IMPACT OF EARLY-EXPOSURE ENVIRONMENTAL EDUCATION ON A

CHILD'S SELECTION OF WORDS AND CREATIVITY

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ABSTRACT

Environmental education researchers have long identified a connection between formative play experiences in nature settings and pro-environmental behaviors (i.e., career paths) of their subjects later in life. Most studies have been post-hoc retrospective looks that have not had the ability to assess causation. As more children are removed from free-play wilderness opportunities, some schools are seeking means to create those formative experiences within the educational setting, but research has not been done to address the impact that this approach has on developing particular environmental behaviors. To address that gap in the literature, this study seeks to identify the impacts that a forest-immersion pre-kindergarten has on the connection of the child with the natural world. Twenty-seven pre-kindergarten students from two academic programs participated in a quasi-experimental study in which they responded to age-appropriate divergent-thinking tasks. Measures of fluency, flexibility, originality, and creativity were compared. Parents completed a survey containing open-ended questions and a 5-point Likert-scaled instrument on ecological perceptions. A significant difference was found between the two groups. The forest-immersion group used more nature-based words in their ideations, which reflects a cognitive impact stemming from their educational environment. Despite both programs employing a Reggio Emilia-inspired teaching philosophy, the students in the forest-immersion program expressed greater numbers of ideations and higher creativity scores as well. Forest-immersion programs used in early-

childhood education have the potential to impact the cognition of the child as reflected in language use. Subsequent studies need to be done to follow these children as they progress through their education to identify lasting impacts that may arise in the form of pro-environmental behaviors.

DEDICATION

To my wife
A'ndrea

and my children
Dakota and Maverick

ACKNOWLEDGEMENTS

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CHAPTER I

INTRODUCTION

Environmental science literature provides insight into the impending catastrophe that will occur if humans continue to regard themselves as separate from their ecological surroundings (Friedman, 2009; Saylan & Blumstein, 2011; Urbina, 2011). As the worst producer per capita of greenhouse gases (second to China in total production), the United States must alter its culture to rectify the current trajectory (European Commission, 2011). Over the past four decades, environmental educators have focused on school-based education, public awareness, and public interest to sway political influences with varying degrees of effectiveness (Saylan & Blumstein, 2011). Hungerford and Volk (1990) developed a theory of behavioral change that reached beyond knowledge-based, moralistic change. They defined the need for emotional engagement if the individual is to deviate from comfortable and routine behavior. Taking those ideas, some educators have applied empathic approaches to early-childhood education as a way to develop environmental sensitivity in young children.

Forest Kindergarten

Forest-immersion schools, often called forest kindergartens, provide an outdoor-immersion setting using nature as the integrating context for children ages three through six. Fjortoft (2001) demonstrated the benefits that such outdoor programs can have on

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physical strength and coordination, but cognitive-developmental benefits have not been established. Educators in forest kindergartens hope that early-exposure, environmentally-immersive programs will instill in children a foundational love of nature that sets the stage for them to learn more, make ecologically-mindful decisions, and work to protect the Earth throughout their lives. As some believe the tipping point for a global environmental calamity has been reached or will be reached soon (Friedman, 2009; Saylan & Blumstein, 2011), identifying the effectiveness of environmental-education programs becomes increasingly critical.

Forest-immersion schools serve students ages three through six years of age employing a student-centered educational perspective with the environment as the integrating curricular context. The wind, snow, rain, and sun encourage different clothing options but rarely inhibit outdoor teaching as learning commences almost entirely outdoors. By educating children outdoors, the hope is to remove their fear of being in nature, and, even more so, to inspire a lifelong connection to the natural world. In a search through SAGE, ERIC, and Education Full Text databases, no research was found to support that the results of such teaching methods are effective. Despite beginning over 25 years ago in Sweden and burgeoning into Denmark, Germany, and England, with a dozen more opening in the United States in the past decade, there is little supporting evidence to encourage the spread of forest kindergartens (Robertson, 2008).

Philosophically there are some who support early exposure to the natural world. Edith Cobb (1959) laid a foundation for understanding in her seminal piece, "Ecology of Imagination in Childhood." The relationship with the outer world in middle childhood

provides an impulse to create later in life through sensory rich memories of experiences in nature. Chawla (2002) continued that line of thinking:

> What I found was that only people who made their way in the world in the arts… recorded the type of relationship with the outer world that Cobb described. Why? Is it because these people begin life, from the earliest childhood, already especially attuned to notice the physical sensory environment? Or are they encouraged to notice their surroundings with respectful attention by cues and examples from people around them that they themselves can no longer recall? Or is it that the arts are the only field of endeavor that validates such attention to the sights, sounds, smells, touch, and dynamic movement of the outer world, as well as people's emotional response to it, so that it is only in this realm that people are encouraged to preserve these memories, or at least to write them down? (p. 136)

From their writings, it is easy to believe that Cobb and Chawla would agree with the intentions of forest kindergarten programs. Nature engages children as the unifying experience, and that experience inspires an active and creative mind that is more open and sensitive to environmental cues.

Pink (2005) claims that the logical, linear thinking of the information age has been surpassed by a society that relies on inventive, empathic, big-picture ideas that denote a new conceptual age. Chawla (2002) carries those thoughts further, "because creative thinkers influence the development of their societies, … their childhood experience of the outer world will have an influence far beyond the individual" (p. 135). Diachenko (2011) believes that our current educational approach has gone the wrong direction. He contends that imagination, which requires creativity, declines through childhood as school systems focus on specific knowledge and unambiguous answers. If Diachenko is correct, then we are failing to educate children in preparation for success in Pink's conceptual age. Robinson (2010) echoes this lamentation as he discusses our current educational system as rooted in the thinking of the industrial revolution with very

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few changes. Students are still grouped by age and not by talent, interest, or ability, and the education offered centers on preparation for standardized tests and not on problem-solving, creativity, and imagination. If the entire world seeks to adapt educational approaches to meet the changing needs of our current and prospective situations, then the need exists to identify where the holes in the current approach exist.

Cobb (1959) and Chawla (2002) both believe that a connection with the natural world imprints memories that last a lifetime. Perhaps learning through gardens in classes held predominantly outside amongst the bugs and rain has the potential to protect and grow creative abilities in children. Tanner (1980) originated research into significant life experiences (SLE) theorizing that access to pristine wilderness areas as a child may have been important to the lives of many environmentalists. Through interviews of 47 subjects he found that most attributed their passion to childhood experiences of wild free play and forays into nature. Pease, Rankin, Verdon, & Reisz (1997) interviewed 305 farmers to understand their decisions to give up potential cropland to restore wetlands and found that 71% had strong memories of growing up with access to natural spaces in which they played, hiked, fished, and hunted. Chawla (1999) interviewed 30 American and 26 Norwegian environmentalists asking in a structured, open-ended-interview format about significant experiences that occurred during their lives. She observed that most of those she interviewed in her research would specifically connect to memories from their early childhood years as formative to their current profession. Wells and Lekies (2006) interviewed 2,000 adults to compare their descriptions of childhood to current environmental attitudes and behaviors. Participation in nature was correlated to a positive relationship and to environmentally-friendly behaviors.

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All of these studies have assessed significant life experiences of adults and are at best correlational. The need is to assess the impact of programs designed to encourage similar types of experiences through structured education. Ideally, an enhanced connection to the natural world would increase an individual's ecologically-minded behavior. Environmentally-friendly career choices, food choices, and attitudes would indicate that early exposure to Mother Earth made a lasting impression. A possible approach would be to use Tanner's SLE research methods to probe for formative experiences in the lives of those adults who attended the first forest kindergartens in Europe. The goal would be to see if kindergarten education imprinted the memories that Cobb and Chawla connected as important to the act of creation and that Piaget might consider adherences that impact the perception of the external reality. However, finding a means of assessing the impact upon the children during or immediately after the program was completed would offer more evidence of cause and effect.

Conceptual Framework

Defining the effectiveness that a forest kindergarten may have on children is a difficult task, because knowing exactly what changes to seek presents problems. Piaget (1937/1954) described a progression of the child's understanding of reality that progresses from age three through age ten. The first is a differentiation of one's self from the external world as it is viewed by everybody else. Piaget held that the problem was that people do not attain complete objectivity during the evolution of this differentiation. To some extent, the internalized experiences of the child manifest in adherences that create individualized perceptions of the external world. Perhaps this is not a problem if

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the child is provided with carefully-constructed experiences. Forest kindergarten

programs seek to do just that. There is a need to identify the extent to which a pre-literate

child has internalized experiences under the presumption that the experiences will

develop adherences that lead to pro-environmental decisions later in life. A longitudinal

study has the capability of assessing the impact, but as many as twenty years must go by

before a follow-up can be done. Standardized surveys developed to assess perceptions

and behaviors require literacy or a conceptual understanding beyond that of the

preschool-aged child. Any assessment of effectiveness must be age-appropriate for

useful data to be elicited. Understanding the underlying developmental processes

through the first six years of life provides the conceptual framework necessary to identify

possible impacts from forest-immersion curricula.

Vygotsky (1978) theorized that language and cognition develop along separate

lines through early childhood and converge to work synergistically, but he did not

identify the mechanisms through which that synergism functions. Forest kindergartens

educate children ages three to six, but the mechanisms that underlie language and

cognitive interconnection begin as the brain originally develops in utero, and functionally

progress in stages throughout the first months of life. Hollich et al. (2000) argued that an

initial bias towards a principle of reference allowing for an early associative connection

of word to representation must exist for language comprehension to begin in the first year

of a child's life. In seeking the mechanism to Hollich et al.'s initial bias, Kudryavtsev

(2011) identified the two primary levels of words as the unique sounds and their

underlying representational meanings. Once the developing mind identifies a sound as

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being unique and further comprehends the connection to an abstract representation, the child is poised to then think in terms of words to register and augment thoughts.

Bloom (1973) argued that for the developing child to grasp the interrelation of decontextualized words with their referent objects, an understanding of object permanence must be achieved. A cognitive comprehension must develop for language use to arise. Bloom's (1973) argument begins building the nature of Vygotsky's synergistic connection but still lacks the research support. Gopnik (1984), McCune-Nicolich (1981), and Tomasello and Farrar (1984) each studied invisible-displacement tasks and found that as children began to understand that objects that disappear from sight are not destroyed, they started using the word "gone." Similarly, the ability to solve certain problems with insight, referred to as means-end comprehension, corresponded with the first reported use of "there" or "uh-oh" (Gopnik, 1984; Gopnik & Meltzoff, 1997). As the first words are mastered through associative connections, the experience helps develop the initial bias principle of reference towards understanding symbolic connections, usually by the second year (Hollich et al., 2000). The comprehension of symbolic reference can be attributed to the naming spurt that occurs around the same time.

Each new word provides a unique tool that children can use to understand the surrounding world. Gopnik, Metlzoff, and Kuhl (1999) argued that in different contexts the same word can have different meanings which is supported by Hollich et al.'s (2000) contention that the primary shift from the first to the second year of language use is from associative to symbolic reference. From the comprehension of the first words, children are capable of discovering the implied different representational meanings from the same

sound through experimental trials as they work to master language as a tool. The ability

to speak the word "gone" would then give a child the tool to explain that the milk was

gone from the bottle, the dog was gone from the room, and the toy keys were gone from

sight (Gopnik, 1984). The synergism begins with mastery of the first words during the

first twelve-to-fifteen months and expands as the vocabulary expands. Twelve-month-

old children comprehend sixty-nine words on average and this more than doubles by

eighteen months with 191 words (Rollins, 2003). Near the end of the child's second year,

the naming spurt occurs in conjunction with the spontaneous ability to begin sorting

objects into many categories (Gopnik & Meltzoff, 1987, 1992). Word comprehension

expands to nearly six hundred words by 30 months and an estimated 10,398 by age six

(Anglin, 1993; Fenson et al., 1994). Each new word has at least one unique cognitive

representation that expands the capability of cognitive expression. Language is the

primary tool children use to develop their cognitive comprehension of the world.

Vygotsky's (1978) theory has thus far been refined by Bloom (1973) and

supported by studies assessing word acquisition in connection with cognitive-task

mastery (Gopnik, 1984; Gopnik & Meltzoff, 1987, 1992; McCune-Nicolich, 1981;

Tomasello & Farar, 1984). Neuroscience has taken it further to develop a physiological

theory that connects sensory reception with language acquisition and, ultimately,

cognition (National Research Council Institute of Medicine, 2000). The developing mind

comes from millions of neurons interconnecting with each other to relay information in a

process known as neurogenesis (Nelson & Bloom, 1997). Each experience that a child

has helps to create new synaptic connections and each of those connections influences the

type of information received and how it is perceived. Synapses form, synaptogenesis, in

redundancy in the early stages of the development of a particular cognitive process and then over time some pathways are reinforced while others are discarded.

The auditory cortex is one of the first major structures to undergo such a transition. A newborn can recognize the difference in endless variations of spoken sounds. By the age of three months, the child begins to acknowledge only those sounds that are spoken in the language of the parents (Gopnik, Meltzoff, & Kuhl, 1999). It is at this time that synaptogenesis for input stimuli has peaked and the redundancies begin to wane, after which new cognitive developments can be witnessed. Canadian babies at six months could discriminate Hindi speech sounds that adult Canadians could not, but by twelve months, those same children lost that ability (Kuhl, 1987). Mastery of the speech sounds of the familial language is required before the language can be understood. Synaptogenesis for language reception and speech production peaks around nine months, which corresponds with the burgeoning of the first words for most children shortly thereafter. Higher functions of the brain occur in the prefrontal cortex. A similar peak in production and elimination of redundancies can be found around the second birthday, a time that coincides with the beginnings of the understanding of the symbolic nature of words, the subsequent naming spurt, and the ability to categorize countless words (National Research Council of Medicine, 2000).

Purpose of the Study

The purpose of this study is to identify evidence of cognitive impacts that forest-immersion kindergartens have on young, pre-literate children through the scope of categorical language use. The synergistic connection of cognition with language begins

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early on as language develops, and that connection continues as the mind grows through the use of language as its primary tool to learn from the surroundings. By employing testing that elicits and encourages multiple verbal responses to open-ended tasks (divergent-thinking tests described below), the language used can be compared between those children in forest kindergarten programs and those in indoor programs. I hypothesized that children exposed to sensory-rich environments connected to nature through forest kindergartens will present with more responses from nature-based themes than counterparts in traditional school settings.

