population qualified for free and reduced lunch and 20% qualified for English Language Learner services.
The population of teachers at TGS at the time of this study included 37, three-quarter to full-time teachers with ethnicity percentages of 87% Caucasian, 8% Hispanic, and 5% African-American. Of the 37 teachers, 38% were male and 62% were female. The average age range of teachers was 26-45 with an average of 9.75 years teaching experience.

**Site selection.** TGS is a public school developed as a progressive approach to education reform efforts. Included in this approach is the autonomy for TGS to implement its own unique program design. This school was selected for this study primarily because of its use of Education for Sustainability (EfS) in school functioning. TGS is the first school in its large urban district to intentionally include sustainability as an essential component for infusion in community culture, curriculum, instruction and assessment practices. As a result of these efforts, TGS was one of the first in the nation to earn the U.S. Department of Education Green Ribbon Schools recognition award. This honor recognizes schools and school districts implementing innovative best practices to reduce environmental impact and costs, improve health and wellness, and provide effective environmental and sustainability education (U.S. Department of Education, 2013). The following image (Figure 1) was taken at TGS and emphasizes a school culture and community that strives toward their mission of sustainability.
Curriculum context. For the purposes of this study, EfS was considered as one form of environmental education with the goal of enhancing socio-ecological knowledge about and concern for, human-environment interactions while empowering students to engage in environmental behaviors within their communities. For purposes of consistency, EfS is referred to as “environmental education” in this study. While this study recognizes the epistemological and practical differences that might exist between environmental and sustainability education, the common ground is considered most important. Foundational principles for both environmental and sustainability education acknowledge that environmental and social systems are interdependent. Theoretical underpinnings of both fields also recognize that environmental, social, and economic resilience can only be achieved by integrating aspects of individual, social, and environmental well-being.
As Clayton (2012) adeptly put it: “People live in environments, and in the long term healthy individuals will not thrive in an unjust society or an unhealthy environment. Taking action to protect the environment may have both direct and indirect benefits for those involved.” (p. 682). To reiterate, while individual epistemological differences might exist, the theoretical goals and practical goals are the same.

EfS emphasizes a learner-centered approach for developing the knowledge and habits of mind needed to address the interdisciplinary nature of environmental problems and the socioeconomic issues that surround them. It is a curriculum that has an independent structure and standards developed by the Cloud Institute (The Cloud Institute, 2013; see Appendix A for EfS mission and standards). A typical day at TGS is structured for project-based learning where students and teachers are often found engaged in practical, hands-on experiences taking place throughout the energy-efficient building, working farm and community garden, and surrounding community.

As a relatively new school, TGS is currently in the process of developing a strong foundation of EfS programming. Current teachers are tasked with designing and implementing interdisciplinary lessons that integrate state academic standards with the EfS standards intended to prepare students to participate in sustainable behaviors and lead in a sustainable future. Teachers’ professional development for EfS pedagogy is further supported with 4-5 half and full day EfS workshops and one day of individualized bi-weekly coaching with the EfS coordinator during teacher planning time (Personal communication with school founder, September 1, 2013).
Participants

**Participant selection.** All teachers at TGS were invited to participate in an online survey. The survey was used to obtain a glimpse of the overall environment identity of teachers at TGS and to eventually provide a context for the individual case studies. A sample of 16 teachers (N=16) out of 37 (43%) provided complete responses to the online survey. Given the time constraints for teachers during a busy school year, a convenience sample of 3 teachers (n=3) from the pool of 16 consented to continue participating and completed the autobiographical narrative, the focus group and individual interviews. Having only three teachers was conducive to this study given the aim of providing a rich description of the environment identity of individual teachers engaged in environmental education at TGS. Table 1 presents participant demographics for two sample populations of teachers.
Table 1. Participant Demographics

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<td>15</td>
<td>2</td>
<td>1</td>
<td>k-5</td>
<td>All</td>
<td>F</td>
</tr>
<tr>
<td>16</td>
<td>&gt; 10</td>
<td>3</td>
<td>k-8</td>
<td>All</td>
<td>M</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Average</th>
<th>&gt; 7</th>
<th>2</th>
<th>Male = 6</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td>Female = 10</td>
</tr>
</tbody>
</table>

Note. Case study teachers 1, 2 and 3 are in bold.

a At the time of this study, Teacher 3 was not teaching a specific grade level and had assumed the position of curriculum coordinator at the school. He often substitutes for teachers at all grade levels and subjects.
Data Collection Methods

The sources used for data collection in this study aligned with the needs of the research questions and advocated an exploratory approach for capturing the environment identity of teachers engaged in environmental education. Data collection methods of online survey, autobiographical narrative, interview, and focus group were used to elicit the formative experiences and mental models associated with teachers’ environment identities. A more detailed description of the utility and purpose of each data source can be seen in Table 2. The methods used in this study gave teachers the opportunity to reflect on and express (a) the formative experiences they attribute to the development of their relationship with the environment, (b) the mental models they attribute to the development of their relationship with the environment, (c) the meanings they attach to themselves in relation to the environment, and (d) the motivations that continue to drive their engagement in environmental education.
### Table 2. Methods Overview

<table>
<thead>
<tr>
<th>Data Source</th>
<th>Measure</th>
<th>Utility and Purpose</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Survey</strong></td>
<td>Stets &amp; Biga (2003) Bipolar Scale</td>
<td>• primary source of information to provide an overview or sense of teachers' environment identity at TGS</td>
</tr>
<tr>
<td>1. n= 16</td>
<td><strong>How do you view yourself in relation to the environment? Where would you place yourself between each of the statements?</strong></td>
<td></td>
</tr>
<tr>
<td>2. Shepardson et al. (2007) Environments Task, part I</td>
<td><strong>Do these images depict the environment? Justify your answer.</strong></td>
<td>• to contextualize the environment identities of teachers’ engaged in environmental education at TGS</td>
</tr>
<tr>
<td>1. n= 16</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Autobiographical Narrative</strong></td>
<td>Chawla (1999)</td>
<td>• primary source of information for teachers’ formative experiences</td>
</tr>
<tr>
<td>1. n= 3 case studies</td>
<td><strong>Allow your thoughts to go back in time and return to the present day. Contemplate and describe, in your own words, the parts of your life that have shaped (and/or continue to shape) how you know, relate to and interact with, the environment.</strong></td>
<td>• to identify the formative experiences teachers’ attribute to the development of their relationship with the environment</td>
</tr>
<tr>
<td>2.</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Semi-structured Interview</strong></td>
<td>McLain (2012) Identity Pile Sort</td>
<td>• secondary source of information for teachers’ formative experiences and mental models</td>
</tr>
<tr>
<td>1. n= 3</td>
<td><strong>Think about what best describes who you are. What is included in your definition of “me?”</strong></td>
<td>• to establish and verify the self-meanings for an environment identity in the context of different roles (i.e. teacher)</td>
</tr>
<tr>
<td>2.</td>
<td><strong>Think about the various identities or roles you take on in your life. List and number each on an index card. Please rank your identities in terms of:</strong></td>
<td></td>
</tr>
<tr>
<td>3.</td>
<td>a. Your perceived importance for each</td>
<td></td>
</tr>
<tr>
<td>4.</td>
<td>b. Amount of time spent in each</td>
<td></td>
</tr>
<tr>
<td>5.</td>
<td>c. Most pleasing to least pleasing to inhabit. Why did you rank this way?</td>
<td></td>
</tr>
<tr>
<td>6.</td>
<td>d. Your ideal self – your most desired rank order in an ideal world. Why did you rank this way?</td>
<td></td>
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<tr>
<td>7.</td>
<td><strong>What does it mean to you to be a teacher at TGS?</strong></td>
<td></td>
</tr>
<tr>
<td>8.</td>
<td><strong>What do you feel is expected of you in this role?</strong></td>
<td></td>
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<tr>
<td>9.</td>
<td><strong>What elements or characteristics, if any, do you bring to the role of a teacher at TGS that are perhaps different from the traditional or societally expected role? In other words, what do you bring to the role because you are you?</strong></td>
<td></td>
</tr>
<tr>
<td><strong>Focus Group</strong></td>
<td>Shepardson et al. (2007) Environments Task, part II</td>
<td>• primary source of information for teachers’ mental models of the environment</td>
</tr>
<tr>
<td>1. n= 3</td>
<td><strong>Describe and explain your drawing.</strong></td>
<td>• to identify how teachers conceptualize the environment</td>
</tr>
<tr>
<td>2.</td>
<td><strong>What does your drawing represent?</strong></td>
<td></td>
</tr>
<tr>
<td>3.</td>
<td><strong>What does the term “environment” mean to you?</strong></td>
<td></td>
</tr>
<tr>
<td>4.</td>
<td><strong>What does the term “environment” mean to you as a teacher at TGS?</strong></td>
<td></td>
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<tr>
<td>5.</td>
<td><strong>Is there anything else you would include in the drawing?</strong></td>
<td></td>
</tr>
<tr>
<td>6.</td>
<td><strong>Is there anything you did not include in your drawing? Why did you not include this/these things?</strong></td>
<td></td>
</tr>
<tr>
<td>7.</td>
<td><strong>Did the experiences from your narratives contribute to your drawing? If so, how? If not, why?</strong></td>
<td></td>
</tr>
<tr>
<td>8.</td>
<td><strong>Did the experiences from your narratives contribute to how you feel or act toward the environment? If so, how? If not, why?</strong></td>
<td></td>
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<tr>
<td>9.</td>
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</table>
Online Survey. An online survey was administered to all teachers at TGS. The primary purpose for using the instrument was to give an overview of the teachers’ environment identities, their mental models of the environment, and also to contextualize the data from the individual case studies (teachers). After listing the first three terms that came to mind to describe the environment, teachers completed two measures in the survey. The first measure was a component of the Environments Task used by Shepardson et al. (2007; see Appendix B for this measure). It consisted of seven images reflecting natural and human-managed environments. Not all of the images are identical to the Shepardson et al. (2007) version, but they capture the essence of the original images. Teachers were asked if they thought each picture represented an environment and to justify their answer. This data source served as one measure to gauge teachers’ mental models of the environment.

A second measure in the survey asked teachers about one dimension of environment identity. Stets & Biga’s (2003; see Appendix C for this measure) 11-item bipolar scale measures how individuals view themselves in relation to the environment. Teachers were prompted to place themselves between 11 bipolar statements representing a spectrum of meanings for the self in relation to the environment. Placement along each scale indicated an individual’s perception of self as being environmentally friendly or environmentally unfriendly. Responses ranged from 1 to 5, where 1 represented agreement on one side of the bipolar scale (e.g. environmentally-unfriendly), and 5 represented agreement on the opposite side of the bipolar scale (e.g. environmentally-friendly). Responses of 3 represented a neutral placement on the scale. A higher score on the scale represents an environmentally friendly identity. The 11-item bipolar scale used
by Stets and Biga (2003) is the only validated tool that exists to measure environment identity as defined within the parameters of this study. No criterion categories between the bipolar statements have been established; Stets & Biga (2003) suggest further research in this area. Data collected from the online survey were prepared for analysis using the following steps:

1. *Data were transferred from online survey format into an interactive Excel spreadsheet for maneuverability.*

2. *To ensure anonymity, teacher identification labels were assigned for all teachers completing the survey (N=16).*

3. *Data were separated into three spreadsheets showing results for all items on the survey, environments task, and bi-polar scale. This provided a birds-eye view of the data overall and by task. Teacher responses from each measure in the survey can be found in Appendices D and E.*

4. *Data were further separated by teacher into separate Word documents to gain clarity on teachers’ overall environment identity as well as any similarities and differences between teachers.*

**Autobiographical narratives.** Autobiographical narratives offer a flexible medium for recall of significant memories, experiences, and interpretations (Chawla, 1998). The three teachers making up the individual case studies were prompted to write a narrative on the parts of their life that they believed to have shaped, and/or continue to shape, how they know, relate to and interact with the environment. The prompt for the autobiographical narrative can be found in Appendix F. Teachers were given 2 weeks to complete the narrative and no further instructions were provided. In other words, these
narratives are also embedded with teachers’ interpretations of environment and environment identity. The narratives were used to attain clarity on the formative experiences contributing to how participating teachers viewed themselves in relation to the environment. Data collected from the autobiographical narratives were prepared using the following steps:

1. Teacher identification labels used in the online survey portion were assigned to ensure anonymity of the three teachers participating as case.

2. Text from the narratives was triple-spaced to allow for ease in coding.

3. Line numbers were added for line-by-line coding.

Semi-structured individual interview. The teachers representing the three cases in this study were asked to participate individually in a semi-structured interview. Interviews are useful for obtaining in-depth information and gaining an understanding of participant’s perspectives, beliefs, and motivations (Johnson & Christensen, 2012). For the interview portion of data collection, teachers were asked to think about and describe their identities and counter-identities, or what they viewed as “me” and “not me”. Following this discussion, teachers were asked to list on index cards the various identities they take on in their life. The list was followed up with a pile sorting activity where teachers were asked to arrange and rank the identities on each index card according to their perceived importance for each, the amount of time spent in each, the most pleasing to least pleasing to inhabit, and their ideal self in an ideal world. The individual interview guide used for this activity can be found in Appendix G. This exercise was adapted from McLain (2012) and was used as a tool to locate the different identities each teacher assumes according to specific criteria. It also provided information on the meanings
teachers give to their different identities. The results from this exercise were used to show a cross-section, or slice of each teachers’ identity profile. The interview concluded with other questions related to how teachers feel about the importance of their relationship with the environment and their motivations as teachers engaged in environmental education at TGS.

**Focus group.** Focus groups are used to collect qualitative data in the words of the participant. They are especially useful as a complement to other methods of data collection, and provided in-depth information in a short amount of time (Johnson & Christensen, 2012). As a final source of data, one focus group took place with all three participating teachers. The focus group served as a venue to administer the second component of Shepardson et al.’s (2007) Environments Task. Guiding questions for the focus group discussion can be found in Appendix H. Teachers were asked to draw a picture of the environment and to explain the drawing in their own words. This visual tool was used to explore teachers’ mental models for the environment, and augmented the data collected from other portions of the study. A secondary objective for the focus group was to guide teachers in a shared reflection on select excerpts from their autobiographical narratives. The purpose of this discussion was to verify researcher interpretations of the narratives (member-check) and to facilitate dialogue between teachers on how past experiences and mental models might or might not have shaped the meanings and motivation for the environment and environmental education.
Data from the individual, semi-structured interviews and focus groups were prepared for analysis using the following steps:

1. *Audio were recorded and downloaded to a secure server.*

2. *Audio data were transcribed and teacher identification labels were assigned to ensure anonymity of the three teachers participating as case.*

3. *Text from the transcriptions was triple-spaced to allow for ease in coding.*

4. *Line numbers were added for line-by-line coding.*

**Data Analysis**

Data from each case study was analyzed using an interpretivist lens to gain insight into the multiple realities and lived experiences of each teacher. Interpretivism assumes that certain meanings are inherent in the way a person acts, and it is the task of the inquirer to reveal and interpret those meanings (Schwandt, 2001). Acquiring a practical understanding of how people define their experiences and interactions is a central concept for interpretive qualitative inquiries (Bogdan & Biklen, 2010). Using an interpretivist lens also implies an emphasis on the authenticity of participants’ voices as a window into the subjective worlds they inhabit. This study relied on the co-construction of meanings attained from methods of autobiographical narrative, interview, and focus group. These strategies align with the objectives of an interpretive analysis process by facilitating a deep understanding of the environment identity of teachers engaged in environmental education. Utilizing these methods also account for the convictions and orientations of the researcher and teachers in the co-construction of a rich description for environment identity.
Qualitative research involves the researcher taking an active role in the collection and interpretation of the meaning-making of others. Measures should be taken to ensure goodness and trustworthiness. This means that the researcher should understand their research as the participants do, and not under their own assumptions and narrow thinking (Stake, 1995). Data trustworthiness is assessed in this study by checking for representiveness, getting feedback from participants, and triangulating methods (Miles & Huberman, 1994). By triangulating methods, findings could be crosschecked for validity (Stake, 2005) while accounting for any commonalities and differences in the meanings teachers hold for their environment identity.

**Procedural overview.** Miles & Huberman (1994) provide the analytical framework used for this study in which data reduction, data display, and conclusion drawing/verification are taking place concurrently and in a nonlinear way. Figure 2 represents the conceptual model for data analysis used by Miles & Huberman (1994, p.12). The following sections provide a more detailed description of each step of analysis used in this study.

![Figure 2. Miles & Huberman (1994) Conceptual Model for Data Analysis](image)
Step 1: Reduce the data. Data from each source were continuously simplified, abstracted, and transformed before, during, and after collection, while ensuring that it was not stripped from its context. Before data collection, research questions were refined, methods, population and setting were selected, and ideas about environment identity were abstracted into a theoretical framework. During collection, textual and visual data were chunked, pulled out, and coded using open coding and line-by-line processes. After all data was collected, it was reduced, transformed, and synthesized into coherent case studies.

Step 2: Display the data. All data was organized in a way that permitted clarity, accessibility, and conclusion drawing. Text was transformed into coded data and displayed in a series of matrices to represent any sequential or chronological patterns and to expose any emergent themes. The creation and use of displays was considered part of the analysis process, and continued to evolve throughout the study as new data was being collected.

Step 3: Draw conclusions and verify. Conclusions were inductively drawn at every step of the data collection process. The meanings interpreted from any patterns revealed during the analysis process were used to make conclusions that were not finalized until the end of the data analysis process. Verification of any conclusions relied on continuously reviewing and comparing primary data as well as member-checking information with participants before, during, and after data was collected.

Using an interpretivist lens and Miles & Huberman’s (1994) framework as an approach for qualitative data analysis allowed for the construction of thick, rich, descriptive case studies of each teacher.
CHAPTER III

LITERATURE REVIEW

“Memory is the connections. Meaning comes from what something is connected to. Something unconnected, unassociated with, unrelated to anything is literally meaningless.” (Kushner, quoted in Thomashow, Ecological Identity, p.187)

The objective of this literature review is to offer a synopsis of the most relevant research to explore environment identity within the context of environmental education. With roots in nature study, outdoor education, and conservation education, environmental education has evolved over 40 years into a discourse that recognizes global and local relationships between people, society, and environments (Disinger, 2001; Stevenson et al., 2013). Ideally, teaching and learning in environmental education takes place in non-formal and formal venues (Hart & Nolan, 1999), and involves interdisciplinary transactions of knowledge, skills, attitudes, and behaviors that equip students to understand environmental and sustainability problems and actively participate in finding solutions (UNESCO, 1997). Environmental education research covers a broad range of topics addressing historical, theoretical, cultural and practical dimensions as well as more targeted discussions on curriculum, instruction, and learning. However, as environmental education inquiry advances and individuals become more removed from the natural environment and environmental impacts, the significance of expanding our understanding of how individual identities relate to the environment becomes a valid research endeavor.
Currently, there are no existing studies that use the framework of environment identity in the context of teachers engaged in environmental education. This study seeks to address what Reid & Scott (2013) might refer to as a “blind spot” (p. 521) in our knowledge. Specifically, I am interested in two characteristics that may be used to describe the development of teachers’ environment identity. These include the formative experiences and mental models that teachers’ attribute to their relationship with the environment. Exploring attributes of formative experiences and mental models might help to elucidate the different meanings teachers attach to themselves in relation to the environment, and how this environment identity translates into behaviors such as engaging in environmental education.

Explorations into the significant life experiences and mental models of students and teachers have been identified in past research as factors that influence environmental understanding, behaviors, and action (Chawla, 1998, 1999, 2007; Desjean-Perrotta et al., 2008; Shepardson et al, 2007; Tanner, 1980, 1998). While the direct connections between formative experiences, mental models, and identity development are unknown, this study asserts that these areas provide useful pathways for further explorations of identity, namely environment identity. The following sections expand on the operational definitions in Chapter I and provide an overview of foundational environmental education literature related to formative experiences and mental models.
**Significant Life Experiences**

Significant life experience research provides a useful avenue for inquiries into the formative experiences that shape environment identity. This research exists primarily in more descriptive and interpretive forms, but lacks any specific and consistent use of a theoretical framework (Liddicoat & Krasny, 2013). Literature in significant life experiences is positioned in the field of environmental education and has been described by Chawla (1999) as “the formative influences recalled by people whose lives demonstrate environmental concern” (p.15). The rationale behind most significant life experience research originates with Tanner’s (1980) work to understand how people acquire the cognitive and affective dispositions that guide active and informed citizens committed to the goal of “maintaining a varied, beautiful, and resource-rich planet for future generations” (Tanner, 1980, p.20).

Significant life experience research using qualitative methods of open-ended survey, interview, life story, and autobiographical narrative has produced coherent results across a broad range of adult environmental professionals in conservation, activism, and education (Chawla, 2006). In her research on significant life experiences, Chawla identifies the types of experiences consistently shown to influence how one feels and acts toward the environment. Some of these experiences include: positive childhood experiences in nature, negative experiences witnessing the destruction of a valued place, environmental stewardship supported and modeled by family members and teachers, involvement in environmental organizations, exposure to social or environmental justice issues, vocations that deepen or inspire environmental commitment, and reading books or being exposed to other media with an environmental message (Chawla, 1999).
While there are no studies that make explicit linkages between significant life experiences and environment identity, this study attempts to reconcile the two by exploring the formative experiences of teachers engaged in environmental education and how these experiences might shape the development of their environment identity.

To contextualize the formative experiences acting as a contributing source for environment identity development, this study pulls from environmental education literature on significant life experiences. Research on significant life experiences is well established in environmental education literature, and it is used here as one of many ways to approach development of an environment identity. Significant life experience research is rooted in the groundbreaking work of Tanner (1980, 1998), Chawla (1998, 1999, 2001, 2006, 2007), and Palmer (1993) (Palmer et al., 1998, 1999), among others. Consequently, this study is informed primarily by research from these authors.

In his foundational efforts to illuminate the factors influencing environmental activists’ choice of work, Thomas Tanner (1980) relied on autobiographical statements and resumes from his participants. According to Tanner, an environmental activist is defined as “one who engages directly in pro-environmental political activism and/or provides it financial support, as through contributions to activist organizations” (Tanner, 1980, p.400). All but one of the responses from forty-five professionals representing citizen conservation groups such as the National Wildlife Federation, the Nature Conservancy, National Audubon Society, and the Sierra Club revealed positive childhood experiences in natural habitats having a formative influence in the trajectory of their career. Other responses recognized the influence of parents, teachers, books, and exposure to environmental destruction.
The premise of Tanner’s significant life experience studies was to further understanding about the experiences that motivate environmentally responsible behaviors. If educators, and possibly even parents, are aware of these factors, then they might be more inclined to nurture significant life experience opportunities for their students.

In her studies of significant life experiences, Louise Chawla utilizes open-ended interviews to extract the autobiographical memories that environmental activists’ from different countries claim as having an influence on their commitment to environmental action. Similar to Tanner’s 1980 study, environmental activists were viewed as those "citizens who have demonstrated amply their informed and responsible activism" (p. 20). In most of these studies, participants were asked to provide a description of where and how they grew up as well as the vocational and environmental activities they were involved in. More importantly, participants were invited to “tell the story” (Chawla, 1999, p. 17) of what they believe to be the sources of their commitment to environmental protection and the personal experiences they believe to have inspired these pursuits.

Primary findings from Chawla’s significant life experience research expand on Tanner’s conclusions by distinguishing significant life experiences at each developmental stage of life. For instance, childhood was considered a pivotal time for forming a foundational relationship with the environment. A majority of the experiences contributing to the development of this relationship took place in natural settings as a part of participants’ everyday life. Other aspects Chawla found to have a positive impact on commitment to environmental action during one’s life span included adult role models, witnessing habitat destruction, peers, education, friends, travel, organizations, books, and film.
Interestingly, 14 of the 56 participants in Chawla’s 1999 significant life experience study on activists from Kentucky and Norway related environmental concerns to social concerns of equity and justice. These individuals also held the understanding that environment and social problems are linked. At least 7 of the 14 participants relating environmental and social justice issues traced their concerns back to experiences in childhood. According to Chawla & Derr (2012), the value of studying the significant life experiences of different populations resides in an understanding that if current and future generations seek to achieve a sustainable world, then opportunities to experience and build relationships with different environments, especially the natural environment, will need to take place on a regular basis. As these experiences with the environment continue to take place, relationships develop, and personal meanings are realized.

Studies in significant life experiences have been produced not only with environmentalists, but also with environmental educators. In her 1993 study, Joy Palmer attempts to bridge the gap between these two groups with an analysis of 232 autobiographical statements from environmental educators belonging to the National Association of Environmental Education in the United Kingdom. Environmental educators were viewed as “citizens who have demonstrated their active environmental concern” (p.26) by helping children to learn about and care for the environment. This is achieved by facilitating different learning experiences designed to “produce active and informed minds” (p.27). Participants were asked to provide details of their demonstration of practical concern for the environment and the experiences they feel led to this concern.
They were also asked to specify the most significant experience they feel contributed to their own development of a positive attitude toward the environment and at what time in their life this experience took place. Palmer’s (1993) findings align with Tanner (1980) and Chawla (1998, 1999) as environmental educators viewed their most formative experiences occurring in childhood and in the outdoors or under the influence of a family member. Additional follow up investigations provide a more fine-grained analysis of environmental educators’ significant life experience patterns relative to different age groups (Palmer et al., 1998) and in different countries (Palmer et al., 1999). The results of these studies corroborate findings (e.g. formative outdoor/nature experiences, influential family member) from previous research.

An important assumption utilized in this study is that environmental educators might not consider themselves to be environmental activists. The multiple meanings and social stereotypes attached to words like “activist” and “environment” produce inherent difficulties that make it challenging to isolate a particular identity. While they may not be environmental activists, teachers in this study are, by virtue of their pedagogical efforts, considered knowledgeable and aware citizens who are motivated to actively engage in environmental decision-making and problem solving. One way this engagement takes place is by equipping current and future generations with the cognitive and affective competencies needed to ensure the sustainability and well-being of our planet.
Mental Models

Similar to significant life experiences, mental model research provides a valuable path of inquiry to explore teachers’ conceptualizations of the environment and how they contribute to the development of an environment identity.

Mental models refer to the internalized representations of knowledge that individuals bring to a situation (Johnson-Laird, 1983). These knowledge structures are the conceptualizations of one’s personal reality of the world and how it works (Norman, 1983). They help to understand human reasoning and guide our positioning in ecological, social, and cultural structures. Mental models can reflect pre-existing, stable knowledge structures, as well as situation-specific knowledge structures. For instance, an individual growing up in one type of environment (e.g. farm) for a long period of time may develop a particular way of thinking about their surroundings. If, however, the same individual were to re-locate to a completely different environment (e.g. city), then the existing, stable mental model would assimilate new information and adjust accordingly. In this way, mental models are formed from ‘lived’ experiences and are constantly being reconstructed as new understandings emerge and new meanings are realized (Johnson-Laird, 1983; Nespor, 1987).

While literature on mental models has its roots in cognitive psychology, the concepts have been applied in environmental education research to understand how teacher and student conceptualizations of the environment influence their perceptions, understandings, and behaviors in relation to the environment (Desjean-Perrotta et al., 2008; Moseley et al., 2010a, 2010b; Shepardson, 2005; Shepardson et al., 2007).
If an individual’s mental model of the environment is incomplete (i.e. does not include humans or interactions, acknowledges only natural environments), the impact that person can have on the environment may not be fully realized because they are not seeing the self in relation to the total environment and its processes (Moseley et al., 2010b). This may have implications for environment identity as our perceptions dictate the meanings we attach to having a relationship with the environment and our motivations for acting in alignment with these meanings (Stets & Biga, 2003). Consequently, there is a need for research that exists specific to identity and mental models of the environment within the context of environmental education.

Unlike significant life experiences, mental model research encompasses both children and adult populations. To illuminate how mental models of the environment might be viewed as a contributing source for environment identity development, this study is informed by environmental education literature focused on the mental models of students and pre-service teachers. Specifically, the remainder of this chapter highlights the prominent work of Desjean-Perrotta et al. (2008), Moseley et al. (2010a, 2010b), and Shepardson et al. (2007).