Interpreting this through Vygotsky and Piaget's theories, such a finding would provide evidence that children had internalized their experiences since the cognitive aspects are reflected in language use and subsequently developed nature-friendly adherences through which they perceive and interpret the external world. Chawla (2002) and Cobb (1959) believe a connection exists between the mind of a child raised in the natural world and a creative mind, not as an isolated, causative factor, but as a healthy supportive component of the development of the creative mind. As such, the divergent-thinking-test data was used to generate comparisons of flexibility (nature-based categorical data) as a primary focus, but also in terms of the number of responses (fluency), originality, and creativity (Harrington, Block, and Block, 1983; Runco and Mraz, 1992). Differences in each of these variables would further support the theoretical framework of assessing language to identify cognitive impacts.

Methods

Two forms of divergent-thinking tests were used in this study. The first is called the Uses test and the second the Instances test. In the Uses test a researcher presents a common item to a testing volunteer and inquires in what ways the item could be used. The Instances test asks the testing volunteer to name as many things as possible that fit within a certain category (Wallach and Kogan, 1965).

Ward (1968) employed divergent-thinking testing from Wallach and Kogan (1965), in which the testing nature of data collection was replaced by the concept of playing a game to assess their appropriateness in working with younger children. Selected tests for pre-literate children were presented as games under the two scenarios: uses and instances. For both tests, children are invited to join a game in a one-on-one session with the teacher. According to Guilford (1956), both tests fall into the semantic category versus the figural category, which supports its use with young children who are just starting to employ language as a tool. This study employed Ward's methods. Analysis developed by Harrington, Block, and Block (1983) was employed for fluency (number of responses), flexibility (number of unique categories of responses), and originality (number of unique responses). Analysis of creativity, and adaptation of Wallach and Kogan (1965) by Runco and Mraz (1992), used the same data, but assess whole-field responses from testing volunteers in order to generate a creativity score.

In the Uses test, the teacher began with a warm-up round and showed the student a pencil, asking, "now I want you to tell me all the things you can think of that you can do, play, or make with a pencil. What can you use a pencil for?" Responses are praised.

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After the child indicates there are no other answers, the teacher offers three more potential uses: a boat mast, a flagpole, and a digging tool. Two more items, a cylindrical piece of foam and a metal eye-bolt, are presented in succession with the same verbal cues except the teacher does not offer alternate responses. Each student response is recorded. In the Instances test the child is given a category and asked to name as many things as he or she can think of that would fall into that category. When the child indicates that as many responses as possible have been given, the next category is introduced. Categories include things that are round and things that are brown. Each response is recorded with the additional comment, noting if the object was present in the room.

Research Questions

1. Is there a greater cognitive connection of the child attending a forest-immersion school with the natural world as represented by more natural elements presented in ideations as compared to peers attending a traditional indoor school?

2. Does an early-exposure environmental-education program elicit measurable changes in a child's fluency on divergent-thinking tests as compared to peers attending a traditional indoor school?

3. Does an early-exposure environmental-education program elicit measurable changes in a child's originality on divergent-thinking tests as compared to peers attending a traditional indoor school?

4. Does an early-exposure environmental-education program impact a child's creativity as compared to peers attending a traditional indoor school?

Hypothesis

1. Greater cognitive connections of the child attending a forest-immersion school with the natural world will be represented by more natural elements presented in ideations as compared to peers attending a traditional indoor school?

2. An early-exposure environmental-education program will elicit measurable changes in a child's fluency on divergent thinking-tests as compared to peers attending a traditional indoor school?

3. An early-exposure environmental-education program will elicit measurable changes in a child's originality on divergent-thinking tests as compared to peers attending a traditional indoor school?

4. An early-exposure environmental-education program will positively influence a child's creativity as compared to peers attending a traditional indoor school?

Null Hypothesis

1. Students attending forest immersion pre-kindergarten programs will have no significant differences in measures of nature-based flexibility responses on divergent-thinking tests as compared to students attending indoor pre-kindergarten programs.

2. Students attending forest immersion pre-kindergarten programs will have no significant differences in measures of fluency on divergent-thinking tests as compared to students attending indoor pre-kindergarten programs.

3. Students attending forest immersion pre-kindergarten programs will have no significant differences in measures of originality of responses on divergent-thinking tests as compared to students attending indoor pre-kindergarten programs.

4. Students attending forest immersion pre-kindergarten programs will have no significant differences in measures of the creativity of responses on divergent-thinking tests as compared to students attending indoor pre-kindergarten programs.

Definition of Terms

- Adherence – aspects of internal experience which cling to conceptions of the external world (Piaget, 1937/1954)

- Creativity - Process of having original ideas that have value

- Ecocultural – Ecological behaviors and attitudes within an individual's lifestyle.

- Environmental Education (EE) – teaching paradigm that seeks to develop people who are sensitive and literate regarding local and global ecologies.

- Flexibility – Number of categories within the ideations

- Fluency – Total number of ideations

- Ideations – Responses in the divergent-thinking test

- Leading Activity – the exercise that forms the basis of a stage progression inherent in the cultural-historical approach to psyhchology (Duncan & Tarulli, (2003).

- Originality – Number of unique ideations as compared to the group

- Place - The perceptual, sociological, ideological, political, and ecological surroundings that define a specific location (Gruenewald, 2003b)

- Situationality - The conditions that comprise a community, its culture, its ecology, and current social/political climate (Freire, 1972), which defines what is necessary in study to develop and promote sustainable education.

Rationale for the Study

Environmental education approaches have sought to foster nature-sensitive behaviors in children and adults for decades with varying degrees of success (Saylan & Blumstein, 2011). Proponents of forest-immersion educational paradigms hope to instill a connection with the natural world into children and, thereby, increase the chance that they will grow to develop environmentally-friendly behaviors later in life. No research studies exist that assess the impact that these programs impart on a child's cognitive connection with nature. Researchers employing significant life experiences methods have identified correlational connections between adults and what those adults feel were some of the most impacting early experiences that influenced their current behaviors (Chawla, 1999; Pease et al., 1997; Worster & Abrams, 2005). The primary focus of this study is to identify the potential impact that those early experiences may have on a child's cognition through the scope of language use.

This study uses the theoretical foundation of Vygotsky (1978) by which he proposed a separation of the development of cognition and language up to a point. Beyond that point the two paths synergistically aid each other. Language becomes a tool to strengthen cognition and cognition helps develop a more robust vocabulary. As

Vygotsky (1978) did not develop the framework through which this process would occur, nor did he develop any data through research to support his claims, weaknesses could be identified in relying upon his theories. To address this potential problem, considerable time is spent presenting language development research that supports the synergistic connection of cognition and language.

Significance of the Study

The No Child Left Behind (NCLB) Legislation imposes many demands on teachers. The more mandates that go into effect where teachers and schools are judged on reaching minimum testing levels and not on rates of progression, the higher the stakes become when alternative teachings styles are discussed. Environmental education (EE) has long touted the ability to change behaviors through knowledge of and meaningful connections with the natural environment (Hungerford and Volk, 1990; NAAEE , 2012; National Environmental Education Advisory Council, 1996; Saylan & Blumstein, 201; Shusler, Krasny, Peters, & Decker, 2009; Sobel 2008, 2012, among others). If an early approach to EE promises increased student connection and engagement as an active learner, then we need studies to support those claims to justify the use within high-stakes testing environments such as NCLB.

This study helps define the cognitive impact that early-exposure EE potentially has on early-childhood development. If the cognitive impact exists, then these programs can be further developed and expanded across the country as a positive means of helping to engage the individual with the natural world. If the cognitive impacts do not present through the methods of assessment developed in this study, then other means of

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measuring cognitive impact can be considered or the use and growth of these programs

can be challenged. Most studies on the developmental experiences of environmentally

conscious people have been correlational through the use of significant life experience

methods (SLE) (Chawla, 1999; Pease et al., 1997; Worster & Abrams, 2005).   SLE

methods use qualitative narratives of personal histories to identify factors that may lead

to adult behaviors and beliefs. As correlational methods, this study would help

strengthen the case for employing SLE methods by identifying impacts that early-

childhood experiences can have on the child's cognitive development.

Delimitations

The focus of this study was to identify differences between young children in

forest-immersion education programs and those in indoor pre-kindergartens. A

constructivist learning theory was chosen as the primary approach to developing the

rationale. As such, the intent of the study was to identify differences in word use as

elicited through a verbal-response divergent-thinking test. The study did not assess

student perceptions of environmental behavior. Parent perceptions of environmental

behavior were collected as a means of comparing background influences for the two

groups of children.

Limitations

The sample populations are relatively small. Schools in two separate regions of
the United States volunteered to participate, but this may not be representative of the
culture in all regions or all cultures worldwide. The scope of the study focuses on a
specific age group and does not attempt to re-assess those children over time for changes
in their language use. Parental influence on children is a primary means of a child's

acquisition of directed behavior. This study attempts to identify those parental influences, but cannot control for them.

CHAPTER II

LITERATURE REVIEW

So why dedicate a dissertation to the question of identifying the impact of forest kindergartens on young children? The answer hinges on understanding our current global environmental circumstances, how our educational system has worked toward and subsequently failed to meet those global needs, and why working with young children poses a possible entry point to developing a much needed solution. This chapter will be sectioned to reflect these three challenges.

Global Environment

Physicist Joe Romm (2009) has characterized much of our current ecological business practices as a Ponzi scheme. He claims that we afford ourselves the luxury of cheap fuel and labor to support our lifestyles as long as there is another developing nation from whom we can borrow. As long as we have access to the minerals we need to generate cell phones and game systems, then the current standard of life in developed nations can continue.

Investors (i.e. current generations) are paying themselves (i.e. you and me) by taking the nonrenewable resources and livable climate from future generations. To perpetuate the high returns (the rich countries in particular) have been achieving in recent decades, we have been taking an ever greater fraction of nonrenewable energy resources

(especially hydrocarbons), natural capital (fresh water, arable land, forests, fisheries), and, the most important nonrenewable natural capital of all, a livable climate. (Romm, 2009).

Recently, Smith (2012) reported that the promise of cheap natural gas has derailed nuclear power initiatives. A great deal of speculation exists as to whether or not those natural-gas reserves are viable resources. The projections speculate the costs to be far greater to extract than promoted and much less plentiful than promised, yet investors are rushing to support the initiative. The result is another Ponzi scheme (Urbina, 2011).

> This view of the universe as a consequence of meaningless, random combinations of matter and energy, on which people project any meaning they choose, dominates contemporary secular culture and underlies the emphasis on self-gratification through endless new forms of material consumption that drives our economy. (Chawla, 2002, p. 140)

Such disconnected thinking is something that must be addressed for us to continue to have a place to pass down to our children.

It has taken gas prices rising dramatically to encourage people to make more astute financial decisions that have environmentally-beneficial consequences. The need exists to find ways to engage people to make environmentally beneficial decisions for the sake of the environment, but our current political climate polarizes the debate (Saylan & Blumstein, 2011). The polarity seems to be getting worse, but the environmental degradation is not waiting for the dysfunctional political institution to fix itself (Saylan & Blumstein, 2011).

Education

If the consequences of consumer actions are far removed from the immediate purchasing decision, then those consequences are rarely considered. People no more change what electronics they choose in consideration for the lives lost in the resource and mineral rights fights in the Democratic Republic of the Congo (Chadwick, 2001; Pisik, 2009; Redmond, 2001) than they change their energy consumption patterns in response to knowledge about mountaintop removal from coal mining in West Virginia (Barrie, 2005). Once the garbage is taken to the curb, there are no thoughts about where it goes or how close the landfill is to filling up, as long as the next expansion to the landfill does not come near their house, or their work, or where their kids play soccer, or the jogging trails they walk on the weekends. Out of sight leads to out of mind, which fosters out of consideration. The dilemma comes in finding a way to protect our people and our lands, locally and globally, for the good of all. The solution to that dilemma comes from teaching care and compassion towards a greater social awareness, falling in line with Hungerford and Volk's (1990) theory of behavior change via emotional engagement.

Al Gore brought one-thousand people together in Nashville and educated them on how to teach the message of global climate change. Their primary task was to go forth and spread the scientific word. The presentation incorporated science, statistics, and pictures of baby polar bears floating on ice drifts leaving little to question about the direction in which our global culture propels itself. A student summed it up in a conversation afterwards.

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I can turn off the sink when I brush my teeth. I can turn off the lights when I leave a room. I can drive a little slower on the highway, but it's not going to be enough because the rest of the world has to do that as well and so much more. We've heard all of the same problems, but nobody tells us how we can really fix it (G. Sims, April 14, 2008, personal communication).

Teaching students about global environmental problems also appears to have that effect (Hillcoat, Forge, Fein, & Baker, 1995; Oluk, Ozuredi, & Sakaci, 2009). Anxiety rises about the issues, but as the problems are a world away or too large to manage, the students detach themselves. Many demonstrate apathy as the issues have far surpassed the ability of an individual to resolve them. Hiroto and Seligman (1975) studied the notion of creating learned helplessness. In four concurrent research protocols, the authors gave a group of college students tasks that were impossible, possible, or paired with a control aversive tone and then given a variety of other non-related tasks such as an anagram puzzle or shuttlebox escape test. They concluded, "learned helplessness may involve a trait-like system of expectancies that responding is futile" (p. 327).

Kidder (1995) proposed that compassion fatigue might explain why society acknowledges that the problem exists but fails to change recognizably maladaptive habits like poor water management, reliance on fossil fuels, and littering. Requests for help inundate the population creating a feeling that one person fails to make any significant impact. To address environmental degradation is to address social injustice (Gruenewald, 2003a), and social injustice is rooted in culture. Facing the reality that change for the sake of a cause may demand altering personal lifestyles is another and more difficult component. For example, would it be possible to convince the US population that we should give up our cell phones to save the children, gorillas, and elephants of the DRC?

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Failure to act is brought about in part by educational institutions that generally do not provide the tools necessary for critical thinking and for understanding the modern world. Nor do they teach individual responsibility and social engagement, two fundamental tenets of a free and democratic society. (Saylan & Blumstein, 2011, p. 1)

Teaching comes through segregation of topics that reflect the state standards. Each subject has a functional progression of material that builds upon itself. Math is presented from pre-algebra to calculus. Students do not study trajectory problems in physics before understanding the basics of Newton's Laws. To introduce harder concepts before mastering conceptually easier concepts makes little sense. Each subject is given its own objectives and goals within a unique class structure. The progression begins in early childhood and ends with teachers specializing in a content area. Because of the segregation of subjects, little crossover exists between subjects and often little integration occurs between teachers (Caillier & Riordan, 2008).

A more engaging approach would treat the school as a hybrid between the real world and knowledge content areas (Caillier & Riordan, 2008). To resolve a water contamination problem in a stream, it is necessary to identify that a problem exists (water quality testing using math and science), where the problem is coming from (community awareness, map interpretation), what the reasons are behind the pollution (problem solving), and how to work for a resolution (organizational skills, writing, speech, activism). At no point in implementing a real life solution can subjects be segregated, which means that we need to develop thematic progressions in place of our current isolated topics approach (Caillier & Riordan, 2008).

Environmental education (EE) is not considered one of these necessary segregated disciplines, so any inclusion of its principles typically occurs as an add-on, competing

with other special interest groups (Powers, 2004). The North American Association for

Environmental Education (NAAEE) states that EE, done right, leads to environmentally

literate people, but also helps increase student academic achievement. The three primary

components to this knowledge include knowing that daily choices affect the environment,

how those choices can help or harm the environment, and what persons need to do –

individually or as part of a community – to keep the environment healthy and sustain its

resources, so that people enjoy a good quality of life for themselves and their children.

President Nixon told Congress in August, 1970 (Hungerford, Bluhm, Volk, Ramsey,

2005):

> It is also vital that our entire society develop a new understanding and a new
> awareness of man's relation to his environment. What might be called
> 'environmental literacy.' This will require the development and teaching of
> environmental concepts at every point in the educational process (p. 23).

It was not overnight that environmental awareness reached the office of the

President of the United States. Some educators and activists had recognized that global

problems existed more than four decades ago and have been working to find ways to

engage the general population towards forward-thinking solutions ever since (Disinger,

1983). An obvious answer to a cultural problem has been to educate the people, but

exactly what message needed to be conveyed created a dilemma. In a review of the

literature, Disinger (1983) identified this definitional problem and lack of consensus as a

stalwart reason for EE's shortcoming results. Educators and researchers have spent a

great deal of time focusing on identifying specific definitions rather than identifying

which approaches work best.

Stapp (1969) was ahead of his time. He laid out the four major types of

knowledge necessary to develop an environmentally literate person, but he took it a step

beyond in identifying that it was in the attitudes towards that knowledge and not the

knowledge itself that empowered an individual. Such a declaration was echoed by

Shusler, Krazny, Peters, and Decker (2009) forty years later by their claim that to attempt

to change behavior by knowledge alone is moralistic and has not done well in other

educational venues such as anti-smoking campaigns (Jenson, 2000; Center for Disease

Control, 1992). "Through genuine participation, youth take part in making meaning of a

particular environmental problem by defining it, analyzing its root causes, and

envisioning and enacting possible solutions" (Gough & Scott, 2007, p. 112). Shusler et

al., (2009) call this democratic education, and it reflect's Stapp's (1969) ideas of

influencing the attitudes towards the knowledge. Three years later in the 1972 United

Nations Conference on the Human Environment in Stockholm, Sweden, the Secretary

General came up with suggestions during the Environmental Education and Training

session. The intent of EE should be "creating citizenries not merely aware of the crisis of

overpopulation, mismanagement of natural resources, pollution, and degradation of the

quality of human life, but also able to focus intelligently on the means of coping with

them (p. 7)." For EE to have its greatest impact, Stapp maintained that three components

were necessary:

> 1) provide factual information which will lead to understanding of the total
> biophysical environment; 2) develop a concern for environmental quality which
> will motivate citizens to work towards solutions to biophysical environmental
> problems; and 3) inform citizens as to how they can play an effective role in
> achieving the goals derived from their attitudes (p. 35).

Ultimately, EE should educate students towards a "clear understanding that man is an inseparable part of a system, consisting of man, culture, and the biophysical environment, and that man has the ability to alter the interrelationships of this system (Stapp, 1969, p. 30)."

Not all call-to-arms definitions have been accepted. Hug (1977) produced a seminal paper about a major problem with putting practice into place in EE. Exactly what are the intentions of the environmental-educator? Some environmental educators teach because of a passionate love for the land and a desire to share those feelings of protection with the next generation. Some teach because of a love for science, believing in truth and knowledge. The definitional fight comes to a head between these two. What are the intended goals of these two types of educators; to produce scientists or to produce activists? Is one answer more appropriate than the other? Hug identifies the two hats of environmental educators as activists and teachers, making the claim that there is an appropriate time for each hat to be worn and to be forthright with students about which is being used. He claims the best approach is to present a balanced education with neutral science such that the students can arrive at their own respective educated decisions.

The National Environmental Education Advisory Council (NEEAC) (1996) attempted to define the process of EE better by acknowledging the need to educate for the sake of awareness of environmental problems and challenges; but they took it further to encourage that the necessary skills and expertise to address those challenges are taught as well. Even beyond that, the proper attitudes, motivations, and commitments must be in place to make informed decisions and take the necessary steps for responsible action.

It appears that some discrepancy might exist between Hug's (1977) call for balanced, neutral education, the NAAEE's statement that people know what needs to be done, Stapp's (1969) focus on engaging the attitudes of the students towards action, and the NEEAC plainly calling for the right skills to be taught that empower people to identify and act in responsible manners. Identifying the definition helps identify the end goals. Is it enough to acknowledge Hugs' two hats? Is there a greater call to engage the student beyond basic education? Considering the interpretation that our collective science demonstrates impending global ecological problems, more needs to be done to engage the attitudes of students towards the environment while empowering their own abilities in critical independent thinking (ICEE, 1997; Saylan, & Blumstein, 2011).

To do that research, however, it would be necessary to first identify a program that taught along those lines, and to get lasting results, those programs would need to spread to other schools. Considering the No Child Left Behind federal mandate, it is becoming more difficult to find teachers and school systems willing to step beyond the curricular bounds of what is tested. This 2001 law represented a federal attempt to "make sure all students, including those who are disadvantaged, achieve academic proficiency" (U.S. Department of Education, 2008). Schools are rated based upon the perception of the teacher's abilities as measured by student performance on standardized tests. Schools respond to such ill-conceived evaluation paradigms by setting timelines for standards instruction. Little opportunity exists for teachers to delve deeper into topics or slow down to manage different learning styles. The top and the bottom percentiles from each class become marginalized in their learning and neither excels with interest or engagement or worse, the student becomes disenchanted with the process and walks

away. Emotional affinity towards the material emerging in this type of learning

environment is difficult (Price, 2010).

Calls for Change in the Educational Paradigm

"Constructiveness in education comprises being open to all experiences, being

useful, being ethical, having self-care and care for others and being humanistic" (Tan,

2007, p. 487). Developing this sense of care seeks to engage the student to maintain and

repair our world, self, and environment, implying that actions are undertaken with a sense

of need beyond one's self (Tronto, 1993). Changing this paradigm requires integrating

critical thinking, individual responsibility, and social engagement. These elements create

a foundation for an aptitude in problem solving necessary to combat community

challenges locally and globally. Without some forum for problem-solving and abstract

thinking, divergent thinking, creativity, and imagination all decline.

What happens when you set a child outdoors? Moore (1986) found that

undoubtedly the child would collect rocks, bugs, and/or animals. Sobel (1996) found that

the child would create a place to be at home in the outdoors by building dens and forts in

which to play. Rogers (1979) collected 220 poems from children aged two to eight

(transcribed for the younger ones) and found that eighty-five percent incorporated the

natural world. Chukovsky (1968) collected thirty-two poems from children ages two to

six and found that roughly sixty-six percent centered on some aspect of nature. Children

play in nature, use it as a refuge, and nature in return provides endless memories through

which creativity and imagination are fueled for a lifetime. If "creative thinkers influence

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the development of their societies, … then their childhood experience of the outer world will have an influence far beyond the individual" (Chawla, 2002, p. 135).

Robinson's (2010) message goes beyond the critique of the NCLB reform as he sees that our current educational paradigm exists as though the world still revolves around the industrial revolution. Sally is good at math. Johnny is a whiz at poetry. They were born within six months of each other and are henceforth in the same grade in school. If Sally wants to put her energy into math, will she get better under the current model in math if the teacher proceeds at the prescribed rate for teaching state standards? Will Johnny master math if the prescribed rate exceeds his comfort level? If Evette is good at math, but is a year younger, would it serve to put Sally and Evette together to progress to more challenging problems? What if Johnny wants to spend extra time on his poetry writing and analyzing skills? The most important component of how children are chosen as class cohorts rests in their date of manufacture – their age. The information and challenges taught in class leave little to discuss, let alone providing a way to move them up Bloom's taxonomy to analyzing or synthesizing, i.e. creating. Robinson (2010) claims the current system kills a student's ability to be creative, i.e. "the ability to produce original ideas that have value," which is important in today's world.

The topic of creativity brings out the need to justify why maintaining it serves a purpose. Divergent thinking is a skill that supports creativity. It is the ability to consider a plethora of pathways to any given solution or to come up with multiple solutions. Fostering creativity requires fostering divergent thinking. Scientific discovery requires the ability to consider these multiple pathways, termed hypotheses, and develop unique tests to validate those pathways. If the results invalidate the pathway or the results lead

in novel or unexpected directions, then new solutions need to be developed, making science a creative endeavor. Theory claims that the child's mind functions like a scientist as it generates new hypotheses and tests them against reality to identify meaning and cultural significance (Gopnik &Wellman, 1994). Approaches such as problem-based learning help connect teachers and students on comparable levels as they work together to identify important problems, consider multiple viable solutions, test those hypotheses, and communicate the results (Torrance, 1981). Creativity and divergent thinking fuel each of these steps (Tan, 2007). Evolution sculpted the human mind to seek understanding. Later in life those same divergent-thinking skills enable poets to grasp the perfect word to describe a breeze or aid a doctor in trouble shooting a non-traditional malady. Supporting those skills through the educational system can only help the functional literacy of the student, but in the age of high-stakes testing to satisfy government regulations there is little room left in the prescribed day to diverge from the set course.

Diachenko (2011) focuses his research on imagination, which goes beyond creativity to seeing a reality outside of the self by maintaining the capacity to plan for an unrealized future. Supporting imagination permits the child to focus on socially valuable self-realization and the potential for creative activity. Cognitive imagination permits the play that allows a child to enact cultural situations. Affective imagination provides a safe venue for the play-acting of fears and conflicts. Through those play sessions, a healthy emotional life and the ability to empathize are developed. "By focusing education on certain knowledge, unambiguous answers and the adoption of ready-made models for the transformation of reality, it reduces the role of the imagination and results in its

extinction in many children in the school system. (Diachenko, 2011, p. 24)" "There is

one answer and it's in the back of the book, but don't look. And don't talk to your

friends. That's cheating (Robinson, 2010)." If Pink (2005) is correct in his assertion that

the shift from the information age to the conceptual age has dawned on the global

economy, then disregarding the key components to function in such a climate is a

mistake.

Implementing Change

> As students, we must hunger for more exposure to new and broader concepts. We
> must understand that we are authors of the future of our communities and nations,
> and that we possess the power to make ourselves heard and to effect change.
> (Saylan and Blumstein, 2011)

The world's first Intergovenmental Conference on Environmental Education was

organized by the United Nations Educational, Scientific and Cultural Organization and

held in Tbilisi, Georgia on October of 1977 (UNESCO, 1978). The document entitled

the Tbilisi Declaration identified five objectives of EE: Awareness, knowledge, attitudes,

skills, and participation. Education should aim at all age levels, be formal, informal, and

constitute a life-long learning agenda, within which adaptations and critical thinking can

be applied to changes over time. To foster those changes educators must look outward to

the community. The individual needs to learn active problem-solving processes within

the context of specific realities while encouraging initiative, ultimately developing a

sense of responsibility and commitment to build a better tomorrow. It is in the power of

people who are connected with their surroundings to sculpt their world.

In an attempt to assist translation of the Tbilisi Declaration's objectives into practice, Hungerford and Volk (1990) described a delineated approach called the value-belief-norm theory aimed at changing learner behavior. The major entry-level variable is sensitivity to the environment with minor variables including basic ecological knowledge. This reinforces naturalist John Burroughs' claim that love for the subject will aid the desire to understand the subject matter (Sobel, 1996). Entry-level variables feed into ownership variables. Major components here include in-depth knowledge about topics and a personal investment in issues and the environment. The final stage is described as the empowerment variables including knowledge and skill in using environmental action strategies, individual locus of control, and an intention to act.

Environmental sensitivity underlies the base level of how to develop changes in learner behavior. Chawla (1999) was inspired by Cobb's (1959) research into three hundred autobiographies of creative thinkers across time. Dr. Chawla took a cue from research into significant life experiences of environmental professionals, done by Tanner (1979) and Peterson (1980) to focus on identifying the stories and memories of current activists and educators that are self-reported as reasons they pursued their chosen careers. She sought to find those sensitizing moments in life.

> The place that they recalled was in a field, or woods, or an overgrown corver of weeds, or along the seashore – or in the few cases where they were in a room or on a city street, in a place awash with the light and atmosphere of the natural world… What they said these memories provided was a base of calm and stability on which they could later draw. (Chawla, 2002, p. 137)

Sobel (1993) followed children in multiple countries to find those forts and dens that children used in an attempt to uncover a hidden meaning. He found the places that children held dear and found a universal need for those places across the globe.

Something about time in nature gave children pause to reflect and play. The sensitizing moments that define entry-level variables are naturally-occurring phenomena in exactly these settings.