In their foundational research on mental models of the environment, Shepardson et al (2007) found a majority of students’ to have underdeveloped conceptualizations of the environment. In this particular study, a large, cross-age and geographically diverse sample of students was given a two-part task to draw and explain the environment, and to indicate and justify whether or not a series of images depicted the environment. Inductive methods of content and statistical analysis were used to construct a typology of four different types of mental models.
The mental models that emerged varied by function and the inclusion or exclusion of different abiotic and biotic elements. Findings revealed that a majority of students’ mental models for the environment either placed humans as separate from the environment and its processes, or students viewed the environment as a resource for living things. These findings have been corroborated in other studies of children’s conceptualizations of the environment (Judson, 2011; Loughland et al., 2002; Payne, 1998; Wals, 1992) and suggest an approach to environmental education that is interdisciplinary, where teachers are cognizant of the different perspectives and experiences of learners. It also suggests environmental education that supports a mental model of the environment that is more integrated and inclusive of different types of environments (e.g. built, natural, industrial).

Mental model investigations similar to those of Shepardson et al. (2005, 2007) have occurred in other areas of environmental education research, particularly in teacher professional development and preservice teacher education programming. For instance, Desjean-Perrotta et al. (2008) and Moseley et al. (2010a, 2010b) found that preservice teachers’ drawings and explanations for the environment were underdeveloped, and revealed anthropocentric views holding humans as superior to the environment. In their 2010 pilot study to examine the potential of the Draw-An-Environment Test (DAET) and the Draw-An-Environment Test Rubric (DAET-R), Moseley et al. use a draw and explain method to elicit preservice teachers’ mental models of the environment.
Information that teachers provide on the DAET is measured using the DAET-R, which was developed using the North American Association of Environmental Education (NAAEE) *Guidelines for the preparation and professional development of environmental educators* (2010) definition of the environment.

The guidelines specify that preservice teachers should be able to:

…describe the broad view that environmental education takes of ‘environment’, incorporating concepts such as systems, interdependence, and interactions among humans, other living organisms, the physical environment-and the built or designed environment. (NAAEE, 2004, p.9)

Under the premise that one should know what the environment is before being able to fully grasp environmental issues and behaviors, the DAET tool provides teachers with a personal understanding of the factors that shape their own beliefs and understandings of the environment. Findings from Moseley et al. (2010a, 2010b) suggest that preservice teachers do not consider humans to be an integral part of the environment. This is evidenced in sixty-percent of the drawings from 118 respondents that did not include humans as part of their drawing of the environment. From the same sample population, Desjean-Perrotta et al. (2010) performed a separate analysis of preservice teachers drawings of the environment and the impact of ethnicity and setting. Operating under the assumption that sociocultural factors shape our environmental understandings, Desjean-Perrotta et al. found these factors to have no significant influence on preservice teachers perceptions of the environment. This information supports the aim of this study to explore other factors that might influence how teachers perceive themselves in relation to the environment.
CHAPTER IV

FINDINGS AND DISCUSSION

“By identifying the meanings that actors’ attribute to their surroundings, by getting ‘inside their head’ and seeing the world from their perspective, we can understand why people do what they do.” (Meltzer, Petras, & Reynolds, quoted in Burke & Stets, Identity Theory, p. 33)

Identities provide meaning for individuals’ lives (Burke & Stets, 2009).

According to identity theory, an identity is comprised of a set of meanings and expectations that serve as a reference to guide how one perceives the self in different situations. But where do the meanings that define an identity come from? This chapter explores this question by looking at the formative experiences and mental models of teachers’ engaged in environmental education and what they attribute to the development of their environment identity, or how they view themselves in relation to the environment.

Recall the research questions:

1. What formative experiences do teachers engaged in environmental education attribute to the development of their relationship with the environment?
   a. How do these formative experiences shape teachers’ environment identity?

2. What mental models do teachers engaged in environmental education attribute to the development of their relationship with the environment?
   a. How do these mental models shape teachers’ environment identity?
In this chapter, the findings informing the research questions above are presented with a discussion. The first section of this chapter presents an identity profile for each of the three participating teachers. A second and third section of this chapter presents findings of the formative experiences and mental models teachers’ attribute to the development of their relationship with the environment. A final section applies findings to the identity theory framework and presents a discussion of how formative experiences and mental models shape teachers’ environment identity.

Identity Profiles

The identity profiles presented in this section reflect information collected during the individual interviews where teachers were asked to provide a statement of what is included in their definition of “me” and “not me”. Teachers were also asked to perform a card sort to rank the identities they inhabit according to perceived importance, amount of time spent, most pleasing to least pleasing, and ideal self. One purpose of providing identity profiles is to locate teachers’ meanings and perceptions of self in relation to the different identities they acknowledge. Individuals assume multiple identities in a given setting (i.e. teacher and colleague). The identities that are of most importance to the person in a situation are those likely to be enacted. The profiles position each teacher within a spectrum of identities and counter-identities, or what they believe themselves to be or not be in different situations. Burke & Stets (2009) refer to the relationship between identities and counter identities as one that is in a state of constant negotiation. In this case, teachers must make compromises with themselves and others on the meanings and expectations of their individual identities. The following identity profiles provide context for a presentation of findings on the formative experiences and mental models of each
teacher in addition to how these characteristics shape environment identity. From this point forward, Teacher 1 is referred to as Doug. Teacher 2 is referred to as Molly, and Teacher 3 is referred to as Allen.

**Doug.** When asked to describe what is included in his definition of “me”, Doug identifies his self in terms of where he is and what he is doing.

I guess I have always felt that I have these two sides. One is very active mountain skiing, hiking, fly-fishing. I always thought I would see myself living in a small mountain town and sort of being a ski bum. Maybe teaching. Maybe not. So I have that side of me, which comes from where I grew up, and growing up in the mountains. And then there is also the side of education and the urban experience of education, which is definitely a part of me as well (Interview, September 3, 2013).

For Doug, the urban environment is where he works and spends a majority of his time, and the rural environment is where he grew up and still tends to recreate in. This presents an interesting dualism between what one can and cannot do in different types of environments. It might also exemplify the standard he holds for himself in those different environments. Doug implies that being a teacher was optional if he lived in a mountain town. He associates his urban experiences with his role in education, but does not do the same when referring to the mountains. This seems to indicate that his role as a teacher does not necessarily align with his propensity toward a lifestyle in the mountains. In his description for what is included in his definition of “not me”, Doug expresses adamant opposition to being complacent about life and his surroundings. He is always trying to learn, to be better, and to do better things. His biggest fear is to be a middle-aged guy “with a belly, driving a minivan, punching the clock at some sort of meaningless job behind a desk all day long and in an unhappy marriage” (Individual interview, September 3, 2013). This seems to indicate that Doug is driven by some sort of purpose or meaning.
that ultimately, defines who he is, who he strives to be, and the type of people he prefers to associate himself with. For instance, Doug goes on to express his dissatisfaction with those who are just “going through the motions” of life without regard for their surroundings or lifestyle choices such as the choice to eat healthy. For Doug, complacency reflects some of the things he sees wrong with society, and he prefers to surround himself with others who feel the same way. This seems to speak to the standard of meaning he holds for others who are in a position to make the world a better place.

As shown in Table 3, when asked to rank his perceived identity roles according to various criteria, Doug revealed an emphasis on the identities related to his roles as a member of a family.

**Table 3. Doug’s Identity Pile Sort**

<table>
<thead>
<tr>
<th>Most Important</th>
<th>Most Time Spent As Each</th>
<th>Most to Least Pleasing</th>
<th>Most Ideal World</th>
</tr>
</thead>
<tbody>
<tr>
<td>2. Father-To-Be</td>
<td>2. Husband</td>
<td>2. Athlete</td>
<td>2. Father-To-Be</td>
</tr>
<tr>
<td>3. Athlete</td>
<td>3. Athlete</td>
<td>3. Father-To-Be</td>
<td>3. Athlete</td>
</tr>
<tr>
<td>5. Son</td>
<td>5. Brother</td>
<td>5. Son</td>
<td>5. Son</td>
</tr>
</tbody>
</table>

Note. Identities ranked numerically most to least

Doug makes a distinction that being an athlete is a role he “wears”, but being active is an important part of who he is and what he values to the extent that he is not happy with himself if he is not being active and staying healthy. When asked about his rankings for the teacher identity, Doug aligns himself with his disdain for complacency and explains that teaching is “so damn hard”, but at the end of the day he knows that he has challenged himself and made a larger contribution to society. This opinion could be
attributed to the fact that Doug was in his first year teaching at TGS, which also speaks to how certain transitions in life influence our identities. For Doug, teaching is one way for him to make the world a better place. From his experiences as a teacher at TGS, Doug finds a shared meaning with other teachers who are driven by good intentions and a passion to always try to find a better way of educating. Interestingly, when asked if he would still be a teacher if he could not teach EfS or some other form of environmental education, Doug did not think he could continue to teach in the classroom because it would be “too discouraging”. This statement reveals how much is at stake for teachers with a strong environment identity. It is may be of no coincidence that Doug received the highest scores of all teachers on Stets & Biga’s (2003) environment identity measure form the online survey.

**Molly.** When asked to describe what is included in her definition of “me”, Molly organized her responses around things she likes to do, relationships, what she works for in her life, and adjectives that best describe her personality. She made a point that what people do does not necessarily define whom they are.

I would say as a teacher I am an advocate for children. I am also an advocate for social justice in all aspects of my life. I am daughter, a cousin, a sister, a niece, and a girlfriend. I am female. I am a singer, musician, and dancer. I love to be outside. I am a hiker, a skier, and a kayaker. I am positive, outgoing, like to be around people, type A, and light-hearted. (Individual interview, August 30, 2013).

Included in her description of “not me”, Molly explains the reason she is in the service profession is because she doesn’t want to “just be” or “just be on the normal trajectory that people take”. For Molly, having a “normal” teaching job and continuing the status quo would not define who she is or ever wants to be. She thrives on the challenge of bettering the world and making her life more meaningful. These feelings are
in alignment with Doug’s commitment to always do better in life, as well as the feelings of resentment associated with being “normal” or being comfortable in a routine.

Also similar to Doug, when asked to rank her perceived identity roles for various criteria, Molly revealed an emphasis on identities associated with those people in her life that she is the closest to. The results from Molly’s pile sort are shown below in Table 4. She goes on to explain the reason for this is because she would still have her family to fall back on if her life in Colorado completely went away. Both Doug and Molly’s emphasis on family-related identities suggest that the people in their immediate surroundings are of particular importance for carrying out the multiple identities they take on in life.

Table 4. Molly’s Identity Pile Sort

<table>
<thead>
<tr>
<th>Most Important</th>
<th>Most Time Spent As Each</th>
<th>Most to Least Pleasing</th>
<th>Most Ideal World</th>
</tr>
</thead>
<tbody>
<tr>
<td>Family Member</td>
<td>Teacher</td>
<td>Girlfriend</td>
<td>Girlfriend</td>
</tr>
<tr>
<td>Girlfriend</td>
<td>Family Member</td>
<td>Friend</td>
<td>Palmer</td>
</tr>
<tr>
<td>Friend</td>
<td>Planner</td>
<td>Explorer</td>
<td>Explorer</td>
</tr>
<tr>
<td>Teacher</td>
<td>Explorer</td>
<td>Friend</td>
<td>Teacher/ Social Justice Advocate</td>
</tr>
<tr>
<td>Planner</td>
<td>Friend</td>
<td>Explorer</td>
<td>Teacher/ Social Justice Advocate</td>
</tr>
<tr>
<td>Explorer</td>
<td>Family Member</td>
<td>Teacher</td>
<td>Meaning Seeker</td>
</tr>
<tr>
<td>Meaning Seeker</td>
<td>Exerciser</td>
<td>Meaning Seeker</td>
<td>Planner</td>
</tr>
<tr>
<td>Musician</td>
<td>Musician</td>
<td>Musician</td>
<td>Musician</td>
</tr>
<tr>
<td>Exerciser</td>
<td>Meaning Seeker</td>
<td>Exerciser</td>
<td>Exerciser</td>
</tr>
<tr>
<td>Social Justice Advocate</td>
<td>Social Justice Advocate</td>
<td>Social Justice Advocate</td>
<td>Female</td>
</tr>
<tr>
<td>Female</td>
<td>Female</td>
<td>Female</td>
<td>Female</td>
</tr>
</tbody>
</table>

Note. Identities ranked numerically most to least
For Molly, being a meaning-seeker means trying to find the meaning in her life and the things that she does rather than just letting it go by. Ideally, Molly considers herself a social justice advocate to the same degree that she is a teacher. The reason for this ranking is because she feels like social justice is personally important to her and is inherently a part of how she teaches the EfS curriculum used at TGS. This is confirmed in her response to what it means to for her to be a teacher at TGS:

It means being in a place where we are pushing against the status quo and educating kids to be problem solvers for a better world and not just keep worsening our world or keeping it the way it is. There is sort of, not the expectation, but the encouragement to then also live that way myself (Individual interview, August 30, 2013).

Interestingly, the time Molly spends as a social justice advocate is far less than her time spent as a teacher. Upon probing further into this discrepancy, Molly explained that she wanted to do more social justice advocacy outside of her role as a teacher, and that sometimes she wasn’t able to because she didn’t have the time. When asked whether she would continue being a teacher if she could not teach EfS or some other form of environmental education, Molly explained that she would still be a teacher because her priority is to educate kids to become good people. In her opinion, one can still be a good person without knowing anything about EfS. Other than family-related roles, the meaning Molly attaches to her role as a teacher supersede other identities she claims.

Allen. When asked to describe what is included in his definition of “me”, Allen pointed out that the boundary between the way he sees himself and everything else is less defined because he believes he is part of something bigger. He further explains this by making the distinction between this “universal self” and his “day-to-day self” as a dad, husband, teacher, and founder of TGS. For Allen, the characteristics that define who he is
are driven by common goals to “Take care of the Earth. Take care of people. Return the surplus.”

In his definition of “not me”, Allen recognizes the reality of his life and his beliefs as someone who does not believe in war making, pollution, or damaging the planet and each other. However, he also points out that although he has control over his own choices, he does not have control over what happens in the grand scheme of things. By saying this, one might assume that, while Allen claims some defining characteristics, he may not feel that he has complete ownership over how those are played out.

When asked to rank his perceived identity roles for various criteria, Allen reveals similar responses to Doug and Molly by emphasizing those identities associated with his role as family member. The pile sorting results for Allen are shown in Table 5.