Creating those entry-level variable scenarios throughout the educational growth of a student may seem more challenging. Engaging communities and campuses as the primary focal point to student energy, experience, and education has more recently been framed in terms of place-based education. To be critical of the actions within an individual's local environment and then partner with others to develop solutions carries an amazing potential to teach. Gruenewald (2003a) takes a notion of place-based education and applies it to critical theory to develop this more-specific notion of intentional analysis of local culture and how it can be used to educate and reform. He claims that, "place-based pedagogies are needed so that the education of citizens might have some direct bearing on the well-being of the social and ecological places people actually inhabit" (p. 4), and he continues with "people must be challenged to reflect on their own situationality in a way that explores the complex interrelationships between cultural and ecological environments" (p. 6). Gruenewald (2003c) provides direction to these pedagogies through action research, cultural journalism, and studies in natural history. All of these approaches are frameworks to develop place-conscious students who strive for social justice through community and ecology. The result creates opportunities to lay the groundwork of sensitivity and compassion while teaching the skills for empowerment.

Examples can be found worldwide that meet these aims. Alsop, Dippo, and Zandvliet (2007) look at engaging the student teacher through a lens of social ecology.

They further analyze the impact of a teacher-education project that connects Canada, Mexico, and Peru through local projects aimed at social transformation. These projects then set the tone for the education curriculum. Schroder (2006) echoes the call to focus on the needs of the people in her assessment of Ecuadorian learning. For fear of gross environmental travesties, locals reject the oil companies and deny others organizations that would bring in money but cannot offer secondary options. The children must be taught to love their land and live to protect it. This requires students to challenge mainstream beliefs and to be empowered to embrace the notions of science as affirming a life rooted in the past while acknowledging the future.

Place-based education encourages connections across the curriculum that engages the surrounding community. A Virginia history project assessed land use and town development, employed active research and role-playing, while demanding critical analysis of success and failures across a region as a prime example of what works (Sobel, 2008). Sobel's analysis of the project described a teaching approach that has the potential to engage service-learning and education for sustainability while using action research, issue and action instruction, and community problem-solving, resulting in students who care and want to make a difference.

> …and so we begin with research: listening, observing, letting children show us how they use their local environment and what they value, what they fear, what they would like to change. From this foundation, we aim to work with children as partners to implement the physical changes, programs, or processes of public education that will respond to children's own perceptions of their needs. In these activities we involve the children in talking, writing, drawing, mapping, counting, and many practical exercises in response to their own interests. (Chawla, 2002, p. 143)

Research needs to be done to assess the emotional-affinity impacts of these programs on children to see if this approach's critical pedagogy of place has the power to engage grade school students' emotional engagement towards the environment.

Nature Impacts

Literacy without comprehension fails to serve the student. State standards aim to educate the child with goals of basic levels of sociohistorical, mathematical, reading, and language competency. If the math skills fail to make balancing a checkbook possible then the standards, or how those standards are taught, fail the student; likewise, with comprehending past-due notices or rental agreements. Environmental literacy needs to work the same if there is any hope to obtain measurable gains in ecological protection (Saylan and Blumstein, 2011). Jumping headstrong into looming global environmental travesties misses the mark as well. Sobel (1996) insists that there should be no environmental tragedies taught prior to the fourth grade. Let the children find something to fall in love with before charging them up to save the world. Some may temporarily become zealots for the cause, but many others become dissociated because of the scope of the problem, fostering a form of learned helplessness. If an elephant in a zoo leaves a lasting impression the first time it is viewed, then how does that second-grade student deal with immediate discussions about ivory poaching or bush meat that threaten their existence? Give a chance for the entry-level variables, the environmental sensitivity, to come in to play first, then broaden the understanding when it is developmentally appropriate.

When Chawla (1999) interviewed current activists and educators, she found fond

memories of family connections with nature. "What these family members gave them

was simply the example of noticing the natural world as something worth noticing

(Chawla, 2002, p. 142). "Continuing to focus education on what is effectively job

training, instead of providing an education that promotes life training, is neither in our

best interests nor in the best interests of our species" (Saylan and Blumstein, 2011).

Something needs to change and that change comes from the developmentally-appropriate

avenue of educating children to garner care and respect for their natural surroundings.

When this foundation anchors their learning, when the imaginations and creativity of

children are fostered as important, then teach the skills to identify and approach problems

with an open and balanced mind. Such an approach echoes the voices of Cobb (1959) as

she calls for a "renewal of our relationship with nature" and Robinson (2010) who

implores us to work towards a paradigm shift in education; a shift moving towards

developing the creative abilities of our children.

Should such an approach exist, it could help stop the ecological Ponzi schemes

from the ground up.

> It depends upon helping the people who live in vulnerable areas of the world,
> whose livelihoods depend upon these regions to have the education, skills, and
> sense of power and responsibility that they need to sustainable manage the places
> where they live and to protect their surroundings from outside exploitation
> (United Nations Development Programme, World Bank, and World Resources
> Institute. World Resources 2000)

That statement sounds a great deal like Alsop et al.'s (2004) research in Ecuador or what

needs to happen in the DRC. This dialogue seeks more than the redress of the American

educational paradigm. The Western culture has used the developing nations of the world

to supply the resources for cheap labor and ample materials to support its own development for generations. Empowering others to protect their resources will help us all maintain the Earth as a place to pass along to our children.

No Child Left Inside

Six years after the passing of NCLB legislation the federal government sought to correct some oversights and introduced the No Child Left Inside act, which aimed to integrate EE into federal NCLB guidelines, create incentives for state development of EE literacy plans, and provide funding for professional development aimed at teaching the teacher to teach outside (Civic Impulse, 2012). It appeared that beyond the calls of Cobb (1959), Gruenewald (2003 b, c), Sobel (1996, 2012), and Chawla (2002) to engage the child outdoors for the sake of creating lasting emotional impressions, some research emerged that demonstrated physical effects as well.

The average American child spends six hours in front of an electronic screen a day (Gobdey, 2009). Rose et al. (2008) did full eye exams on 1,765 six year olds and 2,367 twelve-year-olds while parents and children filled out activity questionnaires. No correlation between activity and myopia was found in the six year olds. In the older children the story changed. Despite correcting for familial history of myopia and ethnicity, higher totals of time spent outdoors, not necessarily sports, presented with lower levels of myopia. Stare at a two-dimensional world at short range for long periods of time and near-sightedness ensues.

The United States military took that concept to the next level. Soldiers who grew up hunting in the woods or in city streets with significant gang-related activities around

them were much more attuned to environmental cues that identify dangers such as roadside bombs. Those soldiers who grew up with more TV and gaming time were less adept at perceiving threats (Perry, 2009). The senses are stronger in those who experience natural environments that demand or permit attention.

Dogs have an acute sense of smell and are regularly used to track things such as animals and people. People have tracking abilities as well. Researchers asked 32 volunteers to try to track a scent for ten meters with all but the sense of olfaction occluded. Two-thirds managed the task. Next they recruited four subjects to train their tracking sense over a two-week period. The lateral deviation from the scent trail improved ($P = 0.0028$) and increased their velocity ($P = 0.0006$). Humans are not bad at tracking, rather behavioral demands never require that the skill be developed (Porter et al., 2007). Changes in behavior that encourage use of the olfactory sense, such as smelling flowers in the Spring, or identifying smells that come with a breeze may help develop that sense better.

What benefit can come from allowing the human mind to develop in connection with the natural environment? In 2004 a tsunami hit the Andaman and Nicobar islands off the coast of India in the Bengal Sea. The primary residents here are the indigenous tribes who have very little connection with the outside world. Despite no means of outside warning, most tribes survived. Their understanding of changes in their surrounding environment and in the animal behavior were interpreted as signs to go inland toward higher ground (National Geographic, 2005).

Mycobacterium vaccae lives in soils and is likely ingested when people spend time outdoors. In an experiment by Matthews and Jenks (2010), mice that were exposed

to the bacteria before being placed in a maze demonstrated fewer signs of anxiety and were able to complete the trial faster than counterparts who had not been so-exposed. Perhaps this is a mechanism by which studies on the beneficial impacts of nature on attention deficit and hyperactivity disorder can be considered (Taylor, Kuo, & Sullivan, 2001; Kuo & Taylor, 2004; Kuo, 2010). More likely, the calming aspects of nature-exposure influence the ability to regain control from attention fatigue (Kaplan, 1995; Berman, Jonides, and Kaplan, 2008). Constant stimulation from television, computers, traffic jams, work, children, and life in general, all tax the mind. Sleep is not enough to provide recovery over time. Providing environments for escape that give the feel of being away, provide a degree of fascination, have a perceived open expanse, and are compatible to a person, provide restorative benefits from attention fatigue. Hartig, Mang, and Evans (1991) performed two separate studies on attention fatigue. In the first study, urban vacationers were compared to nature vacationers with a non-vacationing group as a control. After returning to their daily lives, the subjects underwent a proof-reading task, which is highly demanding of careful attention. The nature vacationers faired better. The second study was more controlled in its approach. Volunteers were randomly assigned to one of three groups: a control, a natural environment, and an urban environment. Subjects were given a set of taxing tests to fatigue their attention span, and then the two different environment groups were asked to walk for 40 minutes in their respective areas. The group walking in the natural environment outperformed both other groups.

Exercise in the wilderness offers more than just a restful place to regenerate from attention fatigue. Fjortoft (2001) created two groups of kindergarten students. The experimental group had 49 students and was given 1-2 hours a day of free play in the

woods adjoining the school. The control group was comprised of 56 students who were given normal access to free play on their playground. Balance, coordination, standing long jump, and bent-arm hang were all significantly improved at an $\alpha < 0.001$ level and shuttle-run speed and sit-ups improved at an $\alpha < 0.01$ level. The only measure that failed to significantly improve was hamstring flexibility. Time outdoors is also time not spent sedentary. In our current concern over increasing obesity rates in children and adults, the more time people spend moving, the less time they spend sitting (Gobdey, 2009). Fjortoft (2001) demonstrated that time in unstructured play environments with rocks to scramble on and trees to climb increased strength and speed. All of which results in increased fitness levels.

In summary, engagement with nature may provide the child with internal connections to the external world under the influence of intentional adherences. Fjortoft (2001) demonstrated that by giving children the means to experience the world outside, physical, and mental health were augmented. Beyond that, children will also have the chance to emotionally engage with nature leading to environmental sensitivity. Formulating education with the environment as the integrating context maintains appropriate connections of the child with the environment, fosters creativity and imagination, which in turn aids the development of more acute problem-solving skills. Changing the current high-stakes testing paradigm to one that seeks to educate the whole child, mind, body, and soul may be a way to educate for Pink's (2005) conceptual age.

> … many of the deepest forms of learning occur in the child's spontaneous encounter with the environment, and that the greatest service that a teacher can do is to provide opportunities for these encounters… and find corners to be alone in undistracted encounters with their place itself. They also reaffirm the importance

of schools with permeable margins between indoors and outdoors… (Chawla, 2002, p. 138)

A Child's Development

The final piece of the puzzle is discussing why focusing on young children should be the first step. Cobb (1959) found that many creative people connected middle-adolescent memories to their current energy and interests. Chawla (1999) found that for environmental educators and activists, early childhood was most consistently attributed as having provided significant life experiences. Pease et al. (1997) found that farmers voluntarily participating in wetlands-preservation programs felt a strong connection to the outdoors that they attributed to their childhood years. Wells and Lekies (2006) found a direct correlation between positive environmental behaviors and positive childhood memories of outdoor experiences. Sobel (1996) insisted that presenting young children (before the fourth grade) with global environmental problems may be more damaging than not. It is possible that such an early introduction of major challenges impedes the young mind from connecting to nature and developing what Hungerford and Volk (1990) call environmental sensitivity. Sobel (2012) laments the focus of EE on "look, but don't touch" approaches that fail to allow children the chance to personally experience the wild. He claims it is through free and wild play that children find their own connection to the natural world. In cultures around the world, Sobel (1993) found common threads in that children often built forts and dens as places to engage in free play.

> It's an instinctive drive to make a home in the world away from the home your parents provided you. When you make a fort, or den, or hideout, it creates a connection to the land, nurturing an affinity for that place. (Sobel, 2012)

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The young mind functions in an endless attempt to grasp the meanings behind culture. Investigation and play are tools used to make this happen. It begins by unraveling the two primary levels of words: the first is the representational sound and the second is the implied meaning (Kudryavtsev, 2011). Through the representational meanings of words, children develop understanding of the surrounding environment (Gopnik, Metlzoff, & Kuhl, 1999). This provides the basic tools to begin creating or imagining a representational structure of their culture (Diachenko, 2011). The ultimate goal is to master cultural tools so that the child can employ those tools by and for himself and reflect the adoption of cultural experience (Diachenko, 2011; Veraksa, 2011). Play provides the arena through which children process cultural experience (cognitive imagination) and work through appropriate emotional responses (affective imagination) (Veraksa, 2011).

Vygotsky (1978) maintained that play was the leading activity through which children learn. This leading activity provides transitions within a social structure, meaning that children change status by mastering cultural tools and skills through play (Duncan & Tarulli, 2003). Play is then the means by which children contextualize events and learn through the processing of those events. Vygotsky believed that children's play was not inherently creative; rather it was a reworking of experiences from which to learn. This would fall in line with Diachenko's (2011) progression of the development of imagination. To have true creative and imaginative play, the necessary tools and mental representations of the world need to be firmly in place. All of that takes time and proper fostering.

This is not to say that children are not creative by nature. Gopnik (1984) found that children constantly try to use words in different contexts from the one presented in an attempt to identify alternate functional meanings. While their thought processes may not be original to adults who already know various meanings, they are unique and novel to the child. Creativity and divergent thinking, which is a function of creativity, serve the child to develop new understandings for herself. Through creativity, which is separate from IQ (Guilford, 1956, Ward, 1968), understanding of cultural elements is made possible (Kudryavtsev, 2011). The child's appropriation of culture is a creative process in itself, rather than a reproduction of cultural wealth according to a particular pattern.

> The world of culture appears before a child as a system of open problems to be solved, but not as a system of algorithms to be reproduced. Culture is not something that can be reproduced, it is rather an open realm of meanings that asks for creative reconstruction. (Kudryavtsev, 2011, p. 47)

In their creative reconstruction, children unknowingly develop those significant life experiences that ground their adult lives (Cobb, 1959; Chawla, 2002). Natural settings encourage more whole-body play (Fjortoft, 2001) that provides physical strength as well as sensory stimulation to develop the mind. If these encounters can be manifested in an educational setting, then perhaps more students will find the environmental sensitivity that Hungerford and Volk (1990) believe is inherently necessary to develop the appropriate attitudes and behaviors that are needed in order to act responsibly towards nature.

Reggio Emilia

Not all teaching philosophies are the same and different pedagogies may very

well develop unique characteristics in the students. Both schools participating in this

study are strongly influenced by the Reggio Emilia early-childhood-education teaching

philosophy. It is important to better understand the Reggio Emilia approach to

comprehend what inquiry-based, child-centered education is intended to achieve. A

poem written by Loris Malaguzzi who is credited with developing the teaching styles of

the educational approach is shortened here, but helps place the ideals in context. The

poem was hanging on a door of a teacher at the Control school.

> The child is made of one hundred languages.
> a hundred hands
> a hundred thoughts
> a hundred ways of thinking
> of playing, or speaking
> The school and the culture
> separate the head from the body.
> They tell the child:
> to think without the hands
> to do without the head
> to listen and not to speak
> to understand without joy
> They tell the child:
> to discover the world already there
> and of the hundred
> they steal ninety-nine (Edwards, Gandini, & Forman, 1998, p. 3)

In an interview, Malaguzzi summarized his views on child-centered inquiry by

stating, "learning is the key factor on which a new way of teaching should be based,

becoming a complementary resource to the child and offering multiple options,

suggestive ideas, and sources of support (Edwards, Gandini, & Forman, 1998, p. 83)."

> The central act of adults, therefore, is to activate, especially indirectly, the
> meaning-making competencies of children as a basis of all learning. They must

try to capture the right moments, and then find the right approaches, for bringing together, into fruitful dialogue, their meanings and interpretations with those of the children (p. 81).

Testing

What would we expect to see that might present differently in children taking part in early-exposure environmentally friendly education programs? Vygotsky (1978) believed that language and cognition develop along separate lines, to a point. At which time the two engage each other's development. Debate exists regarding the validity and accuracy of Vygotsky's theories with particular emphasis placed on his lack of experimental rigor in development of those ideas (Tomasello, 1996). Studies done over the next few decades have demonstrated that Vygotsky's theories on the influence of social aspects of language development, as well as Piaget's on stage-wise progressions, are not as incorrect as they are incomplete. Refinements and connections have been developed by several researchers (Gopnik, Metlzoff, and Kuhl, 1999; Rollins, 2003; Tomasello, 1996).

Gopnik, Metlzoff, and Kuhl, (1999) and Kudryavtsev (2011) hold that children employ words in creative ways to discover for themselves the deeper cultural meanings in words. The pathway is cyclical in how cognitive creativity allows the child to consider new meanings of words, which then allows the words to supply new meanings to cognition. If children are impacted by environmental exposure to the extent that the memory imprints upon the psyche as a significant life experience, then it is possible that the language use of the child might reflect that impact. Likewise, Diachenko (2011) states that imagination needs to be supported in order to fully develop, so if sensory rich

environments such as the forest are provided where children are prone to explore more with bugs, sticks, and animals while building hide-a-ways and forts, then perhaps the creative and divergent-thinking processes of young children (the precursors to imaginative play) would be enriched as well.

To identify cognitive differences within the discussed framework of language use and cognitive development synergism, the researcher needs to elicit developmentally-appropriate responses from pre-literate children. Divergent-thinking tests have the potential to provide such an avenue (Wallach & Kogan, 1965). Historically, these tests have been implicated in predicting gifted and talented potential and predicting creativity (Runco, 1992). Debate exists surrounding the ability of these tests to accurately discern these later traits. Within that debate is the identification of the components of creativity which includes the ability to present multiple responses to a single prompt (fluency), originality of responses, and depth of categories to which responses can be assigned (flexibility). Each of these can be ascertained from data elicited in divergent-thinking tests. Revisions in analysis by Runco (1992) better measured creativity from subject responses by rating each in terms of fields of response instead of rating individual responses. This has been demonstrated to be more reliable (Runco, 1992). The focus of this study is on the frequency of nature-based categories in the responses of young children and divergent-thinking tests selected and adapted to be age-appropriate serve these needs.

From the divergent-thinking testing, measures of the other factors were identifiable as well. Beyond nature-based flexibility, measures of frequency, originality, and creativity were also generated to further identify cognitive differences between

children attending the different school models that presented in language use. The

inquiry-based teaching philosophy of Reggio Emilia would seem to further support the

use of divergent-thinking tests. As both programs encourage the children to seek

multiple solutions to any given question, testing their abilities to generate many responses

to a single prompt is appropriate as it fits within the model of the student's normal

behavior expectations.

CHAPTER III

METHODS

Purpose of the Study

This study sought to identify the impact of a forest-immersion pre-kindergarten

school in terms of language use and unique response generation to tests of divergent

thinking.

Experimental School Recruitment

Six schools were identified as forest kindergartens (FK) or nature schools as a

result of a search using the Google Corporation's search engine. E-mails were sent to the

listed contact e-mail address on each identifiable school's web page, introducing the

project and inquiring about their interest in participating as the experimental group for

this study. Two schools were willing to connect me with former students, but not with

current students. Three schools expressed interest, but upon further discussions the scope

or expansiveness of two of those programs did not meet the study's needs of a daily, full-

immersion, forest-based, education program. The director of the remaining school

volunteered to approach her board of directors and teachers, all of whom agreed to

participate. From their pool of 41 students, 16 students attended the school two or more

days a week and 13 of those parents granted permission to include their child. These

students ranged in ages from $3 - 6$ years ($M = 52.2 \pm 12.3$ months).

Control School Recruitment

The control-group school was selected to match the demographics and characteristics of FK. The predominate characteristics of the area surrounding the experimental group included expansive and undeveloped virgin forest that was secluded from any major city. Sixty-nine percent of the encompassing county voted democratic in the last major presidential election (Kramer, Mayo, Schaul, & Zawilksi, 2012). The primary researcher had lived in a similar region that was removed by 50 miles from the nearest major city and encompassed 14,000 acres of mostly undeveloped forest. This small town housed the county's democratic presidential headquarters in 2008 and 2012. No set data were available to compare to the 69% democratic voting record of the community surrounding the FK program, but the prevailing attitude was liberal. The director of the local pre-school agreed to participate as the control for the study. Seventeen students were in the class ranging in ages from 3-5 years old ($M = 51.7 \pm 6.9$ months). The parents were contacted and all permitted participation for their child.

Nature of the Research Design

The primary objective for this study was to understand any observed differences in word-use and creativity between the children of the two program types. Demographics and attitudinal perspectives of the parents of each child were obtained to assess the ecocultural background with which each child enters the respective program. Significant differences in parents' characteristics might detract from any potential differences found in the children. Gaining insight from the child's home life offers an internal perspective

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to the children's foundational up-bringing. Finally, the teachers' backgrounds and personal teaching philosophies offers a final means of assessing common external influences thereby adding strength to any impact stemming from differences in academic programming.

Research Questions

1. Is there a greater cognitive connection of the child attending a forest-immersion school with the natural world as represented by more natural elements presented in ideations as compared to peers attending a traditional indoor school?

2. Does an early-exposure environmental-education program elicit measurable changes in a child's fluency on divergent-thinking tests as compared to peers attending a traditional indoor school?

3. Does an early-exposure environmental-education program elicit measurable changes in a child's originality on divergent-thinking tests as compared to peers attending a traditional indoor school?

4. Does an early-exposure environmental-education program impact a child's creativity as compared to peers attending a traditional indoor school?

Variables

The independent variable was the education program in which the child is enrolled. By engaging Reggio Emilia-inspired schools the hope was to study programs that were directed by the child's interests. This helped to remove teacher bias from daily classroom foci.

Dependent Variables

- Fluency – Total number of ideations

- Originality – Number of unique ideations as compared to the group

- Flexibility – Number of categories within the ideations

- Creativity - Process of having original ideas that have value

Null Hypothesis 1

Students attending forest immersion pre-kindergarten programs will have no significant differences in measures of nature-based flexibility responses on divergent-thinking tests as compared to students attending indoor pre-kindergarten programs.

Null Hypothesis 2

Students attending forest immersion pre-kindergarten programs will have no significant differences in measures of fluency on divergent-thinking tests as compared to students attending indoor pre-kindergarten programs.

Null Hypothesis 3

Students attending forest immersion pre-kindergarten programs will have no significant differences in measures of originality of responses on divergent-thinking tests as compared to students attending indoor pre-kindergarten programs.

Null Hypothesis 4

Students attending forest immersion pre-kindergarten programs will have no

significant differences in measures of the creativity of responses on divergent-thinking

tests as compared to students attending indoor pre-kindergarten programs.

Procedures

Procedures

Parents

Each parent received an information sheet that explained the purpose of the study

and the parameters. The parent's role in the study was also explained, because they hold

insight into student behaviors at home and can fill in personal demographic and

attitudinal information. A link to an on-line version of the same form included a place

for parental consent for child participation. Following the provision of consent there was

a questionnaire regarding parent's demographics and the New Ecological Paradigm

survey as developed by Dunlap et al. (2000). The final component was several option-

based and open-ended questions seeking information about the child's at-home

behaviors, attitudes, and imaginative preferences. Parents were assured of anonymity for

themselves and for their children.

Teachers

The teachers were interviewed in open-answer format as to their educational

backgrounds, teaching philosophy, and professional goals. The teachers' descriptions of

a typical day in the classroom and questions connecting their teaching to any known

pedagogy helped to identify major component of the program's attributes.

<p style="text-align:center">Students</p>

Two forms of divergent-thinking tests were selected. The first is called the Uses

test and the second the Instances test. In the Uses test a researcher presents a common

item to a testing volunteer and inquires in what ways the item could be used. The

Instances test asks the testing volunteer to name as many things as possible that fit within

a certain category (Wallach and Kogan, 1965).

Ward (1968) employed divergent-thinking testing from Wallach and Kogan

(1965) but felt that a battery of tests with a time limit was developmentally inappropriate

for young children. Instead, children were engaged in games under the two scenarios:

Uses and Instances. For both tests, children were invited to join a game in a one-on-one

session with the teacher. Both tests fall into the semantic category versus the figural

category, according to Guilford (1956), which supports its use with young children who

are just starting to employ language as a tool. This study employed Ward's methods.

Analysis developed by Harrington, Block and Block (1983) was employed for fluency

(number of responses), flexibility (number of unique categories of responses), and

originality (number of unique responses). Analysis of creativity, an adaptation by Runco

and Mraz (1992), used the same data, but assessed whole field responses from testing

volunteers, which generated a creativity score.

In the Uses test, the teacher began with a warm-up round and showed the student

a pencil, asking, "now I want you to tell me all the things you can think of that you can

do with a pencil, or play with it, or make with it. What can you use a pencil for?"

Responses are praised. After the child indicates there are no other answers, the teacher

offers three more potential uses: a boat mast, a flagpole, and a unicorn horn. Two more

items (yellow foam water-noodle and a broom made of twigs) are presented in succession

with the same verbal cues. Each response is recorded using a digital tape recorder and

video camera.

For the Instances test, the child is given a category and asked to name as many

things he or she can think of that would fall into that category. When the child indicates

that as many responses as possible have been given, the next category is given.

Categories include things that are pointy and things that are big. Each response is

recorded with the additional comment, noting whether or not the object is present in the

room.

The scenarios are presented to the children as games in which the researcher was

interested in as many ideas as the child could produce. All responses were praised with

equal enthusiasm. The children were never informed of the underlying purpose of the

study so that their responses were unique to their imaginations and not given to please

any adult. This was done to limit bias.

The directors of the two schools gave permission to approach their teachers,

parents, and students in the study. The researcher acted as the primary interviewer with

the assisting teacher present to engage the child where shyness was a concern. Because

these young children had built relationships with their surrounding adults, the presence of

the teacher greatly facilitated eliciting responses from children who may not have been

comfortable responding to the researcher.

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Data Analysis

Evaluators

Two sets of evaluators were recruited for the purpose of data analysis of students' responses. The whole-group creativity category required developing three review teams with multiple students in each. Twenty-one students volunteered to make 3 groups of 7. The nature-based flexibility category required three individual reviewers. In both cases college students were asked to volunteer with bonus points offered as incentives.

Parents

The New Ecological Paradigm survey groups its 15 questions into 5 subsets arranged as the hypothesized facets of an ecological worldview: 1) the reality of limit's to growth, 2) antianthropocentrism, 3) the fragility of nature's balance, 4) rejection of exemptionalism, and 5) the possibility of an ecocrisis (Dunlap et al., 2000). NEP survey employs likert-scale data and, therefore, the Mann-Whitney U test was used for identification of differences between the programs within each category of the survey. As the increased risk of a type I error increased with each subsequent t-test used for a given metric, the alpha level to compare these five subsets was held at $\alpha = 0.01$ or $1/5^{th}$ of the normal $\alpha = 0.05$. Demographic information was compared using Chi-squared goodness-of-fit.

Student responses

Four primary response characteristics were reviewed: fluency, originality, nature-directed flexibility, and creativity. Each response was coded by school, student, question, and response number. This blinded the researcher and any external judges during analysis. The null hypothesis was rejected at the 95% confidence level using 1-tailed tests where permitted by the statistic used.

Analyzing fluency required comparing the number of responses for each student between the two schools using Student's T-test. All of the responses from each question from uses, the foam noodle and the broom, were combined to create a composite score that went into the analysis. The same was done for instances and then all were combined for a total responses analysis.

In originality the researcher sought to identify uniqueness within the responses of each group. All responses from the two groups were coded by the frequency of occurrence. Responses were grouped by frequency of occurrence and Chi-squared goodness-of-fit was used to differentiate the schools.

To compare the schools in nature-directed flexibility, three judges, who were college students, were given a list of all student responses and asked to categorize each as man-made, naturally occurring, or not able to categorize in that dichotomy. The rating scale is adapted from Harrington et al. (1983). If the three ratings did not concur then a) the dissenting mark was eliminated or b) if all three were different then the response was removed from consideration. Chi-squared goodness-of-fit was used to analyze the resulting frequency counts.