**Table 5. Allen’s Identity Pile Sort**

<table>
<thead>
<tr>
<th>Most Important</th>
<th>Most Time Spent As Each</th>
<th>Most to Least Pleasing</th>
<th>Most Ideal World^a</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Husband</td>
<td>1. Educator</td>
<td>1. Father</td>
<td></td>
</tr>
<tr>
<td>2. Father</td>
<td>2. Husband/ Father/ Dad</td>
<td>2. Husband</td>
<td></td>
</tr>
<tr>
<td>3. Leader</td>
<td>3. Leader</td>
<td>3. Friend</td>
<td></td>
</tr>
<tr>
<td>5. Educator</td>
<td>5. Designer</td>
<td>5. Educator/ Leader</td>
<td></td>
</tr>
<tr>
<td>8. Traveler</td>
<td>8. Son</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Note. Identities ranked numerically most to least

^a Teacher 3 explains that, in his ideal world, ‘ranking’ anything does not exist. Therefore, all of his identities are equal ‘in an ideal world’.
Allen explains his reasoning for ranking husband and father in the top positions in at least three of the four categories.

I spend a lot of time raising other people’s kids and not necessarily enough time raising my own. I would like to play with my daughter more than do just about anything.

I think my relationship with my wife is the most important thing I can do for my daughter (Individual interview, September 3, 2013).

Upon probing into his identity as a consumer, Allen relays that being a consumer doesn’t necessarily define him personally, but more in the sense that his role as a consumer in the world creates ripples of influence for others. By saying this, he is positioning his identity as a consumer beyond the immediate surroundings and within the world-at-large. For Allen, being a consumer is inevitable. It is also the least important role.

Similar to teachers Doug and Molly, Allen identifies with living a life of intention. This characteristic fuels his roles as a designer and educator as he tries to find ways to address needs and solve problems. As a designer of the governance model at TGS, Allen describes being influenced by an understanding of the variety of ways in which people interact. This came about through his experiences as a traveler observing how people interact.

When asked whether he would still teach without EfS or some form of environmental education, Allen cites his reasoning for behind leaving a past career in engineering.
Not surprisingly, his ideas about acting against the mainstream or status quo are similar across all three teachers.

I left engineering for a reason. Because I am an educator. I think it is my responsibility as a teacher to bring more of the EfS mindset to a more conventional teaching role. Nobody else is going to do it in mainstream public education because it is not valued (Individual interview, September 3, 2013).

Studies show that one’s identity serves as an important motivator for behavior because individuals act in ways to verify the meanings they attach to their different identities (Burke & Reitzes, 1981; Stets & Biga, 2003). The identity profiles help to elucidate teachers’ different identities. Specifically, teachers seem to share ideas about their (a) intentionality for living a life of purpose and not complacency, (b) refusal to be part of the status quo, and (c) importance of family. Perhaps Allen described teachers’ intentionality best as taking care of the earth, taking care of people, and returning the surplus. All three teachers expressed their intentions for contributing to make the world a better place both in and out of the classroom environment. In a setting such as a school where individual identities are negotiating and compromising on a daily basis, it could be that intention is what motivates teaching. Furthermore, if teachers’ intentions are aligned with certain behaviors and actions, then teaching environmental education and engaging in other environmentally friendly behaviors are ways that teachers live out their intentions.

Along with intention, teachers seemed adamant in their refusal to be part of the ‘status quo’. This is a dominant theme in environmental education research as multiple authors have argued that societies require citizens who can independently analyze problems, find collaborative solutions, and make pro-environmental choices, even when
doing so challenges social norms (Jensen & Schnack, 1997; Short, 2010; Stapp, Wals, & Stankorb, 1996). The idea that education should cultivate autonomous decision-making as well as collective problem solving is consistent with the foundations of environmental education (UNESCO, 1978). By choosing to be in a school that challenges the norms of traditional education with an innovative approach for environmental education, Doug, Molly, and Allen are actively engaging their environment identities.

Finally, the importance of family was a shared across the three teachers. For instance, teachers expressed concern for the futures of their children and family members. Specifically of great concern was how to ensure a healthy environment that family members can thrive in. This seems to align with similar goals for environmental education.

**Formative Experiences**

In the findings for this section, autobiographical narratives were used as a primary source of data to inductively analyze the formative experiences teachers attribute to the development of their relationship with the environment, and subsequently, how these experiences shape teachers’ view of themselves in relation to the environment. Each teacher was asked to construct an autobiographical narrative from the prompt:

*Contemplate and describe, in your own words, the parts of your life that have shaped (and/or continue to shape) how you know, relate to, and interact with the environment.*

Additional depth for each case study was attained with supporting information from the individual interview and focus group. The analysis process outlined in Chapter II was used to develop categories and discover any emergent themes across the three teachers. Commonalities and differences across the teachers are also highlighted and discussed.
One of the strengths of significant life experience research is its use of a retrospective approach to understand formative experiences occurring over the span of a lifetime. Almost immediately in the coding process, it was apparent that teachers were arranging their formative experiences into different stages of a life. The placement of formative experiences according to specific life stages was not asked for or alluded to in the autobiographical narrative prompt. Teachers’ interpretations flowed organically into age categories, which were then interpreted as developmental stages of life.

Chawla (1998) emphasizes that recognizing the developmental stages when formative experiences happen is an important consideration for future longitudinal studies across different and changing generations. Presenting the information in this way aligns with past significant life experience research (Chawla & Derr, 2012; James et al., 2010) that recognize developmental stages for how and when individual relationships with the environment are established.

Under the guidance of Miles and Huberman (1994) and Yin (2003), the findings of the formative experiences of each teacher in this study are presented chronologically in a time-ordered sequence based on developmental stages of life. These stages are (a) childhood and early adolescence (b) late adolescence and early adulthood, and (c) early adulthood to present. Childhood and early adolescence occurs through the middle school years and is considered in significant life experience literature as the most formative time in a person’s life for acquiring the types of dispositions that motivate environmental behaviors and action (Chawla, 1999; James et al., 2010).

In addition to childhood, stages of adolescence and early adulthood have been found to be a time for formative experiences with the environment. These experiences
occurring through the college years have been shown to manifest in environmental sensitivity, interest and concern (Peterson & Hungerford, 1981). Finally, experiences in adulthood occur at a time when participating teachers have completed their formal education and advanced into their present careers as teachers engaged in environmental education. Formative experiences that have shaped how teachers know, relate to, and interact with the environment have deep roots in the past, while also being shaped by experiences in the present. It is at this stage of life when formative experiences begin to accumulate into an environment identity that “crystallizes in advanced education and skills, and affiliation with other committed environmental professionals.” (Chawla & Derr, 2012, p. 535).

Overall, the parts of teachers’ lives that shape and continue to shape how they know, relate to and interact with the environment varied for each teacher. For Doug, a majority of formative experiences were described as happening during childhood and early adolescence. For Molly, most formative experiences occurred during late adolescence and early adulthood. For Allen, formative experiences happened largely in adulthood. In order to reflect this continuum of formative experiences across the teachers, the findings for this section of Chapter IV were organized according to developmental life stages.

**Childhood and early adolescence.**

*Doug.* Doug traces the development of his relationship with the environment back to childhood and the home where he was raised. At this time, he was growing up on the family farm situated in the mountains of Colorado near a socio-economically diverse municipality of less than 200 people. Spending childhood and early adolescence on a
farm in rural Colorado provided the environmental and social landscape for a multitude of experiences that were formative for Doug’s development of a relationship with the environment.

I grew up in an off the grid house, on five acres of land surrounded by National Forest. Our five acres allowed us to have goats, pigs, sheep, chicken, ducks, geese, and a large vegetable garden. (Autobiographical narrative, June 15, 2013).

Doug had the unique experience of growing up in a home that was energy-independent and electricity was provided by the Sun and wind power. The five acres of land surrounding his home allowed Doug and his family to raise livestock and produce “backyard local” food. Additionally, having a designated wilderness area in close proximity to the farm provided access for long family hikes through the forest.

More so than Molly or Allen, Doug described being profoundly impacted by his direct interactions with the natural environment at this particular stage of life. These experiences took place as a normal function of everyday life and were consistent throughout his childhood.

While Doug explicitly grounds his relationship to the environment in his childhood and the home where he was raised, Molly and Allen reveal less formative experiences happening in childhood and early adolescence. This is evident not only in content of the autobiographical narrative, but also in the interviews and focus group as Molly and Allen made fewer references to this stage of life. For instance, in the autobiographical narratives, Doug dedicates most of his narrative speaking to his childhood experiences.
Molly manages to describe this stage of her life in one paragraph, while Allen does so in one or two sentences. Noticeably, Doug’s experiences at this stage had a high degree of impact for his developing a relationship with the environment.

*Molly.* Molly described her upbringing in childhood and early adolescence as one that followed traditional upper-middle class roles.

My dad spent long hours at the office while my mom stayed at home and raised my sister and me (Autobiographical narrative, June 15, 2013).

It was at this time in her life when she first experienced living in the mountains of Colorado. In a town with a population of approximately 10,000, Molly was able to walk to school and play outside until it was dark. She remembers feeling more “connected to the environment” while living in close proximity to natural areas where she was able to hike, ski, and learn about area wildlife. After a few years in Colorado, she moved away from the mountains to Connecticut with her family. She elaborates on this experience in her autobiographical narrative:

I remember feeling like my world turned upside-down when we moved from the open and vast mountains to the rolling hills of New England. A different kind of beauty. Tree-lined streets that magically changed with each season (Autobiographical narrative, June 15, 2013).

From this experience, Molly attributed what seems like a major transition in her life to changes in physical landscape within natural and built environments (e.g. suburbs). The “beauty” of the mountains was juxtaposed with rolling hills as she held on to a sense of wonder for new, yet familiar elements (e.g. trees). This internalized meaning for the natural environment would eventually expand in later years as described later in this section.
Allen. While not explicitly formative, the experiences Allen describes as shaping how he knows, relates to, and interacts with the environment occur as a child growing up in the suburbs of Denver, Colorado.

I grew up on the leading edge of suburban sprawl. I could bike or walk 3 blocks north from my house and arrive at the end of civilization. There was almost nothing north of 120th in those days. (Autobiographical narrative, June 15, 2013).

It is in childhood and early adolescence that Allen recalls his interactions with the environment to include the ability to “go outside and play”. By describing the presence of sprawl and the changes to a landscape remembered from childhood, Allen’s statement is reminiscent of the types of formative experiences that have been shown in the literature to occur as a result of destruction of familiar places. However, there is no strong indication from Allen that these changes are viewed as positive, negative, or formative for that matter. One can only imagine what it would be like as a child to have access to “the end of civilization”. Perhaps the experience of being near the built environment of suburban sprawl and the environment at the end of civilization explains how he placed himself in relation to different environments. In a more explicit reference, Allen expresses taking advantage of having access to “the end of civilization”:

I took advantage of our location and spent lots of time playing in the canal and the wooded and brushy areas surrounding it (Autobiographical narrative, June 15, 2013).

For Allen, being outdoors in the natural environment might be viewed as a positive emotional experience, but it is not clear whether or not this was formative to his relationship with the environment at this time in his life.
When comparing groups of environmental professionals and those who had no interest in the outdoors or environmental activities, James et al. (2010) found that a majority of individuals in the environmental group recalled meaningful experiences as children playing in woodlands and waterways (interstitial areas) near the home. Most in the comparison group either did not remember having any significant experiences outdoors or had negative experiences outdoors.

Interestingly, and quite different from the other teachers, Allen explains that during this time his connection to “nature or the environment” was “different from the way others describe”. For instance, rather than a belief about the importance of something outside of himself, he believed the natural environment to be part of his temperament, where he felt (and still feels) most at ease. This might suggest the presence of some kind of personal meaning related to his environment identity.

Beyond the autobiographical narratives, Molly and Allen do not emphasize experiences in childhood and early adolescence as being formative to the development of how they know, relate to, and interact with the environment. These experiences happened later in life and will be examined in more detail later in this section.

**Late adolescence and early adulthood.** For at least 2 of the 3 participating teachers, a mixture of different experiences occurring in late adolescence and early adulthood were described as having an impact on the development of how they know, relate to and interact with the environment. These include travel, education, and career orientation. Interestingly, Doug did not explicitly reference any formative experiences occurring during this stage of life. His parents still reside on the farm, so it is possible that the experiences from his childhood continue to linger as ‘formative’ in his mind.
Molly. Findings from Molly showed a majority of formative experiences occurred during late adolescence and early childhood. It was at this time that she was in college and entering into a teaching career.

I grew up thinking the environment was just nature. You know, like grass, or the air and trees. A big mental shift in my life was moving from this concept of the environment as ‘nature’ to a more holistic view that everything is the environment. (Focus group, September 5, 2013).

For Molly, the freedom that accompanied moving away for college “drastically changed” her worldview. While attending a Jesuit college, she began to pursue an interest in education and psychology. The college experience offered opportunities for experiential and service learning challenges that led to what Molly described as “intellectual and personal transformation in service”. This is consistent with past research providing evidence that, beyond childhood experiences of free play and exploration, the adolescent-early adult years are a time when formal knowledge of the environment, skills and hobbies develop, and individuals prepare for environmental vocations and volunteering (James et al., 2010).

When asked about which experiences contributed the most to how she conceptualized the environment, Molly attributed this to her experiences in college studying abroad in Ecuador.

I was learning from books and lectures, and suddenly I was learning from other people and experience. I connected with people. I went to tiny surfing towns, cloud forests, the rainforest, and high desert. It was a crash course in environmental wonder (Autobiographical narrative, June 15, 2013).

The experiences of being in different environments promoted the sense of wonder Molly referred to in childhood. Additionally, traveling to Ecuador and experiencing different cultures and environments facilitated the expansion of her view of the
environment to include humans and human interactions. This evidence is verified in the focus group and in Molly’s autobiographical narrative.

[Study abroad in Ecuador] inspired more my love for the beauty of the natural environment, and made me more aware of the interactions between people in the natural environment. Seeing the rainforest and people’s impact on the rainforest. Seeing others in the most biodiverse country in the world. Just seeing all of that. I have never experienced that before (Focus group, September 5, 2013).

I was always eager travel and see whether other cities had a similar connection to the environment that San Francisco did (Autobiographical narrative, June 15, 2013).

For Molly, being in the natural environment and observing how different people interact with their surrounding environment seemed to provide the most pleasurable experience.

By the end of college, Molly describes the influence of a person she began dating who widened the periphery of what she knew about the environment and environmental issues.

My senior year, I began dating a guy who was studying environment issues and he opened my eyes to the positive relationship one can (and should) have with nature. We moved to San Francisco after graduation and joined the AmeriCorps. This is where I began my ‘outdoorsy’ education (Autobiographical narrative, June 15, 2013).

The influence of a significant person prompted a formative experience for Molly. Most research on significant life experiences attributes changes to an influential person in childhood and early adolescence. However, given this context, it seems equally feasible that this influence can occur at any stage of life.

It was during her time in San Francisco when Molly recalls emotions of being “astounded” and “grounded” by the natural beauty of the area. This is reflected in new environmental and social behaviors. She joined a CSA, started to recycle and compost,
hiked, skied, camped, and became a kayak guide. She also experimented with Buddhist and Quaker religions, which recognize the human relationship with the environment as an important part of a bigger whole.

In addition to her experiences traveling, Molly began teaching at a school focused on outdoor and sustainability education. It was during this experience that she remembers beginning to see the links between different environmental and social systems. In terms of identity development, it might have been a time for verification of the meanings she was attaching to her environment identity. Making the social connections to environmental issues also tapped into her passions for social justice, which were grounded in her experiences traveling around the country and the world.

I was hooked. It was the first time that I understood sustainability as a mindset and more than just ‘saving the environment’ (Autobiographical narrative, June 15, 2013).

For Molly, the experience of having access to people and the surrounding natural environment was profound. As a result, she made a promise to herself that she would always live where natural beauty inspired her. These formative experiences would later play a role in her adulthood as she explains in the next section.

*Allen.* Similar to Molly, Allen also mentioned the impact of career choice and travel in the development of his relationship to the environment.

For instance, working as an electrical and computer engineer exposed him to what he describes as a “naked reductionism” of complex earth systems and processes, to the detriment of accounting for individuality.

One of the first things you are taught in engineering is that you have to make certain simplifying assumptions. This is unfortunate when you are dealing with people, because you have just discounted the vast majority of experience and potential (Individual interview, September 3, 2013).
Allen’s experience as an engineer seemed to carry over into later stages of adulthood as he became dissatisfied with the common application of linear thinking to solve complex problems. As a result, he began to educate himself to develop an understanding of system dynamics and systems thinking. This focus on systems would eventually have an impact on his relationship with the environment in the present day.

Similar to Molly, experiences with travel resulted in a broader view of the environment to include humans and human impacts. For instance, after working as a computer and electrical engineer in early adulthood, Allen joined the Peace Corps in southern Africa.

I used the Peace Corps to engineer my escape. I became a teacher and the pattern of preferring to be outside continued. This worked out well in southern Africa where sitting around outside with people is a major past time (Autobiographical narrative, June 15, 2013).

This formative experience not only verified Allen’s penchant for being outdoors, but also nurtured a strong interest in and awareness of how different people live in their environments. In the individual interview, he describes these experiences interacting with different people and cultures through travel as being linked and integral to his worldview.

When I travel to other places, I prefer to stay there for a while and make a connection to the place. It is really about just expanding my sense of place, which includes people in those places. It is not just the land (Individual interview, September 3, 2013).

Importantly, Allen acknowledges that at this point in his life (late adolescence and early adulthood) he had not fully formed his concerns about the environment and how to face future problems in the environment. This would come later in his adulthood, and will be clarified in the next section.
Early adulthood to present.

Doug. Doug attributes his childhood growing up on a farm to the development of a “deep connection to the planet and the environment”. At this stage in life, Doug spends much of his time actively pursuing experiences in the natural environment.

I spend almost every spare moment in the mountains skiing, climbing, hiking, running, or fishing. I do this because being in the mountains is my time to be in the natural world (Autobiographical narrative, June 15, 2013).

Experiences outdoors in the natural environment continue to be formative as Doug describes feelings of being “humbled” by the environment whenever he experiences a pristine mountain lake, or goes on a hike to identify wildflowers or summit a peak. An alternative suggestion to these feelings would be that he has a fully formed relationship with the environment, and this relationship is continually verified in his experiences outdoors. This manifests itself in personal behaviors such as installing solar panels and limiting water use.

While experiences in the natural environment continue to influence Doug, the urban environment is also recognized as an important setting for formative experiences. For instance, he describes one part of himself as having an affinity for the conveniences and diversity that the “urban experience” provides.

I love experiencing the ethnic diversity of an urban school. I love hearing the different languages and different accents. I love that in the city I have access to food that I wouldn’t otherwise get in a small mountain town. I did not grow up with these things (Individual interview, September 3, 2013).

For this teacher, being an educator in a diverse urban school is a formative experience that is defined by current and past exposure to urban and rural environments.
**Molly.** For Molly, growing up and being able to see the juxtaposition of the built environment of the suburbs and the natural environment of the mountains accounts for how she defines herself in adulthood.

After finishing grad school, I was itching to embark on a new adventure so I chose to move to Denver, CO. I always knew I was more of a mountains girl than a beach girl. I was ready for something different. A more livable city with even easier access to outdoor activities and potential to connect to the environment (Autobiographical narrative, June 15, 2013).

Like Doug, Molly expresses a need for access to the natural environment. Accessibility is an important element that impacts her current ability to nurture the type of experiences that have been formative to her relationship with the environment in the past. This was also evident in the focus group discussion.

I found it difficult to be in the natural environment when I lived on the east coast unless I put in a lot of effort. Being in San Francisco, there was more of that opportunity to go out in nature with less human impact (Focus group, September 5, 2013).

Past experiences continue to shape the desire to connect not only with the natural environment, but also with people and the urban environment. This was evident in her explanation about moving to and living in Denver (albeit to a smaller degree).

Here in Denver, I do feel connected to the environment, but not as much as I had anticipated. It really is a city and you have to drive out to get into the mountains (Autobiographical narrative, June 15, 2013).

Molly recognizes her most formative experiences happening outdoors primarily in natural environments with less human impact. Although not as much in her experiences as a teacher, her relationship with the environment continues to be supported in her weekend explorations and adventures hiking around Colorado.

**Allen.** Adulthood proved to be the stage of life that Allen considers the most formative for the development of his relationship with the environment. This was a
pivotal time for Allen as he began to apply his knowledge of systems thinking to
disentangle and understand the underlying complexity of large-scale systemic problems.
After becoming a property owner, husband and father, he began to integrate his
understanding of the “big picture” and the importance of acting to ensure a “durable”
future for the planet. As the sustainability movement emerged in 2005-2006, he realized
that others were experiencing a similar line of thinking, and the idea for TGS originated.

Allen describes his experiences with sustainability as a “refreshing change” from
the discourse of the environmental movement, where the environment is viewed as
something separate from humans.

I think engaging in an argument like -you have to be nice to the
environment/no I don’t as long as it’s profitable- really only serves to
reinforce the idea that the environment is something out there, separate
from us, that needs to be used or needs to be cleaned up (Autobiographical
narrative, September 3, 2013).

The statement above suggests that Allen currently views himself as a part of the
environment, and not separate from it. This is further supported in the following excerpt:

We have been raised to believe that God gave man dominion over the
Earth. When I was younger, I didn’t really understand what that means
and it didn’t seem worth figuring out. Now that I am older, I understand
the environment as something much greater than me and something of
which I am a part of, not as a collection of resources and ecosystem
services available for my use or exploitation (Autobiographical narrative,
June 15, 2013)

Emergent Themes on Formative Experiences

Parents and family. It should be mentioned that, in addition to formative
experiences outdoors in the natural environment, teachers expressed being influenced by
their parents in childhood and early adolescent years. For example, while cumulative
experiences in the surrounding natural environment and a childhood growing up in a
lifestyle of subsistence seemed to be the most formative for him, Doug’s parents also played a large role in the development of his relationship with the environment. Doug vividly remembered one of the most frequent things his father would say was, “who left the damn light on in the kitchen?” He recalls his “ornery” father’s persistent, daily vigilance of energy use as a factor that shaped his current awareness of resource use.

I grew up in a very sustainable way without it being like this ‘holier-than-Thou’ thing. It is just because that is what my parents wanted to do (Individual interview, September 3, 2013).

Other than recycling and going on the occasional hike, Molly does not remember her parents putting much emphasis on “appreciation of the environment” during childhood and early adolescence.

My dad was incredibly anal about organizing and sorting the recycling each week—more of him feeling good about household chores rather than any connection to protecting the environment (Autobiographical narrative, June 15, 2013).

This influence might not indicate a formative experience for Molly, but it alludes to the repetition of a mindset that may carry over into later adulthood.

Allen ascribes his propensity to play outside as a result of a “lightly supervised childhood”. If given the choice, he always preferred to be outside rather than inside. This is indicative of an adult influence, although not necessarily the kinds of influence revealed in the literature.

**Mental models.** An additional theme emerging from the data includes the development of a mental model for the environment. This was consistent across all three teachers, and was especially prevalent in the stage of life where the most formative experiences occurred. For instance, Doug’s formative experiences in childhood seemed to
indicat...non-human environment.

Molly’s formative experiences during early adulthood involved interacting with other cultures in diverse natural environments. This seemed to indicate a slightly more inclusive mental model of the environment that emphasized both human and natural environments. Allen’s mental model of the environment was more complex during his formative experiences occurring in early adulthood. He emphasized more of a systems view of the environment by acknowledging the existence of different parts interacting to make a functioning whole. What is unknown is the extent to which formative experiences might have contributed to the development of teachers’ mental model for the environment. Are these mental models static? Did they change over time? Are they a reflection of the current reality for teachers? How do formative experiences contribute to their presence, if at all? Is the mental model personally relevant for the teachers? Does it contribute to their environment identity? If so, how? Some of these questions will be explored in more detail in the mental models section of this chapter.

Overall findings reveal differences and commonalities in the type and setting of experiences teachers considered as formative to the development of their relationship with the environment. The primary difference in formative experiences across teachers was the time of life in which the most formative experiences occurred. This could mean that environment identity development is a continuous, lifelong process where identities are constantly being reformulated or built based on one’s surroundings and exposure to different situations. Teachers’ formative experiences also vary according to different circumstances where teachers’ have interacted with components of both natural and
human environments. Commonalities across the three teachers include the types of experiences teachers considered as formative to the development of their relationship with the environment. These include extended periods of time spent outdoors in natural areas, influential family members or significant others directing attention to the value of the environment, and traveling to different places and witnessing the interactions of people and their surroundings. To a lesser extent, education and career experiences were also considered formative to the development of teachers’ relationship with the environment.

Doug, Molly and Allen’s experiences align with the literature on the significant life experiences said to motivate the career choices, behaviors and actions of a variety of environmental professionals. By engaging in environmental education, teachers are exhibiting behaviors and actions similar to other environmental professionals. This is a significant consideration for how formative experiences might shape teachers’ environment identity. According to identity theory, behaviors reflect the meanings attached to an identity.
Mental Models

In the findings for teachers’ mental models of the environment, the focus group was considered a primary source of data. Each teacher was asked to draw a picture of the environment, and explain his or her drawing in a share discussion. This measure was borrowed from the second part of Shepardson et al.’s (2007) Environments Task. One of the strengths of using drawings to represent individual mental models is their ability to convey personal beliefs built on prior knowledge and past experiences (Desjean-Perrotta et al., 2010; Johnson-Laird, 1983). By capturing teachers’ mental models of the environment, one can make reasonable inferences into individual belief systems, which are developed over time from past experience and cultural influences (Libarkin et al., 2003). A additional supporting piece of information that was useful for exploring teachers’ mental models of the environment came from an item in the online survey asking teachers for the first three words that come to mind when they think of the word environment.

Overall, teachers’ indicated a view of the self as a significant component of the environmental system. This system includes the interactions and processes that occur between human, non-human living (biotic), abiotic, and built factors. All three teachers acknowledged that their mental models were influenced in some way by the formative experiences expressed in the autobiographical narratives. Table 6 displays findings for the mental models of the environment expressed by each teacher.
Table 6. Summary of Teachers’ Mental Models of the Environment

<table>
<thead>
<tr>
<th>Teacher</th>
<th>Key Elements of Mental Model</th>
<th>First Three Words to Describe Environment</th>
</tr>
</thead>
<tbody>
<tr>
<td>Doug</td>
<td>Mountains, Farms, Rivers, Smokestack emitting fumes</td>
<td>Industrial building, Sun, People all over, Sustainability, Conservation, Destroyed</td>
</tr>
<tr>
<td>Molly</td>
<td>Water, Geography, Mountains, Flora/Plants/Trees, Fauna/Animals, Bear</td>
<td>Rabbit, Insect, ATMosphere, People, Arrows for relationships and cycles, Trees, Conservation, Protection</td>
</tr>
<tr>
<td>Allen</td>
<td>Sun, Moon and Star, Rain cloud, Mountains, Trees, Corn plant, An animal, Human brain</td>
<td>House with antennae, Smokestack, Industrial building, Wavelengths, People standing on car, Person holding cell phone, Earth, Distress, Hope</td>
</tr>
</tbody>
</table>

For Doug, formative experiences growing up in the mountains on a rural farm contributed to the inclusion of mountains and a farm in his mental model of the environment. His experiences in urban areas and natural areas impacted by humans are also a part of the way he views the environment. For Molly, formative experiences interacting with people in different environments contributed to the inclusion of symbols to emphasize the interconnections between biotic and abiotic components in the environment. For Allen, formative experiences learning and working from a systems perspective contributed to a mental model of the environment where different scales of interaction exist between abiotic and biotic components in the environment. To highlight the unique and shared properties of individual mental models of the environment, the findings for this section of Chapter IV are organized by teacher.
Doug. Diversity exists with regard to how individuals conceptualize the environment. Differences between our points of reference within the environment has been linked to past and current experiences in our immediate surroundings (Rickinson, 2001). For Doug, formative experiences growing up on a farm in a rural area have had an impact on the mental model he uses to conceptualize the environment.