Creativity, the final metric, required eliciting groups of judges to rank order student responses as proposed by Runco (1992). Three groups of seven judges were amassed and instructed on the how to judge creativity using the constructs of fluency, flexibility, and originality. Each group was provided with an envelope filled with response cards from a particular sub-question from the divergent-thinking test: one envelope for each of the foam noodle, broom, things that are pointy, and things that are big. Each card had a student's unique code and all of the responses given for that question. The judges were asked to order the cards by creativity. When finished with one envelope the group would then move on to the next until each group of responses had been ordered. Rankings for the foam noodle and the broom were averaged for each student and Mann-Whitney U test was used to generate the final data points for the uses category. The same was done for the pointy and big categories used in the Instances test. Finally, uses and instances scores were averaged to create a total response data point for each student and those were evaluated with the Mann-Whitney U test as well.

CHAPTER IV

RESULTS

Identifying the extent to which the use of the forest as the integrating educational context creates observable differences identifiable in the children, requires that several factors be ruled out as major contributors to that difference. The foundational teaching philosophy of schools and parent upbringing can both impact a child to such an extent that other factors cannot be isolated as the source of impact. In reviewing the results, foundational programmatic philosophies are compared first, followed by parent demographics and beliefs regarding the environment. The final section presents statistical analyses of child responses in terms of the proposed research questions.

Teachers from each program were referred to by identifying initials. EK and TK were from the forest kindergarten school and CP and KK were from the control school. Children and parents were referred to without identifiers, except for their school association.

Programs Description

Forest kindergarten

During an interview with EK, the executive director of the FK school, she explained,

> It is really scary to me that there are so many kids these days who are so disconnected with nature they actually hate being out in nature. It's not even that

they fear it, it's that they're so unimaginative in nature that they need all of these props to understand or feel comfortable with being outdoors.

She dreamed of "becoming a really good attorney for non-profit environmental groups that couldn't afford it." She wanted to fight for the environment. Unfortunately, fighting for the environment meant long hours inside court-rooms and law libraries. This would leave a significant hole in her personal connection with the outdoors. From summer employment over the years, overseeing a hot springs in a virgin forest, EK taught herself ethno-botany and began giving tours to the visitors. The tours led to nature-programming activities, such as camps and year-long training for adults. A position opened up to teach pre-school, presenting her with the opportunity to take her nature education to the youngest of students. When those children got excited that she was excited about the world beyond, or perhaps the world within, the playground, the idea of an outdoor preschool developed. She read Louv's (2008) *Last Child in the Woods* and found out that these schools existed en masse in Europe and she was sold. EK continues,

> …in 2007 we started putting out the call to the community that we were going to start this outdoor preschool and the first year we ran 2 mornings a week and we had 5 or 6 families with us and about midway through the year we upped it to 3 mornings a week. The second year we did 4 days a week. I could never have imagined what a success it would be.

Hungerford and Volk (1990) felt it necessary to instill sensitivity towards the environment with basic ecological knowledge weaved into the education. EK's first experience with children on the playground provided a glimpse of this sensitivity as a natural trait. "I truly believe that all children are born to want to interact with nature, and then, basically, it's the adults who are preventing that." Much of her teaching philosophy centers on the belief that children possess a natural curiosity and desire to engage with

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the surrounding environment. The connection that Hungerford and Volk sought to create

exists already as long as the opportunities to interact are presented to reinforce it.

Within that last statement lies EK's concern:

> One of the most important things and one of the things that concerns me the most is that people of my generation have an intuitive understanding of why it is beneficial because we all benefited from it. Everyone in my age range spent all of their childhood outdoors and when we came home from school we changed out of our school clothes and put on our play clothes because we knew we would get muddy and dirty. We would play outside after school until dinnertime and then go back out afterwards. When you have a personal experience in nature it develops a compassion in you and respect for it that helps you want to preserve it.

At this point EK references Chawla's (1999) correlational research connecting outdoor

experiences and adult mentorship as primary components of crucial experiences to

developing engaged environmental citizens. As EK compares her own story to those in

the studies, she reports that she has found it essential to provide children with that time to

play in the woods under proper adult guidance. In doing so her program is recreating the

childhood of her generation.

> My big concern is that if children are disconnected from nature, who are our future environmental stewards going to be? Who is going to care enough about nature and all of the components of the natural world to want to preserve it?

EK developed her program from a personal compassion for the outdoors. She

modeled hers after the schools in Northern Europe, which took many of their cues from

the Italian-based Reggio Emilia curricula that emerged in the 1940's and 50's (Edwards,

Gandini & Forman, 1998). She explains,

> We don't have any set lesson plans. Every day is a new learning experience. Organic and free flowing. We follow the children's lead. It's called interest-led or child-driven. The other component to our teaching philosophy is that it is inquiry based. The teaching style is that we don't give the children answers. We try to tease out all of the different multiple answers that a child could give to a certain question. All of our teachers are trained to continuously ask leading

questions. Avoiding any idea of there being a right or wrong answer, but trying to leave kids' minds open such that we encourage problem solving.

One of her teachers, TK, continues that line of thinking,

They're not [learning] because we're drawing on a chalkboard. They're like, "oh hey, I just made an A with a stick." Drawing, chalk, the leaves and counting, always counting. How many people are having snacks today? It's all here. It's a matter of teachable moments. If you follow their lead, all of that stuff happens.

Such a free flowing approach to early education seems counter-intuitive to the rising number of state standards that require specific types of information to be taught. That question was addressed by Inan, Trundle, and Cantor (2010). They studied a Reggio Emilia inspired school and found their inquiry-based education model for the natural sciences met or exceeded many of that state's education standards.

Control school philosophies

Reggio Emilia inspired student-centered concepts arose in conversation with the control school as well. The lead teacher, KK, explained that their school follows a student-directed Reggio philosophy as well.   She felt there were influences from other teaching paradigms such as Waldorf and Montessori (Pope, 2002), but their mission was anchored in a, "concept of child as an individual and seeing them as a person with interests rather than a child in school… I focus heavily on social and emotional [well-being] and problem-solving."

She went on to talk about the difficulties they had this year with their facilities. The building that the school normally functions out of is currently undergoing renovation so they are displaced. The current location lacks the expansive outdoor courtyard used for classroom activities and the wooded playground. Nature has become less of a day-to-

day occurrence and more of an intentional planned adventure through hikes and forays into the woods.

The next obvious question was, "How does nature fit into the paradigm of teaching the whole individual?" Her response:

> We need these kids out in the natural space…There are trees and rocks and sticks and leaves. You start using your imagination in working with the other kids. You have to be able to talk to the [other] kids. You have to be able to understand the social rules of play. Nature is a really good place for those children to be so [they] can get a practice for those skills.

The other teacher in the program, CP, responds to the same question: "It's their surroundings. They need to know their surroundings. They need to know that in different seasons the leaves change colors and why. It's an important fact and it's really cool if they can witness it."

Subject Description

Teachers

The backgrounds of the teachers vary widely, but the compassion for the job does not. There are three teachers at the FK school, EK, TK, and BK. EK earned a bachelor's degree in ecology and a juris doctorate. TK has a certificate in early-childhood education and a bachelor's degree in English. BK has a master's degree in language education. She has taught internationally and hopes to open her own program that centers on languages as the integrating context for early-childhood education. The Control school has two primary teachers: KK and CP. KK is actively pursuing her Master's degree in early-childhood education and CP has seven years of experience, but no degree. CP exemplifies compassionate care for the work and expresses interest to teach throughout

her career, which makes her a strong presence in the classroom. As above, the influence of the teacher's backgrounds will be further discussed in the discussion section.

Students

Thirteen students from the FK school and 17 from the control school participated in the study. Mean ages were 52.2 ± 12.3 months and 51.7 ± 6.9 months respectively and were found to be equal, $t(29) = 0.124$, $p = 0.902$. FK students had attended their school for an average of 18 ± 12 months and control students averaged 30 ± 7.7 months of attendance. Control school students have attended their program significantly longer, $t(17) = -2.824$, $p = 0.01$.

Parents

The upbringing of the child begins at home. The children spend much more time with their parents than they do the teachers at school, especially if some of these students had only been with their respective programs for 4 months. The attitudes of the parents regarding nature, engagement with the outdoors, and ecological perspectives were addressed in the optional survey sent out with the informed consent form.

No significant differences in age, $\chi^2(df=3) = 4.189$, $p = 0.242$, or education levels, $\chi^2(df=2) = 1.081$, $p = 0.582$ were observed. All but one person between the two schools identified themselves as Caucasian. Open-ended responses probed into the reasons parents elected to send their children to a particular school, what kinds of activities they prefer to do when the time presents itself, and reports about their children's regular use of electronic media.

Exposure to nature, education about nature, connection to the school property, community relationships fostered through school.

I liked the interest led model and wanted [my daughter] to develop a deep kinship with the outdoors. And to have an opportunity to connect, explore and play with other children in nature. Toys often suggest a form of cultivated play, while being outside with little manmade influence allows them to move beyond boundaries and traverse the undulating waves of their imagination.

Because I believe kids should be outside in nature and thrive there and because of the play to learn, child-led model.

The responses from parents of the FK program echo the teaching philosophy that EK described and even further the Reggio principles (Edwards, Gandini, & Forman, 1998). They can also be viewed as attempting to create Gruenewald's (2003a) critical pedagogy of place. A survey comment from a parent explains why they chose to enroll their child at this school:

Strong belief in the importance of nature in childhood brain development. He also loves being outside as do his parents and we wanted to foster that love.

The reason the children are outdoors is because their parents want the social interaction and the connection to nature.

KK and CP both stressed the importance of nature in developing the whole child, but nature is not the primary integrating context for their program. Again, the parents of the Control school reflect the philosophy in their responses:

Amazing teachers, the Reggio philosophy, the extra opportunities provided (field trips, music class, library time, etc.), the emphasis on building relationships.

Student driven and curiosity driven education, positive, peer-reinforced atmosphere.

Education, artistic enrichment, play and socialization.

Offers child-centered learning, unique learning opportunities and environments, and respects the individual child.

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One parent expressed concern for the loss of the natural play space in the

transition to the temporary accommodations of the school this year.

> We love the teachers and, when it was at [the other place], we loved the outdoor space and emphasis on play. The emphasis on play remains at [this year], but we miss the playground.

Some comments recognized connections with the outdoors, but as it is not a

primary philosophical or practical approach expressed by the school, the parents see the

excursions as field trips and playground time. The desire to be outdoors is virtually the

same. In questions inquiring about free-time after work, weekend activities, hobbies, and

vacation dreams parents were fairly consistent in the types of activities they presented.

FK school parents after work wanted to:

> Exercise and read.

> Go to the coffee shop with my boys.

> Cook, read, garden.

For some the question brought more amusement as free time and relaxation is not

much of a possibility.

> I don't really relax. I do laundry, dishes, paperwork, or music practice

> ha!

> relax? after work? Yes, please! No, really this mainly happens on the weekend.

> Comments were similar from the Control school parents

> Spend time with my kids and husband.

> Sit outside, work in the garden, feed and watch the wild birds, take our dog for a walk.

> Play with my child, be in nature, read.

Again, the stress of a full-time family impacts this demographic as well:

Being a full-time Mom with a part-time self-employed home-based business, I go

to bed when I'm finished with my day.

Reading was the most common response between the Control and FK schools (n = 4, n = 5, respectively). Beyond that, most responses were equal in frequency: playing with kids and/or family, going to a coffee shop, gardening and cooking. The biggest difference was perhaps in the complaint of being too busy for after work activities, which was a response only given by parents at the Control school. This identifies a possible difference between the parent groups. A question asked for job titles on the survey. The jobs listed for the FK school parents included 3 stay-at-home mothers, 2 emergency-service workers, 2 small-business owners, and a marketing director. The job titles for the Control school parents were predominantly in the education field (n = 7) as associate professors, lab coordinators, academic deans or instructor, plus 2 allied healthcare professionals, and one stay-at-home mother. Income level was not asked of the parents, but if significant differences in pay existed between these job types, then at-home stress levels or numbers of work hours may be different as well. Either job stress or work hours could change the perception or reality of free-time availability after work.

Similar comparisons with free-time activities and hobbies can be made. Most participants elected to exercise (Control, n = 5; FK n = 6). Hike (n = 4), cook/bake (n = 3), movies and read (n = 2 for each), music (n = 1), and garden (n = 1) made up the choices from the parents of Control children. The FK families elected to read (n = 5), spend time with friends and family (n = 5), garden (n = 3), and two each for music,

cook/bake, hike, and travel. One person from the FK school enjoyed volunteering with local organizations. Response types and frequency of enjoying outside activities were similar (combination of exercise, hike, and garden; FK, $n = 10$; Control $n = 11$). Weekend time looked very similar. Ten references from each group were made to spending time outdoors or in nature.

In general the parents presented with many of the same themes throughout the open-response questions. Children played with the same types of electronic media (tablets, computers, smart phones), and they watched television about the same amounts each week, $\chi^2(df = 3) = 1.24$, $p = 0.743$. The parents were interested in many of the same types of things and seemed to run their households in similar fashions.

The New Ecological Paradigm (Dunlap et al., 2000) survey provided some unique insight. Results are visible in Table 1. An individual's ideological beliefs would be very influential on a child. If the environment were something largely important to the parents then those perceptions might influence a child's worldview as well. A Bonferroni correction for $\alpha = 0.05$ sets $p \leq 0.01$. At this level there were no significant differences. The belief that an ecocrisis could result if human behavior maintained its present course had a p-value of 0.011 making it likely that a difference exists. A larger sample size may have resulted in a significant finding. Regardless, both groups positively viewed the possibility of a crisis, with the FK group considering a greater inevitability. The next closest comparison was in the belief that humans exist as the most important species on the planet ($p = 0.04$) and both groups believed along the same lines with the FK group trending towards a more agreeable sentiment with the given statements. The parents, as a group, appeared to be similar.

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Table 1

NEP comparison results for parent responses.

	df	U – value	p – value
Growth	24	69.5	0.65
Centrism	24	40.0	0.04
Balance	24	52.5	0.17
Exempt	24	61.5	0.38
Crisis	24	32.0	0.11

Programmatic differences

The two programs were both built upon the Reggio Emilia educational ideology.

The parents have more in common than they have in disagreement. Consequently, the

differences in the children appear to stem from how the educational programs present

their curricula. At this point it would help to understand the setup for each school. The

atmosphere and the daily activities set the stage for understanding how the impact is

garnered in the educational setting.

Control

A small, liberal-arts college creates the town within which the Control school

exists. It is 50 miles to the nearest large city. The air temperature cools 10^0 F just to

drive up the mountain to reach the area. It feels isolated and protected to be within the

20,000 acres of protected forest land. Logging has not occurred here in the past 100 years.