Recall from earlier in this chapter that the formative experiences Doug attributed to the development of his relationship with the environment were primarily influenced by experiences in places where there was an abundance of non-human, biotic components. This resonates with his drawing and explanation of the environment provided in the focus group and shown in Figure 3.

Figure 3. Doug’s Drawing of the Environment
In this drawing, Doug includes images of mountains, a river, a building with a smokestack, a farm, and humans. While he did not provide any conceptual labels or arrows, he explains in the focus group that he would revise his drawing and include these objects to show the interconnections between each image.

I started [the drawing] with the mountains because that, for me, is important. Then the rivers and farm and food, which the environment provides and the farm represents. Also the Sun which provided energy for our home (Focus group, September 5, 2013).

For Doug, formative experiences growing up in the natural environment seem to have influenced the development of his mental model of the environment in terms of landscape and how humans are situated within the environment. For instance, he explains that he used images of the mountains and farm because that is where he grew up. He also recognizes that people depend on the environment to provide for them in different ways. This distinction is made when he describes people who spend time outdoors for peace and sanctuary and people who depend on the environment for basic human needs such as food, water and materials. In what he refers to as “sort of a dichotomy” with the environment, Doug explains that the environment “doesn’t really care about us, but it provides everything for us”.

When asked why he included the building and smokestack in his drawing, Doug explains that he used those particular images to represent “buildings and pollution”. The emphasis on placing humans in different parts of the drawing suggests a view of the environment that is dominated by humans. Interestingly, Doug seems to view the environment as a system of interacting parts, the function of those parts is in question. If
humans are a vital part of the environment, then the function they serve in his mental
model is not a positive one. He alludes to this in his autobiographical narrative.

I realize that the places that have been minimally impacted by humans are
the way the planet used to be, the way the planet should be. It is because
of the time I spend outdoors that it saddens me to see these places are
changing; that these uninterrupted places are changing and disappearing
because we consume too much energy, water, manufactured food, and
resources, all for cheap (Autobiographical narrative, June 15, 2013).

It is apparent from his mental model and information provided in his
autobiographical narrative and the focus group discussion that Doug includes in his belief
system an emotional affinity for the natural world. For Kals et al. (1999), an emotional
affinity toward nature is defined by having an interest in nature, a sense of love for
nature, feelings of safety and oneness in nature, and indignant feelings when it is not
protected. Their research reveals a positive correlation between past experiences with
family members in nature and a willingness to commit to behaviors on behalf of nature.
Perhaps this is what motivates Doug to take responsibility for the environment through
his personal behaviors and possibly through teaching about social justice issues and EfS.
Regardless, of most importance for Doug is his commitment to maintaining his
connections to the outdoors and facilitating those types of experiences for his students.

**Molly.** Few studies have investigated the influence of different social and
cultural factors on individual mental models of the environment. When asked for her
drawing of the environment (seen in Figure 4), Molly presents images and labels of the
atmosphere, people, fauna/animals, flora/plants, and geography/mountains. Arrows
pointing in all directions and in a cycle are also present. Under the drawing, a label reads,
“THE Environment”.


In her drawing of the environment, Molly holds a mental model of the environment that emphasizes the interactions and interrelationships happening within the environment. Arrows located between human, non-living biotic, abiotic, and built components within the environmental system represent this.

That is what my arrows are supposed to represent. I had water, geography, different landforms, flora and fauna, the atmosphere, and then of course, us. I consider the environment to be the interactions between all those different pieces (Focus group, September 5, 2013).

When asked to explain her drawing, Molly indicates her intentions were to represent the different parts of the environment that she thinks “interact”. Upon hearing this in the focus group, Doug and Allen agreed that those arrows are an important piece that is missing in their own drawings of the environment.
In his study on mental models, Norman (1983) asserts that when individuals interact with the environment, they form internal mental models of themselves and the things in which they are interacting. Furthermore, these models are useful for predicting and explaining the interaction. What is interesting to mention here is that Molly does not include any indication of deleterious interaction between humans and other parts of the environment in her drawing. It could be that by not including a symbol or representation of negative human impacts in her drawing, this aligns with the way she describes her self in her identity profile as a positive person who always “sees the glass half full” and prefers to be around others that feel the same.

This was not the case for Doug and Allen who included exhaust from cars and buildings with smokestacks in their drawings. When asked to explain why she did not include these components in her drawing, Molly explains that she probably should have, but she didn’t feel like it would really represent how she conceptualizes the environment, which emphasizes the different ways that people interact with the different parts of the environment.

“It’s hard because the environment has so many connotations. I think that it is the different ways that people -mainly people- interact with the rest of the parts of the environment, so it [the buildings] is kind of included anyway (Focus group, September 5, 2013).

Without prompting, Molly refers back to her experiences growing up as having an influence on the way she views the environment. She clarifies a point during her early adulthood when she began to understand the more holistic concept that “everything is the environment”. Doug expressed a similar sentiment in the focus group. When asked what the environment was to him, he responded that it was “everything” to him (Focus group).
When asked whether she believed that the environment was made up of different types or sub-environments (e.g. human, non-human biotic, abiotic, built), Molly further explains that she believes there are natural parts that humans did not make, and our interaction with those natural elements created other parts, like buildings.

These are man-made things, which are still part of our environment, but they weren’t here before us (Focus group, September 5, 2013).

For Molly, “natural” refers to something that was not created by humans. Conversely, something un-natural might refer to something created by humans using natural resources. It is because of our interaction with the natural resources in the environment that we have created other “parts” of the environment. One thing to note here is how Molly uses the terminology of “our” environment. While there was no follow up to this, perhaps this signals an internally held belief that the environment is owned or that humans have a shared responsibility for the environment.

For Molly, the environment includes different systems of human, non-human biotic, abiotic and built components. However, it is the interactions between the different components of the environment, especially human interactions, which represent how she conceptualizes the environment. Recall the experiences she considers formative to the development of her relationship with the environment occurred primarily during late adolescence and early adulthood. These experiences happened when she had access to traveling and seeing other people interact in different environments (e.g. Ecuador, rainforest). It is also at this time when she began to consider herself as the social justice advocate she is today. It is possible, then, that this period of time in her life was also a formative time for the development of her current mental model of the environment.
Allen. Mental models can be useful for understanding how individuals structure their own reality in order to make sense of the world around them. For Allen, this reality includes a conceptualization of the environment (seen in Figure 5) that emphasizes what Moseley et al. (2010b) refer to as a “systemic approach”. In other words, the mental model Allen holds for the environment is complex, varies in scale, and includes all human, non-human biotic, abiotic, and built components.

![Figure 5. Allen’s Drawing of the Environment](image)

When asked to draw a picture of what he thinks the environment is, Allen includes images of mountains, a tree, an animal, humans, humans with technology, an antennae on a house emitting wavelengths, a factory, a car with exhaust, a human brain, a raincloud, the moon, a star, and the Sun. No conceptual labels or arrows are shown in this drawing, but Allen clarifies that as one thing he would have changed.
For Allen, the environment includes a complex network of human, non-human biotic, abiotic, and built components. For instance, the images of the wavelengths emitted from the house and radio represent his idea that different parts of the environment can have “man-made or natural origins”. He also explains that these images are a result of his past experiences as an engineer. In the same sense, the mountains are included because he grew up near the mountains. Although the interactions taking place between these components are inferred from what is in the drawing, Allen provides an explanation in the focus group discussion:

That is supposed to be corn down at the bottom next to the tree, so sort of plants that occur as a result of human activity and plants that occur without human intervention (Focus group, September 5, 2013).

From this statement it would seem that humans have a role in the environment that includes manipulation of certain parts of that environment (e.g. the food system). Allen provides no additional examples to substantiate this, but he does provide some statements in his autobiographical narrative and individual interview that might further clarify how he defines the environment. For instance, in his autobiographical narrative, he defines the Earth as a “containing system not only for the economy, but also every other sub-system that supports or interacts with life here”. He also adamantly disagrees with what he calls the “modern economic orthodoxy” that the Earth is nothing more than a collection of resources to be efficiently distributed. For Allen, the environment is not something that is separate from humans or a place that needs to be “used or cleaned up”.
It is inherently the responsibility of humans (because we are a part of the environment) to “Take care of the Earth. Take care of people. Return the surplus.” (Individual interview, September 3, 2013). According to Allen, humans play a role in the environment to the degree that there is no distinction between natural and not natural.

There is this pervasive idea that somehow people are separate from nature and that everything of value is therefore not natural. I personally object to that characterization. I think it is very dangerous to position humans as not filling some niche in this world. If we did not fulfill a niche, we would not be here. I think it is important to accept the fact that, because we do have a role on this Earth, we have the ability to do something positive (Focus group, September 5, 2013).

The vital role that humans and human perceptions play in the environment is evident in the image of the brain used in the drawing. For Allen, the brain represents the “mental environment” which acts as a filter to process our experiences. This is surprisingly similar to the idea that mental models act as a filter for past experiences.

When mental models are used to filter experiences in the environment, formative experiences eventually feedback into the mental models and shape how the environment is understood and conceptualized. For some, formative experiences recognize humans or the self as part of the environment. For others, humans or the self may not be a part of the environment. Another possibility is the recognition that humans and the self are part of the environment, but the relationship exists at varying degrees of interdependence.

In the focus group discussion, Allen proceeds to clarify his definition of the environment quite simply as “the setting in which we operate, which includes everything.” He recognizes and explains that this concept is something that he has only been able to understand pre-verbally for quite some time, but has only recently been able to articulate it in conversation.
Looking back to Allen’s formative experiences, this seems to align with the evidence that early adulthood-present adulthood is the stage of life when he had what he considered his most formative experiences contributing to the development of his relationship with the environment.

**Emergent Themes for Mental Models**

The findings from this and past research reveal that a relationship exists between one’s past experiences in the environment and the mental models they apply to conceptualize the environment. For instance, teachers’ formative experiences involved interactions with different human and natural elements of the environment. These interactions may have influenced the kind of mental model teachers currently hold for the environment. A question for future research is how the developmental stages from teachers’ formative experiences are related to the development of their mental model.

Mental models are dynamic and continue to expand with new information and new experiences. For some, they can be internally engrained in cognitive structures to the point where it is difficult to change or assimilate. For instance, Doug’s most formative experiences for developing his relationship to the environment happened in a childhood where the immediate surroundings were a farm, forest, and mountains. The daily, repetitive contact with natural places forged a mental model of the environment that has developed over time to include the urban living experience.

While we do not know for sure, an argument could be made that Doug’s mental model from childhood remains somewhat in tact and lies at the core of his identity. Molly’s most formative experiences for developing her relationship to the environment happened in early adulthood. Activities such as hiking in Ecuador’s rainforest and
kayaking in San Francisco exposed Molly to diverse groups of people interacting in different natural environments. This is apparent in her current mental model for the environment that emphasizes interactions showing interdependence between people and their environments. Again, while we do not know for sure, an argument could be made that Molly’s mental model developed in early adulthood remains somewhat in tact and lies at the core of her identity. Allen’s most formative experiences for developing his relationship to the environment occurred more recently in adulthood. Having a career in computer and electrical engineering provided Allen with an initial exposure to the complexities of systems and system dynamics. As he became a husband, father, and property owner, he began to apply personal meaning to his role as a functioning part of bigger systems. Humans have always had “niche” in environmental systems and processes. For Allen, there is no separation between himself and the environment.

**Shaping Environment Identity**

A guiding question for this study asks how formative experiences and mental models shape teachers’ environment identity. This section will address this question with a proposal that teachers’ formative experiences and mental models shape their environment identity by dictating the *meanings* they attach to themselves in relation to the environment.

According to identity theory, every kind of identity one claims has a particular set of meanings attached to it. Recall that, in this study, *meanings* refer to “the characteristics or attributes that individuals see as representing who they are, how they feel, and what they value” (Stets & Biga, 2003, p. 403).
In this case, the meanings that Doug, Molly and Allen attach to their environment identity are influenced by their formative experiences in the environment and their mental models of the environment. Consequently, these meanings are internalized and reflected in how they view themselves as part of the environment.

Shepardson et al. (2007) contend that in order for a person to understand their position on an environmental issue and the reasons underlying their environmental behavior, they must first have an understanding of how they conceptualize the environment. Existing literature on mental models assert that individuals interpret past experiences through their belief systems, which are, in turn, reflected in their mental models (Nespor, 1987). With this knowledge, one could assume that a relationship exists between formative experiences and mental models such that formative experiences continually influence the development of mental models, and mental models continually influence the experiences considered to be formative. A hypothetical model to represent the relationship between teachers’ formative experiences, mental models, and environment identity is shown in Figure 6. For Doug, Molly, and Allen, an accumulation of formative experiences outdoors in natural areas, with influential people directing attention to the value of the environment, and traveling to different places to witness human-environment interactions contribute to their current mental models of the environment. These holistic mental models include both human and natural systems, processes and interactions.
Alternatively, the mental models teachers hold for the environment mean that the experiences they consider formative will most likely include time spent outdoors in natural areas, with influential people directing attention to the value of the environment, and traveling to different places to witness human-environment interactions.

![Hypothetical Model Relating Formative Experiences, Mental Models, and Environment Identity](image)

**Figure 6. Hypothetical Model Relating Formative Experiences, Mental Models, and Environment Identity**

When this model is applied to findings from the formative experiences and mental models teachers attributed to the development of their relationship with the environment, meanings attached to how teachers view themselves in relation to the environment begin to emerge.

The combined effect of the relationship between formative experiences and mental models on environment identity is apparent in the meanings teachers attach to themselves in relation to the environment. Three of these meanings are shared across the teachers and include (a) being connected to the environment, (b) being aware of the one’s role in the environment and environmental problems, and (c) being responsible for the environment. Table 7 provides sample excerpts to support the shared meanings teachers’ attach to themselves in relation to the environment.
**Table 7. Teacher Meanings for Environment Identity**

<table>
<thead>
<tr>
<th>Teacher</th>
<th>Meaning</th>
<th>Excerpt</th>
</tr>
</thead>
<tbody>
<tr>
<td>Doug</td>
<td>Connected</td>
<td>“My time outdoors instills in me a deep appreciation for and desire to preserve our natural world.” (AN)</td>
</tr>
<tr>
<td></td>
<td>Aware</td>
<td>“Bringing my own conceptualization of the environment into the classroom means that students will have more of an awareness and ability to observe and question. That is, for me, what has led me to my beliefs about things.” (FG)</td>
</tr>
<tr>
<td></td>
<td>Responsible</td>
<td>“Because of my childhood and my upbringing, I take simple, perhaps even trivial steps-tilting at the windmills, if you will.” (AN)</td>
</tr>
<tr>
<td>Molly</td>
<td>Connected</td>
<td>“I want my children to grow up immersed in nature. I really need to be in a place with super easy access to the outdoors for me to truly enjoy it and connect with it often.” (AN)</td>
</tr>
<tr>
<td></td>
<td>Aware</td>
<td>“When you leave school grounds it’s a lot more about the awareness and appreciation piece because, I mean, if anything you can tell kids till you are blue in the face about something, but until they actually experience it, and are like, ‘Wow, this forest is really cool’ or ‘I do feel really good out here’, it’s going to mean a lot more to them.” (II)</td>
</tr>
<tr>
<td></td>
<td>Responsible</td>
<td>“For me, being a teacher at TGS means educating kids to create a better world and to not just keep worsening our world or keeping it the way it is. I am expected to teach that future.” (II)</td>
</tr>
<tr>
<td>Allen</td>
<td>Connected</td>
<td>“Rather than a belief about the importance of something outside myself, it [the environment] seems to be part of my temperament, where I feel most at ease.” (AN)</td>
</tr>
<tr>
<td></td>
<td>Aware</td>
<td>“I hope that by the time kids are in eighth grade, their scope of awareness, and the context in which they operate, is at least national and possibly international.” (FG)</td>
</tr>
<tr>
<td></td>
<td>Responsible</td>
<td>“We should be paying at least as much attention to climate mitigation as we do teaching common core reading, writing, and math because, in the long view, which one is honestly more important? Which one is going to have a greater impact on the outcomes of the human race? I would suggest climate change does, but at the same time, learning to read, write, and calculate so you can do things to mitigate climate change is really the goal here.” (FG)</td>
</tr>
</tbody>
</table>
First, being a part of the environment means feeling more *connected* to the environment. If given the choice, all three teachers preferred to be outdoors than indoors in order to feel connected to the environment. This was especially true for Doug and Molly who expressed strong emotional connections to the outdoors and the natural environment. Allen expressed a similar sentiment in his belief that being outdoors in the natural environment was part of his temperament, where he feels most at ease.

Connecting with the environment via the outdoors holds personal meaning for all three teachers’ environment identity. Second, being a part of the environment means having an *awareness* of one’s role in the environment and environmental problems. For Doug, Molly and Allen, humans are a functioning part of the environmental system. Being aware of the role they play in the environment and their contributions to environmental health reflects the personal meaning they attach to their environment identity. Finally, being part of the environment means being *responsible* for the environment. Teachers’ formative experiences and mental models are reflected in their ideas about how humans should interact with their environment. For Doug, Molly and Allen, the environment is where humans live interdependently with their surroundings. In order for humans to survive, the environment must thrive. Therefore, it is their personal responsibility to, not only take care of the environment, but also to ensure environmental sustainability.

The findings from this study highlight the connection that exists between the formative experiences and mental models teachers’ attribute to the development of their relationship with the environment. While the formative experiences and mental models differ slightly between each teacher, the similarities that exist across teachers reveal shared *meanings* for how they view themselves in relation to the environment.
According to Burke & Stets’ (2009) identity theory, when we identify the meanings of an identity for an individual, we can predict the meanings of the person’s behavior. The shared meanings for Doug, Molly, and Allen’s environment identities should serve as a indicator for how they will behave as teachers engaged in environmental education. Not being able to enact a core identity, such as an environment identity, can lead to feelings of inauthenticity, or lack of sense of self. For teachers engaged in environmental education, implications exist for how schools and surrounding social, cultural, and political structures support the efforts of these teachers in a way that validates their environment identity. Chapter V addresses implications of environment identity for different areas of environmental education including environmental teaching, environmental learning, and environmental research. Future directions for environment identity research are also suggested.
CHAPTER V

IMPLICATIONS AND FUTURE DIRECTIONS FOR RESEARCH

“Of course, it is of no use to direct our steps to the woods if they do not carry us thither.” (Thoreau, quoted in Thomashow, Ecological Identity, p.178)

Implications

Findings from this exploratory study of environment identity provide significant insight into characteristics that define an environment identity. Specifically, the formative experiences and mental models of teachers engaged in environmental education contribute to the development of their environment identities through the shared meanings of being connected to, aware of, and responsible for the environment and its associated problems. Identity theory assumes that individuals are situated in social structures where behaviors are chosen, not according to personal preference, but because they reflect what is demanded by the different identities they occupy. If it is true that self reflects society, as identity theory suggests, then implications exist for the structures surrounding the development of a person’s environment identity. Specific to environmental education, supports inside and outside the school community should be in place to enhance the development of both teacher and student environment identity. Additionally, environmental education research should make a larger investment in exploring the environment identities of teachers and students, and how the behaviors associated with environment identity might impact environmental quality and problem solving.
**Environmental teaching.** The way we construct knowledge and understanding about the environment is based on our individual perspectives and the meaning we attach to our environment identity. If environment identity is considered a core identity, as identity theory suggests, then the implications for teachers’ inability to apply these identities in their roles as teachers might lead to decreased feelings of authenticity and self-efficacy. Burke & Stets’ (2009) identity theory aligns with the idea that when we behave in a way that is consistent with the meanings and expectations we attach to an identity, our self-esteem rises. As a result, we maintain a sense of self and feel competent enough to handle difficult situations. Self-efficacy is especially important for teachers with strong environment identities who are faced with the challenging task of implementing effective environmental education in mainstream education. Difficulties abound for any teacher who feels obligated in their intentions to go against the norms of traditional education. If structures are not in place to support the kind of formative experiences and mental models that shape the meanings teachers’ attach to their environment identity, then teachers’ begin to feel ineffective and risk losing a sense of self.

Looking at the meanings the three teachers at TGS attach to their environment identity (connectedness, awareness, responsibility), one could reasonably assume that they are making efforts in their personal and professional lives to maintain their environment identity standards each day. Engaging in environmental education is one approach teachers use to verify their environment identities. Consequently, implications exist if the efforts that validate teachers’ environment identity are not supported in the school community.
Teachers play a large role in shaping the culture of a school, and vice versa. School administrators should support their teachers to develop the kind of environment identities that strengthen a school culture grounded in environmental education. For instance, funding for and access to field experiences and outdoor learning environments could support teachers’ connection to the environment. Professional development experiences that support of the meanings teachers hold for being aware of the environment and environmental problems could include self-reflection exercises like autobiographical narratives and mental model drawings, or environmental science workshops that increase teachers’ environmental literacy. Additionally, a top-down and bottom-up approach for recognizing and awarding teachers who exhibit personal responsibility for the environment, such as riding their bike or car-pooling, would be supportive measures to verify teachers’ environment identity and it’s corresponding behaviors.

In essence, teachers engaged in environmental education need to feel and see that their efforts are making a difference not only in world, but also in the lives of their students. It is for this reason that innovative school communities like TGS maintain an atmosphere where environment identities are acknowledged, and shared meanings are capitalized. When environment identity development is supported, the collective impact on student learning and in the surrounding community is one that ensures a connected, aware, and responsible citizenry that has the knowledge and skills to effectively approach environmental problems.

**Environmental learning.** Our experiences and perceptions shape the identities that we inhabit and acquire over time. This presents a challenge for understanding how
diverse learners establish the competencies and capacity to act for an environmentally healthy and resilient future. The implications of exploring the formative experiences and mental models teachers attribute to the development of their environment identities include a better understanding of how to facilitate the kind of learning opportunities that will assist students to develop and realize their own environment identities. If the meanings teachers attribute to the development of their own environment identity include feeling connected, aware, and responsible for the environment, then providing relevant and developmentally appropriate experiences that allow students to make their own connections to the environment is a worthy endeavor. One way teachers can support students in their environment identity development is by guiding students in self-reflection and self-assessment strategies where they can assimilate new knowledge into their mental model of the environment. For instance, teachers can take their students to a public park where they could observe and collect data on how the park is used. Measures and indicators can then be determined to see what variables and interrelationship are necessary to restore, regenerate or maintain the overall health of the park. This experience builds students’ awareness of their surroundings and their own role in the environment. It can also be applied to navigating a tragedy of the commons scenario in which the degradation of a known resource occurs as a result of open and unmanaged access. Knowing one’s own environment identity is a valuable skill to have when faced with environmental problems and problem solving challenges that involve complex situations. With practice and over time, students develop the habit of asking themselves: Am I connected to my environment? Am I aware of what is happening in my environment? Am I being responsible for my environment? If so, how? If not, why not?
As a result of this type of critical reflection, students become empowered because they are acutely cognizant of their own perceptions of self in the environment and the meanings they (and others) attach to their relationship with the environment.

**Environmental education research.** The interdisciplinary nature of environmental education inherently fragments the literature that supports it. This presents a challenge for environmental education researchers to be clear in their intentions and to consider a plurality of epistemologies, ontologies, and methodologies when exploring complex concepts such as environment identity (Dillon & Wals, 2006). For instance, in order to contextualize teachers’ environment identity within the field of environmental education, this study pulls from literature that is specific to environmental education; however, the theoretical framework of identity theory is grounded in the social and psychological sciences. Within the social and psychological domains of identity research, different theories exist related to the development of identities. For instance, social identity theorists emphasize the classification of an individual identity in terms of social groupings. Conversely, identity theorists in psychology focus on the internal processes and role expectations in individual identity development. For the purposes of this study, Burke & Stets (2009) identity theory was used because it evolved from and merged both social and psychological identity theories. What remains unknown at this point is exactly how ideologies of education, environmental education, and even science education fit within identity theory, and how environmental education researchers can best clarify their positioning amongst a “plurality” of different approaches.
Future Directions for Research

The findings from this study clearly indicate a need to better our understanding of factors related to how individuals develop an environment identity. For instance, formative experiences and mental models contribute to the development of an environment identity, but it remains unknown to what degree these factors influence the longitudinal impact of environment identity development over time. Other studies exploring formative experiences and mental models express similar directions for future research. For instance, in their studies of mental models, Shepardson et al. (2007) and Moseley et al. (2010b) highlight the need to determine the impact of life experiences on conceptualizations of the environment as well as the influence of social and cultural factors on the development of mental models. Chawla & Derr (2012) also recognize the importance of utilizing comparison groups in future studies of significant life experiences. This study of the environment identity of teachers engaged in environmental education would benefit from a comparison group of teachers within TGS and with teachers in other schools.

Finally, the findings from this study have implications for continued research on the relationship between environment identity development and environmental literacy development. One purpose of environmental education is to ensure that individuals have the knowledge and skills needed to protect and improve the environment for all living things. An overarching goal for environmental education is to promote an active and environmentally literate citizenry, which according to Charles Roth (1992) includes “the capacity to perceive and interpret the relative health of environmental systems and take appropriate action to maintain, restore, or improve the health of those systems” (p.10).
In his research to operationalize environmental literacy, Roth presents environmental literacy as developing along a continuum of competencies of understanding, skills and action. In general, people tend to progress in the development of their environmental literacy in stages that Roth identifies as awareness, concern, understanding and action. For instance, if a person exhibits *nominal* environmental literacy, then they have a very rudimentary understanding of how natural systems work, and are only beginning to show an awareness and sensitivity toward the environment. If a person exhibits *functional* environmental literacy, then they have a broader knowledge of human and natural systems and the interactions occurring between those systems. They also display a heightened sense of awareness for negative interactions in environmental systems and are motivated to work toward their remediation. *Operational* environmental literacy means that individuals possess the knowledge and skills to understand environmental problems and navigate environmental issues. Their habits of mind include feeling a personal investment and responsibility to prevent environmental degradation and enhance human well-being at personal and collective levels and at local and global scales.

Interestingly, the characteristics that define the developmental stages of an environmentally literate person (awareness, concern, understanding, action) align in some ways with the development of meanings for teachers’ environment identity (connectedness, awareness, responsibility). Further research is warranted to explore if a connection exists between environment identity and environmental literacy, how these interacting knowledge structures might represent concepts stored in memory, and how environment identity and literacy are enacted in behaviors and actions.
Conclusion

Teachers engaged in environmental education at TGS tend to have strong environment identities that have developed from formative experiences in the environment, and include a mental model of the environment where human and natural systems interact and function interdependently. The formative experiences and mental models teachers attribute to the development of their relationship with the environment shape their environment identities through the meanings they attach to themselves in relation to the environment. For the three participating teachers in this study, being part of the environment means being (a) connected to the environment, (b) aware of one’s role in the environment and environmental problems, and (c) responsible for taking care of the environment for future generations.

Teachers engaged in environmental education exhibit behaviors that reflect their environment identities. This includes actively choosing to teach environmental education that aligns with the meanings they attach to their environment identity. If teachers’ environmental behaviors are not supported, then their environment identity is not supported. Supporting teachers’ environment identity has implications not only for school communities practicing environmental education, but also for developing the kind of environment identities in students that might ensure an environmentally healthy and resilient future.
REFERENCES


Gough, A. (2013). The emergence of environmental education research. In *International handbook of research in environmental education*, eds. R. Stevenson, M. Brody,


NAAEE. (2010). Guidelines for the preparation and professional development of environmental educators.


APPENDIX A. EfS MISSION AND STANDARDS

Inspiring young people to think about the world, their relationship to it, and their ability to influence it in an entirely new way.
Jaimie P. Cloud
President
www.cloudinstitute.org

KNOWLEDGE & ACTION

A. CULTURAL PRESERVATION AND TRANSFORMATION
The preservation of cultural histories and heritages, and the transformation of cultural identities and practices contribute to sustainable communities. Students will develop the ability to discern with others what to preserve and what to change in order for future generations to thrive.

B. RESPONSIBLE LOCAL/GLOBAL CITIZENSHIP
The rights, responsibilities and actions associated with leadership and participation toward healthy and sustainable communities. Students will know and understand these rights and responsibilities and assume their roles of leadership and participation.

C. THE DYNAMICS OF SYSTEMS & CHANGE
A system is made up of two or more parts in a dynamic relationship that forms a whole whose elements ‘hang together’ and change because they continually affect each other over time. Students will know and understand the dynamic nature of complex systems and change over time. They will be able to apply the tools and concepts of system dynamics and systems thinking in their present lives, and to inform the choices that will affect our future.