The school exists in its current form in the basement of a university multi-use activities building. To get there, park and walk down the cobbled sidewalk through newly-built wooden gates to an open wall of windows. The inner auditorium is bathed in natural light. It is here that they have created three runways of classrooms to suit the three ages of students within the school. Teachers explain how they creatively arrange the furniture to prevent alleys through which kids can generate any significant amount of indoor running momentum. The furniture is arranged into small stations. Each station contains a different activity or set of objects from which children can invent their own activities. A station for small wooden blocks, a station for art projects, one for dress-up and make-believe, and another for manipulatives, all fill the runway (the one that should not have any running in it). At the far end of the oldest classroom's space there lies a carpet for gatherings, such as group storytime, phonics-based songs, or play. Small tables with small chairs create a family-style eating space where children are encouraged to serve themselves and, each other, and to socialize.

The day flows with a certain rhythm. CP greets each student as they begin arriving at 7:30 AM. They trickle in through about 8:30 AM so she has a unique chance to talk with them individually, assess how their day is beginning, and engage them in some free play or an activity of their preference. The child-directed foci of the program are immediately noticeable. Free-play continues until 8:30 when they clean up and have a family meeting on the carpet to discuss the day and sing some songs. They then gather their things and get bundled up to head out to the playground where, again, they have

self-directed play-time. At 10:00 AM everyone heads back inside for snacks. Mealtimes function to help teach mutual respect, as they are family style and require shared community snacks.

After snack-time students clean up together and choose stations to play at until lunch. Each of these play times creates scenarios for developing appropriate socialization and expansion of imaginative abilities.   The afternoons tend to be more regimented as lunch comes at noon and then naptime until 2:15 PM. The children gather for book time until 2:45 PM and the afternoon snack arrives at 3:00 PM. Parents come through anytime from 3:00 – 5:00 PM to pick up their children and go home.

As described by KK and CP, the focus is on child-directed choice of activities as free-play options dominate the morning hours. The schedule above references the observed days, which occurred in the middle of winter. Nature hikes and outdoor excursions return to the normal routine when outside temperatures stay above 55^0 F. Despite the strong influence of Reggio Emilia, teachers would typically develop topical lesson plans for the week. A lesson plan on water would offer many opportunities to play in and experience water, but there would be a given component that focused on conservation. As such, the Control school spent time each week on environmentally-directed behaviors through focused lessons.

<p style="text-align:center">Forest kindergarten</p>

The drive to the forest kindergarten (FK) school required a 5-point turn as the driving instructions were ignored and the GPS led down a road flooded in a storm the night before. Upon correcting the mistake it turned out that no one else had much luck

that morning either. EK was in search of a chainsaw to remove the tree branch that fell

and blocked the entrance. Everyone walked to school that day.

The FK is set back on five acres of land in a remote section of a virgin forest

nestled on an island that is only accessible by ferry. The properties surrounding the

school are all individual homeowners, each on their own acreage. The relationship with

those neighbors has not always been easy for the FK as hordes of playing children defeats

the remote isolation that some may look for in this type of location. EK says the current

owners are much more amenable to a peaceful coexistence with her school.

Massive trees towered over the gravel driveway to a drop-off area that was not

going to be used that day. A small path snaked its way into the forest. A mud-splashed

welcome sign that identified the school sat at the trailhead. Its vibrant colors were muted

by the mud that splashed up from the previous night's rain.

Four man-made structures lie within the first 50 yards of the path. The first is the

teachers' cabin where supplies are secured. Further up the path is a 10x10 covered picnic

table with a wood-burning stove marking the only place the children can go to get a

reprieve from bad weather. This serves as the lunch area and where student interviews

were held.   An old single-room building sits off to the side. It was at one time EK's

personal house, but now sits in wait of another purpose. Beside it is the composting

toilet. There is no plumbing, no electricity, and no telephone lines. A quick check to my

cell phone assures me we aren't alone, however. That thought is reinforced by the

airliner flying overhead taking its leave from the city across the bay.

As children arrive they are greeted by one of the 3 teachers. The teacher engages

the child and gets a feel for the attitude of the day. She helps identify interests and

redirect negative energy. Parents all arrive within about 20 minutes of each other depending on which ferry they caught to get to the island. Teachers corral the group until the majority is present, and then the students dictate where they want to go. They choose the forest theater. A light dusting of snow covers a log. One of the boys rushes ahead and jumps to the other side. He opens a snow-cone bar. Most of the others get excited and rush up to the bar and place their orders. He proceeds to make snow cones for all who ask. Within the scenario, the boy creates a fee system for his business. The teachers engage just enough to help the younger students count out the appropriate currency. Once the snow is used up the students elect to continue their trek to the theater.

Along the way, a student will begin playing with a leaf or notice a moss on the ground. EK stops with them and asks what they have found. "What is it? What does it smell like? Do you think it would go well in our lunch-time tea?" Anytime a child engages with the teacher the focus is on the child finding her own path, her own set of answers.

All of the games come from observing the surrounding area and creating their own props. The teachers stay close by and engage when it's necessary, but they really focus on observing for teachable moments. A teacher might engage a child who distances him/herself from the group, but even conflicts are let to resolve on their own. The peer-to-peer relationship building comes from respectful engagement and the teachers allow the students to work through those conflicts. The energy of the group begins to fade around 10:45 AM and the teachers take this as a cue to move back to main camp and have a snack. Beyond the arrival and departure, time serves as a guideline not a schedule. The sense of timelessness fits into EK's perception that a lack of a schedule

eliminates time from the experience. Play until the game works itself out. Engage the interest of the child until the focus drifts.

For snacks the children sit at a picnic table and EK serves them. One of the teachers takes the observation book and begins recording the day's games and activities. A log of each day and any major observations creates a record of science, math, pre-writing, and other learning that has happened. The book is at least a year old and filled with countless examples of child-directed learning.

After snacks the group moves out to another area: the puddle. Even if the rain-proof pants and bomb proof boots allow some water inside, little time remains where any major discomfort from cold could impact a child's enjoyment. The teachers vigilantly watch the children to make sure that all are accounted for, but also to read for signs of discomfort or disconnect. EK relates stories of meltdowns in which one child went past the point of comfort and began to cry, which induced two other children to step over the line. She emphasizes the importance of reading the emotional well-being as a means to a successful day. Ultimately, the parents arrive and the children part ways.

As a connection to nature is an overtly expressed desire of the FK program, the teachers do very little to impose their beliefs upon the children. Beyond requiring a respect for each other, the teachers sought to guide the children's interests. In doing so, the students were not over-burdened with conversations centering on global environmental calamities or even the "right" kind of behaviors such as recycling and conservation. The children's day was filled with self-directed play in a natural space with the teachers providing guidance towards teachable moments in developmentally-appropriate lessons like basic math, letter recognition, and art.

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Student Analysis

In each testing scenario, a child and a teacher sat at a bench and played games with the researcher. Imagine with me. I want to know your ideas. What can this be? How could you play with this? What can you pretend it could be? They gave their answers to the Uses test. Now tell me all of the things you can think of that are big, or that are pointy. Again, they gave their answers. Four students made the scenario interesting.

One young lady wanted nothing to do with the game. Her active thoughts were consumed by an imaginative playscape, and the questions being asked did not fit into that storyline. Participation was entirely voluntary, so her story created the dialogue and no usable data was collected from her. Another had no desire to talk. She was exceptionally shy and withdrew when the game started. The smile came back to her face when she rejoined her classmates. A young man really felt like he needed to be near EK, except EK was not the teacher playing the game with us. The teacher managed to coax him into playing the uses game, but afterwards he cognitively left us to rejoin the class before he ever physically left the table. The last unique child spoke French as his primary language. Thankfully, his mother was a teacher in another class and she volunteered to assist in translation. He had a particular fondness for dinosaurs in his responses that day and had plenty of ideas to offer throughout the game.

Students were tested outdoors at both schools. As a connection to nature is a component of both schools, children from both programs were comfortable with the environment despite the cold (38-40^0 F at both locations during testing week). FK

students ($m = 857.77 \pm 253.52$ seconds) took significantly longer to answer questions than did control school students ($m = 623.53 \pm 202.00$ seconds), $t(df = 28) = 2.720$, $p = 0.011$. Many in the FK school would stop to go observe the Towhees playing in the bushes or to get props for their responses. Two students in the Control school got out of their seat, but it was only to act out parts and not interact with their surroundings. In this observation, mannerisms were different between the two groups in giving responses. Results for the four main tests are visible in table 2.

Table 2

Analysis of student scores on measures of fluency, creativity, originality, and flexibility

	Uses			Instances			Total combined		
	df	Statistic value	p value	df	Statistic value	p value	df	Statistic value	p value
Fluency	27	$t = 0.91$	0.185	26	$t = 2.44$	0.011*	26	$t = 2.05$	0.026*
Creativity	27		0.077	26		0.008**	27		0.034*
Originality	2	$\chi^2 = 3.72$	0.156	2	$\chi^2 = 0.79$	0.67			
Flexibility	1	$\chi^2 = 4.71$	0.03*	1	$\chi^2 = 0.01$	0.906	1	$\chi^2 = 2.39$	0.122

* = Significant at $\alpha=0.05$ **= Significant at $\alpha=0.01$

Null hypothesis 1

Students attending forest immersion pre-kindergarten programs will have no significant differences in measures of nature-based flexibility responses on divergent-thinking tests as compared to students attending indoor pre-kindergarten programs.

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The null hypothesis for flexibility was accepted for the Uses test χ^2(df=1) = 4.71, p = 0.03, but not for the instances, χ^2(df=1) = 0.01, p = 0.906. The combined responses comparison was not significant, χ^2(df=1) = 2.39, p = 0.122.

Null hypothesis 2

Students attending forest immersion pre-kindergarten programs will have no significant differences in measures of fluency on divergent-thinking tests as compared to students attending indoor pre-kindergarten programs.

The first null hypothesis was rejected, t(df = 26) = 2.05, p = 0.026 using student t-test. Significant differences were found in the Instances test t(df = 26) = 2.44, p = 0.011, but not the uses, t(df = 27) = 0.91, p = 0.185. One student elected not to continue with testing upon completion of the Uses test. That student's data was not considered in the overall combined comparison of fluency scores.

Null hypothesis 3

Students attending forest immersion pre-kindergarten programs will have no significant differences in measures of originality of responses on divergent-thinking tests as compared to students attending indoor pre-kindergarten programs.

The null hypothesis for creativity was accepted for both measures of originality, uses, χ^2(df=2) = 3.72, p = 0.156 and instances, χ^2(df=2) = 0.79, p = 0.67.

Null hypothesis 4

Students attending forest immersion pre-kindergarten programs will have no significant differences in measures of creativity of responses on divergent-thinking tests as compared to students attending indoor pre-kindergarten programs.

The second null hypothesis was rejected, (df = 26), $p = 0.034$. The Instances test was significant, (df = 26), $p = 0.008$, but the Uses test was not (df = 27), $p = 0.077$. Again, one student did not participate beyond the Uses test and was removed from the data pool for the combined comparison.

Summary

Originality was the one category that had no significant differences in either the Uses or the Instances tests. The combined comparisons for fluency and whole-group creativity, but the individual tests were different. Differences in the data elicited in the fluency Instances test were significant ($p = 0.006$) but differences in the data from the Uses test was not ($p = 0.085$), which trends towards significance, but fails to meet the 0.05 level. The same is true for creativity scores. Differences in instances data was significant ($p = 0.008$), but uses data was just shy of a significant level ($p = 0.077$). Nature-based flexibility presented results in the opposite direction. The Instances test data was not significantly different ($p = 0.906$) but Uses test data was ($p = 0.03$).

In all three categories the FK program scored higher in one test or the other at a significance level of $\alpha < 0.05$. The null hypothesis that the groups are the same is rejected. It is possible that those values that trend towards significance would be more

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definitive in one category or the other with more data points to compare. Participant numbers were limited as schools typically only have a maximum of 10-20 students per class. Larger sample sizes can be developed by repeating this study over more years or by recruiting more schools to participate. The latter solution is difficult as there are only a handful of forest kindergarten programs in the country. Sample size impacts the parent surveys as well. As discussed earlier, the NEP survey had two sections where the null was accepted, but the *p*-value was close indicating a trend may exist.

CHAPTER V

CONCLUSIONS

Introduction

In light of global environmental challenges, researchers (Australian Government, 2009; Chawla 1999; Gruenewald, 2003c; Sobel, 2008) identified the need to engage youth with wild spaces as a means of developing environmentally literate citizens who exercise responsible environmental behavior. Worster and Abrams (2005) found that a person's sense of connection to an ecocultural location enhanced the development of environmentally-friendly behaviors. Their study attempted to empirically connect the early-years' experience of children with professional job-choices. As a retrospective study it allows stronger evidence to demonstrate the link between experience and behavior than do the correlational studies from previous years. Worster and Abrams (2005) do not identify any means of creating those experiences or the effectiveness of programs that try to do. Forest-immersion programs attempt to develop this connection of the child with nature within the context of an educational setting. The extent to which these programs impact the child's developing mind have yet to be considered in research studies. This chapter reviews the research question, provides discussion on implications and looks forward to future directions needed for this area.

Purpose of the Study

This study sought to identify programmatic effects in language use through the developmental lens of Piaget (1954) and Vygotsky (1978). In asking open-ended divergent-thinking questions to children currently enrolled in forest-immersion schools, the student's responses were compared in terms of the frequency of use of nature-based words to students enrolled in a matched control school. An increased use of these words is theorized to be tantamount to increased adhesions that child maintains with nature. Such a connection would explain the impact that early-childhood experiences have on later-life behaviors, such as career paths (Chawla, 1999; Pease et al., 1997; Worster & Abrams, 2005).

Other research questions sought to use the data collected from divergent-thinking tests to identify other differences that may occur in fluency, originality, and creativity of thought. The implications of these differences provides evidence regarding the impact of nature to help develop these skills at a young age.