D. SUSTAINABLE ECONOMICS
The evolving theories and practices of economics and the shift towards integrating our economic, natural and social systems, to support and maintain life on the planet. Students will know and understand 21st century economic practices and will produce and consume in ways that contribute to the health of the financial, social and natural capital.

E. HEALTHY COMMONS
Healthy Commons are that upon which we all depend and for which we are all responsible (i.e., air, trust, biodiversity, climate regulation, collective futures, water, libraries, public health, heritage sites, top soil, etc.). Students will be able to recognize and value the vital importance of the Commons in our lives and for our future. They will assume the rights, responsibilities and actions to care for the Commons.

F. NATURAL LAWS AND ECOLOGICAL PRINCIPLES
The laws of nature and science principles of sustainability. Students will see themselves as interdependent with each other, all living things and natural systems. They will be able to put their knowledge and understanding to use in the service of their lives, their communities and the places in which they live.

G. INVENTING AND AFFECTING THE FUTURE
The vital role of vision, imagination and intention in creating the desired future. Students will design, implement and assess actions in the service of their individual and collective visions.

H. MULTIPLE PERSPECTIVES
The perspectives, life experiences and cultures of others, as well as our own. Students will know, understand, value and draw from multiple perspectives to co-create with diverse stakeholders shared and evolving visions and actions in the service of a healthy and sustainable future locally and globally.

I. A SENSE OF PLACE
The strong connection to the place in which one lives. Students will recognize and value the interrelationships between the social, economic, ecological and architectural history of that place and contribute to its continuous health.
APPENDIX B. ENVIRONMENTS TASK, PART I

Environments Task, Shepardson et al. (2007).
Online survey
June 1-June 15, 2013

- Part I: Participants in the online survey are shown seven images depicting human and natural environments.
- Prompt: Does this image depict an environment? Please justify your answer.

1. [Image]
2. [Image]
3. [Image]
4. [Image]
5. [Image]
6. [Image]
7. [Image]
APPENDIX C. ENVIRONMENT IDENTITY BIPOLAR SCALE

Online Survey
June 1-June 15, 2013

- Participants in the online survey were given eleven bipolar statements ranging from environmentally friendly to environmentally unfriendly views. Using a scale of 1 to 5, with 1 reflecting agreement with one statement and 5 reflecting agreement with the opposite statement, and 3 is halfway between the two statements. NOTE: “natural environment” is used in the original measure, but has been modified for teachers’ open interpretation of “environment”.

- Prompt: How do you view yourself in relation to the environment? Where would you place yourself between each of the statements?

1. in competition with the environment 1 2 3 4 5 in cooperation with the environment
2. detached from the environment 1 2 3 4 5 connected to the environment
3. very concerned about the environment 1 2 3 4 5 indifferent about the environment
4. very protective of the environment 1 2 3 4 5 not at all protective of the environment
5. superior to the environment 1 2 3 4 5 inferior to the environment
6. very passionate toward the environment 1 2 3 4 5 not at all passionate toward the environment
7. not respectful to the environment 1 2 3 4 5 very respectful of the environment
8. independent from the environment 1 2 3 4 5 dependent on the environment
9. an advocate of the environment 1 2 3 4 5 disinterested in the environment
10. wanting to preserve the environment 1 2 3 4 5 wanting to utilize the environment
11. nostalgic thinking about the environment 1 2 3 4 5 emotionless thinking about the environment
APPENDIX D. ENVIRONMENT IDENTITY BIPOLAR SCALE RESULTS

All teachers (N=16)

- 100% hold more environmentally-friendly views
- Average score = 4
- Max score = 5, on item 8 only
- Min score = 4, on all other items
- 3 out of 16 teachers (19%) total score = 3
- 10 out of 16 teachers (62%) total score = 4
- 3 out of 16 teachers (19%) total score = 5

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Participating teachers (n=3)

- 100% hold more environmentally-friendly views
- Average score = 4
- Max score= 5, on items 8, 9, 10, 11
- Min score = 3, on item 1 only
- 1 out of 3 teachers total score =5
- 2 out of 3 teachers total score = 4
- The total score for Teacher 1 was higher (5) than Teachers 2 and 3 (4)
- Scores between teachers deviated on 7 out of 11 items (in bold)

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Note. Compared to all teachers, participating teachers scored 0.27 higher overall on the Environmentally friendly side of the scale.
APPENDIX E. ENVIRONMENTS TASK, PART I RESULTS

Online Survey Response Summary
Environments Task, Part I
June 1-15, 2013

- All teachers (N=16)
- Case study teachers 1, 2, and 3 are highlighted and in bold
- Prompt: Does this image depict the environment?

**Image 1 desert**
Yes=16, No=0

<table>
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<th>Yes, Blue sky, nature¹</th>
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</table>
| Natural environments include all living (e.g. cactus) and non-living things (e.g. rocks).
[not environment] This shows a desert environment
An environment can be a physical space.
I see this as a desert environment
It is part of the natural world. It is part of our surroundings.
this is a commons

<table>
<thead>
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<th>Yes, It is AN environment...²</th>
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| it shows the outdoors
It is a picture of a desert, which is part of our natural environment.
it is something which I interact, has components that come from the earth that we use-natural resources,
It is a desert ecosystem.
The image is taken outdoors. There are many natural things are part of the environment.

<table>
<thead>
<tr>
<th>Yes, it depicts an environment, not the environment³</th>
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</table>
| Not the environment I would automatically think of, but it is an important ecosystem.
It reminds me of Utah and trips to the deserts and reminds me of drought and dwindling water resources

**Image 2 city skyline with park in background**
Yes=15, No=1

<table>
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<tr>
<th>Yes, Human environment, snow capped peaks¹</th>
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</thead>
</table>
| It depicts both a natural environment (living and non-living things) as well as a built environment (buildings).
On my first response I would say "no" simply in the fact that I don't associate a city with an environment, whereas I do think it is environmentally related
An environment can be a physical space
This would be an urban environment
It is part of our world.
this is a commons as well

<table>
<thead>
<tr>
<th>Yes, The environment includes cities.²</th>
</tr>
</thead>
</table>
| city environment
It is a cityscape, but it is still part of the environment.
refer to previous justification... additionally, people made resources are depicted
It is an urban environment, which supports people, plants, and animals.
The park and mountains are part of the environment. The city interacts with the environment, but is not part of the natural environment.

<table>
<thead>
<tr>
<th>Yes, it depicts an environment, not the environment³</th>
</tr>
</thead>
</table>
| Again, important part of an ecosystem.
I think of golf, which I love to play. And I think of CO, which is an environmentally friendly place. |
### Image 3 grizzly and cub walking across river

**Yes, Nature**
The image depicts the bears' environment and shows how the organisms exist in their environment. Animals are part of our environment.

- An environment can be a physical space.
- I see a forest environment in the background.
- Animals make up a part of our environment.

**Yes, We share our environment with animals.**

- outdoors
- It is again part of the natural environment.
- refer to previous justifications, minus people made resources
- It is an ecosystem, which supports plants, and animals.
- The animals are living in their natural environment.

**Yes, it depicts an environment, not the environment**

- Again, part of an ecosystem.
- I think of Alaska and grizzlies and of the rivers and the wild. All of which are key components of the environment.

### Image 4 wooded stream

**Yes, Nature**

- It shows a freshwater environment
- water sources are part of our environment
- An environment can be a physical space.
- This is only my favorite environment in the whole world.
- Water and plants definitely make up our environment.

**Yes, Natural settings are part of our environment.**

- outdoors, wildlife
- It reminds me of mountain springs in Oregon.
- refer to previous justifications
- It is an ecosystem, which supports plants, and animals.
- This is a wooded environment with a stream. The are part of nature.

**Yes, Same**

- When I think of the most when I think of "the environment"
- Rivers, water, flowers, nature, beauty, all of which epitomize the natural world and the environment.
**Image 5 farm with fields**
Yes= 16, No=0

<table>
<thead>
<tr>
<th>Yes, Humans using the environment to grow food.¹</th>
</tr>
</thead>
<tbody>
<tr>
<td>It depicts both a natural and built environment.</td>
</tr>
<tr>
<td>Our farmlands are a type of environment</td>
</tr>
<tr>
<td>An environment is a physical space.</td>
</tr>
<tr>
<td>This would be a rural environment</td>
</tr>
<tr>
<td>Fields and man-made structures make up our environment.</td>
</tr>
<tr>
<td>commons</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Yes, Agriculture affects our environment in many ways.²</th>
</tr>
</thead>
<tbody>
<tr>
<td>rural environment</td>
</tr>
<tr>
<td>It is a picture of a farm. The land has been altered by people, but it is still part of the environment. refer to previous responses</td>
</tr>
<tr>
<td>It is an ecosystem, which supports plants, and animals.</td>
</tr>
<tr>
<td>I think this is part of the environment, but it is different from the previous pictures because the fields are man made.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Yes, it depicts an environment, not the environment³</th>
</tr>
</thead>
<tbody>
<tr>
<td>Farms. Food. Fuel. Resources. This photo depicts all of the above and the lack of farms reminds me of dwindling resources in the US and the world. Yes, all of that impacts the environment.</td>
</tr>
</tbody>
</table>

**Image 6 industrial area with field in foreground**
Yes= 14, No=2

<table>
<thead>
<tr>
<th>Yes, Human interactions with the environment can be, and often times are, harmful. But this is still the environment nonetheless.¹</th>
</tr>
</thead>
<tbody>
<tr>
<td>Environments can also pose risks to organisms. Toxic waste or air pollution, for example, can be detrimental.</td>
</tr>
<tr>
<td>there are beautiful fields right next to the gross industrial plant. Every part of this is part of our environment</td>
</tr>
<tr>
<td>An environment is a physical space.</td>
</tr>
<tr>
<td>This would be an unpleasant polluted environment</td>
</tr>
<tr>
<td>Our physical surroundings are always part of our environment.</td>
</tr>
<tr>
<td>responsibility to be sustainable</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Yes, Though I have negative thoughts about this picture because the factory is probably polluting the environment.²</th>
</tr>
</thead>
<tbody>
<tr>
<td>industrial environment</td>
</tr>
<tr>
<td>Still part of the environment. The land (and air) has been altered but it is still part of the environment. components of previous response...do I want to sustain a factory that utilizes natural resources to produce various forms of energy/resources while generating waste, no. But it is something that interacts with me and the natural resources around it, therefore, I consider it a part of our environmental system.</td>
</tr>
<tr>
<td>It is a production plant within an ecosystem, which supports plants, and animals.</td>
</tr>
<tr>
<td>[not environment] The factory interacts with the environment, but it is not natural.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Yes, it depicts an environment, not the environment³</th>
</tr>
</thead>
<tbody>
<tr>
<td>[not environment] destruction of</td>
</tr>
</tbody>
</table>
Yes, More nature. No sign of human interactions.
An environment is a complex collection of conditions that impact an organism and its survival. This depicts a forest environment.
Yes, changing of seasons and the forest are parts of the environment
An environment is a physical space.
A peaceful environment because it's my favorite time of year
Trees. Yes, part of the environment.

Yes, Nature
outdoors
It is a forest - still part of the environment.
refer to previous justifications
It is an ecosystem, which supports plants, and animals.
It is natural.

Yes, it depicts an environment, not the environment
most comfortable to me.
Walden Pond perhaps. If a tree falls in the woods, does it make a sound? Yes, forests are an essential part of the environment.
APPENDIX F. AUTOBIOGRAPHICAL NARRATIVE PROMPT

What’s your story?

This is a written autobiographical narrative. Please find an adequate period of time and a space conducive to reflection on the following prompt. There is no right or wrong answer. Please return to Hillary.Mason@ucdenver.edu.

Allow your thoughts to go back in time and return to the present day. Contemplate and describe, in your own words, the parts of your life that have shaped (and/or continue to shape) how you know, relate to and interact with, the environment.
APPENDIX G. INDIVIDUAL INTERVIEW GUIDE

Objective:
- to gain an understanding of participant’s sense of self in terms of identities (McLain, 2012)

Goal:
- to establish and verify the self-meanings for an environment identity in the context of different roles (i.e. teacher)

The following exercise is intended to nurture self-reflection and gain a better understanding of you and the different “hats” you wear in your life.

Identity Card Sort
1. Think about what best describes who you are. What is included in your definition of “me?”

2. What is included in your definition of “not me?”

3. Think about the various identities or roles you take on in your life. List and number each on an index card.
   a. Please rank your identities in terms of:
      i. Your perceived importance for each
      ii. Amount of time spent in each
      iii. Most pleasing to least pleasing to inhabit. Why did you rank this way?
      iv. Your ideal self – your most desired rank order in an ideal world. Why did you rank this way?

4. What does it mean to you to be a teacher at TGS? What do you feel is expected of you in this role?

5. What elements or characteristics, if any, do you bring to the role of a teacher at TGS that are perhaps different from the traditional or societally expected role? In other words, what do you bring to the role because you are you?
APPENDIX H. FOCUS GROUP DISCUSSION GUIDE

Objective:

Goals:
• to measure teachers mental models of the environment
• to member check for narratives

“The following exercise is intended to gain a better understanding of how you conceptualize what the environment is as well as the processes and phenomena that interact to shape and characterize the environment.”

“Using a sheet of poster paper, draw a picture of what you think the environment is (what it looks like). Label the parts of your drawing if necessary.”

Group discussion
1. Describe and explain your drawing.
2. What does your drawing represent?
3. What does the term “environment” mean to you?
4. What does the term “environment” mean to you as a teacher at TGS?
5. Is there anything else you would include in the drawing?
6. Is there anything you did not include in your drawing? Why did you not include this/these things?

“Please review your autobiographical narratives.”

7. Do the experiences you mentioned in your narratives contribute to your drawing? If so, how? If not, why? (This question establishes that the experiences are truly ‘formative’ to how participants see themselves in relation to the environment.)

8. Do the experiences from your narratives contribute to how you feel or act toward the environment? If so, how? If not, why? (These questions are added to gain insight into research questions 1 and 2. If the environment is perceived as a part of the self, as an environment identity suggests, then the self-meanings for the environment identity may be seen as characteristics that individuals see as representing who they are, how they feel, and what they value.)