Overview of Literature Review

Environmental-educational paradigms seek to develop the individual within the mindset of protecting their ecocultural surroundings. If changes to the larger culture are going to have an impact on the current assessments of local and global environmental health, then programming needs to be identified that is effective in its efforts to develop the desired behavioral traits. Hungerford and Volk (1990) theorized that to do so the educational approach must first engage the emotional interest of the student to elicit

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change. To date, research studies have largely considered impacts on grade-school-aged students in formal education settings through short-duration studies (Billig, S., Root, S., & Jesse, D., 2005; Duffin, M., Powers, A.L., Tremblay, G., & PEER Associates, 2004; Duffin, M., & PEER Associates, 2006). To what extent these programs have developed life-long active citizens who regularly engage in pro-environmental behaviors has yet to be determined.

Chawla (1999) and Pease et al. (1997) found that many current environmental activists connected their personal narrative of who they are and why they do what they do back to formative experiences in early childhood. Those experiences in natural spaces and the influence of an adult mentor were attributed to positive environmental behaviors that include a desire to actively seek change through their work. The missing component surrounding their research lies in the development of causation. To address this short-coming, Kals, Schumacher, and Montada (1999) connected nature affinity from past events as a predictor of future environmental ability, but again their work addressed retrospective analysis of participants. No studies have been conducted that seek to consider the effects of engagement with nature through an educational setting on the development of environmentally-protective behaviors.

Gruenewald (2003b) encourages an educational paradigm he calls a "critical pedagogy of place" to bridge this gap in the research. However, seeking to focus education on engaging the natural world and reconnecting an interdependence with the land as a primary integrating goal has been challenged by other activists as a secondary concern within a world of violence and inequality (Gruenewald and Smith, 2008). Deeper consideration of these other more important views opens discourse regarding the

underlying environmental problems from which they cultivated. Control of land yields

control of assets, which leads to power. Gruenewald (2003a, 2003c) focuses his writings

on the need to educate from the context of a place, which means studying the use of land

to understand historical contexts for discrimination, poverty, and violence. From this

perspective the environment weaves the story that can connect the student to their local

science and history while embracing the land and the environment as key terms within

the discussion and not extraneous add-ons. "A focus on the lived experience of place

puts culture in context, demonstrates the interconnection of culture and environment, and

provides a locally relevant pathway for multidisciplinary inquiry and democratic

education (Gruenewald and Smith, 2008, p. 148)."

Sobel (1998) approached the connection of the individual with place through a

different direction. He began by speaking with students and identifying their connection

with place at a younger age through play. By asking children of multiple cultures and

countries to draw maps of their immediate surroundings he was able to see the evolution

of age and developmental ability through exploration and land use. Children would

naturally find places to build forts in and around their homes and those domains would

grow as the children adventured out more. Sobel (2008) outlines the importance of these

experiences, but does not have causative data to connect such experiences with

environmental activism. His focus is more on the idea that if children in many different

cultures all seek these types of experiences, then society should work to promote their

existence as a basic need of the developing mind.

The forest immersion programs seek to connect many of these pieces. The free-

play scenarios found in the narratives of Pease et al. (1997) and Chawla (1999) are found

in EK's timelessness approach to her Reggio-inspired, child-led education. The integration of the five aces of the school as the teaching context creates age-appropriate place-based education of Gruenewald (2003b). Sobel (2008) outlines design principles for childhood and nature such that children have the ability to experience this free-play in the natural world. Adventure, fantasy, and imagination, animal allies, and maps-and-paths concepts, described in Sobel's writings are all integral to the forest immersion approach.

The last piece of the puzzle is to identify the emotional engagement of Hungerford and Volk (1990). In that component lies a complex issue. Identifying trait development desired for particular behavior patterns that may not show up for years to come in pre-literate children creates many challenges. My research connects several decades of theory and research to hypothesize an approach.

Vygotsky (trans. 1978) theorized that language and cognition developed along parallel lines up to a point. At that point the two overlap and begin to work synergistically. It was not until Gopnik (1984) and Gopnik and Metlzoff (1984, 1992) connected an infant's cognitive comprehension of an idea with the first utterances of a specific word that Vygotsky's theory was supported through experimentation. "Uh-oh" presented verbally at the same time that cause-and-effect activities were comprehended and "all-gone" presented when object permanence understanding was achieved. Once the child grasps that objects, and therefore their associative words, can be categorized, a naming explosion happens and the child's vocabulary exponentially increases from 55 words at sixteen months to 10,000 by thirty months.

Piaget (1937/1954) theorized that the egocentric mind differentiates itself from the external world. In most cases this objectifying process is incomplete, because emotional attachments called adhesions prevent complete separation. In looking to identify the emotional attachment to behavior through educational processes, as described by Hungerford and Volk (1990), it seems that the point is to create or support the maintenance of Piaget's adhesions. Such desired adhesions would be a theoretical explanation of place attachment and the resulting environmentally responsible behavior, which has been described by many (Leopold, 1949; Hungerford and Volk, 1990; Sobel, 1993; Tuan, 1979) and empirically addressed more recently (Kals, Schumacher & Montada, 1999; Worster & Abrams, 2005). If an educational program such as a forest-immersion pre-kindergarten hoped to develop emotional entry-level traits, those traits would potentially last a lifetime (Piaget's adhesions). Considering Vygotsky (1978) and Gopnik, Meltzoff, and Kuhl's (1999) interconnection of language and cognition, the purpose of this study was to assess the hypothesis that those adhesions would present in differences in word selection and use.

Research Questions

The research questions addressed in this study were:

1. Is there a greater cognitive connection of the child attending a forest-immersion school with the natural world as represented by more natural elements presented in ideations?

2. Does an early-exposure environmental-education program elicit measurable changes in a child's fluency on divergent-thinking tests as compared to peers attending a traditional indoor school?

3. Does an early-exposure environmental-education program elicit measurable changes in a child's originality on divergent-thinking tests as compared to peers attending a traditional indoor school?

4. Does an early-exposure environmental-education program impact a child's creativity as compared to peers attending a traditional indoor school?

Research Design

To answer the research questions, a quasi-experimental research design was implemented. Students at two existing early-childhood educational programs, a forest-immersion and a matched control, were compared in order to assess for underlying changes potentially created by those programs. Divergent-thinking tests appropriate for the age group of concern (3-6 years old) were given over the course of two weeks to all students who volunteered to participate. Various methods of comparing data samples were used including Chi-squared, Student's T-test, and Wilcoxon U. Data was also collected via interviews of parents and teachers as well as surveys for the parents.

Summary of Findings

No significant differences were found between the parents of the two groups of children. The hypothesis that the forest-immersion school impacted the language use of the children attending was accepted.

Research question 1: Is there a greater cognitive connection of the child attending a forest-immersion school with the natural world as represented by more natural elements presented in ideations? A significant difference exists between the two groups: χ^2(df=1) = 4.71, p = 0.03 (Uses test).

Research question 2: Does an early-exposure environmental-education program elicit measurable changes in a child's fluency on divergent-thinking tests as compared to peers attending a traditional indoor school? A significant difference exists between the two groups: t(df = 26) = 2.44, p = 0.011(Instances test).

Research question 3: Does an early-exposure environmental-education program elicit measurable changes in a child's originality on divergent-thinking tests as compared to peers attending a traditional indoor school? No significant differences existed in measures of originality between the two groups: uses, χ^2(df=2) = 3.72, p = 0.156 and instances, χ^2(df=2) = 0.79, p = 0.67.

Research question 4: Does an early-exposure environmental-education program impact a child's creativity as compared to peers attending a traditional indoor school? Significant differences exist between the two groups: (df = 26), p = 0.008 (Instances test), which is significant at $p < 0.01$.

Summary

A significant difference was found between the two groups. The Forest Kindergarten (FK) group used more nature-based words in their ideations, which suggests a cognitive impact stemming from their educational environment. Despite both

programs employing a Reggio Emilia-inspired teaching philosophy, the students in the FK program expressed greater numbers of ideations and higher creativity scores as well.

Conclusions

"It is only in the mind that shining adventure remains forever bright (Leopold, 1949, p. 150)." Hungerford and Volk (1990) present those cognitive connections of the mind as the base requirement to developing long-lasting behavior change. Kals, Schumacher, and Montada (2005) identified activities that develop an affinity for nature can occur in early or present-day life, but, regardless, they predict environmentally-protective behaviors. In a time when considerable damage occurs to the natural world, developing such behaviors becomes an important concern.

Conclusion 1

Students attending the forest-immersion pre-kindergarten program assessed in this study demonstrated a difference in vocabulary use that reflects an underlying cognitive difference as compared to their counterparts in a traditional indoor setting. FK students were more connected with the natural environment than their peers.

Conclusion 2

Students at the FK school had developed greater numbers of ideations than their peers. With any given test item the FK students took longer to answer to complete the task and presented more ideas.

<center>Conclusion 3</center>

The FK school did not appear to foster greater originality in student responses. Students in each program presented the same number of overall unique responses to the test items with which they were challenged. An outdoor setting may not increase the original thought processes of the children.

<center>Conclusion 4</center>

Students in the FK school showed greater creativity in their response sets.

Discussion

The results of each research question leave some room for interpretation and discussion. Significant differences exist between students participating in forest-immersion education programs and students participating in predominately indoor classrooms, but only one of the tests in each category was significant in the case of fluency, creativity, and flexibility. In measures of creativity, the two groups were significantly different in the Instances test ($p = 0.008$) and trended towards significance for the Uses test ($p = 0.077$). The differences between the groups for measures of fluency were significant for the Instances test as well ($p = 0.011$), but not for differences in responses from the Uses test ($p = 0.185$). With more students in a follow-up study the results may be clearer regarding overall impact.

Analysis of the groups on measures of flexibility is a little cloudier. The data showed the groups to be significantly different in the Uses test ($p = 0.03$), but the same

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with a 90% confidence in the Instances test ($p = 0.906$).   Understanding why the

instances and Uses tests resulted in data sets so strikingly different needs to be reviewed

in future studies.

Reggio Emilia

The philosophical descriptions of the two education programs, both entrenched

within the Reggio Emilia framework, are very similar. Both focus on a child-directed

educational approach using an inquiry-based model of teaching. Both programs feel a

deep connection to nature as an important component of developing the whole child. The

programmatic differences lie in the depth to which nature is used as an integrating tool.

The FK school immerses children in the forest. KK's expression of nature on learning

the social rules of play is taken farther in the FK school as those children must spend all

of their school time engaging with the natural world as a primary source of imaginative

play. Since the focus of this study is on the impact of forest immersion, having the two

programs stemming from the same foundational philosophies helps minimize teaching

style as a threat to internal validity.

Language exposure

As both programs use similar core teaching constructs of Reggio Emilia-based

pedagogies they each have similar interests in nature-based vocabularies. No attempt

was made to differentiate the extent of potential differences between the vocabulary sets

of the children. Normalizing for underlying pedagogy of the schools, for parent

influences, and for exposure to nature outside of the normal school day was an attempt to

control for significant differences in vocabulary acquisition. It is possible to argue that differences in frequencies of categorical word use could come from the over-exposure the FK children had to a different language set, but the Control school had more directed time towards environmental and conservation behaviors within the teachers' approaches to lesson-plan development. Finding significant differences in the cognitively connected aspects of creativity, fluency, and originality reinforce the association of language as an indicator of an underlying cognitive influence. That cognitive influence was developed from the FK program which sought to connect a cognitive bond through experience rather than environmentally-directed lesson plans, as was the case in the Control school.

Implications

The child's mind does not need to objectively separate the internal self from the external world to wholly develop. In those adhesions lie the passionate connections that empower people to act upon the external world and seek to make a change. Forest-immersion education programs offer a means of recreating the free, wild, childhood playscape that underlies the narrative of environmental activists and environmentally-responsible behavior. Cognitive changes that the teachers of the FK program sought to develop are reflected within the language use of their students. The programs connect the child's cognitive development with the natural environment and should be expanded.

As addressed in the limitations section, this study does not seek to identify the predictive nature of early-childhood experiences, but instead identify cognitive impacts that develop as a result of extensive time spent exposed to nature. Significant life experience research (Chawla, 1999; Pease et al., 1997, Tanner, 1980; Wells & Lekies,

2006) correlates adult narratives of early-life experiences with their present day behaviors and beliefs. In part, this study sought to reinforce that research by identifying cognitive impacts in children who are engaged in experiences similar to those noted by Chawla (1999) and Pease et al. (1997).

Ultimately, many factors will continue to sculpt the behaviors and attitudes of children of both programs. Rather than consider this to be a predictive study, it makes more sense to understand that these early-cognitive impacts are the planting of a seed. The teachers in the FK school seek to engage the child such that the nature-immersion fosters a love and respect for the natural world that surrounds her, with hopes that these impacts lead to life decisions that embrace the value of the natural world.

Recommendations

Future research

Ultimately, this was a small cohort of students in both programs. Greater numbers of student participants would help define existing differences more and potentially settle questions left by trending analyses. The study should be repeated.

Researchers should also follow these same students as they progress in their education. A longitudinal study would also provide definitive answers regarding long-term impact on behaviors, which would provide validating evidence regarding the connection of cognition and language. Twenty years from now, reviewing a narrative by these children discussing their early-life memories would be a very interesting study. A continuation of this study that followed these students using tools that progressed accordingly with age development would have the potential to reveal more information

about the validity of other probative tools such as the nature-affinity surveys of Kals, Schumacher, and Montada (2005) and Tanner's (1980) significant life experiences narrative approach.

Students have studied in forest-immersion education programs for almost three decades, as the concept developed in Sweden in 1985 (Robertson, 2008). Significant life-experience research has the potential to further validate the worth of studying young children attending these schools. By interviewing those first students, now well into their careers, it would be interesting to obtain their recollection of formative life experiences and see what their current perceptions are on climate change as well as their choice of professions.

This study should be done in comparison to a public school system as well. Matching the FK program to another Reggio Emilia-based school helped validate the results by removing threats to internal validity. Reggio teaching philosophies encourage the child to learn from their own interests, from inquiry, and from play. The teachers at the control school openly recognized the importance of time spent connecting with nature, which is a luxury that many public school programs do not have. Comparing the results of this study to data collected in various geographic locations of public schools might demonstrate even greater effect.

Identifying how much exposure is necessary to develop these cognitive impacts would be beneficial as well. Knowing how many school hours a week are necessary to work to develop an affinity or at least a comfort within the outdoors could help guide public programs in their weekly planning. It may be necessary to follow the academic progress of students who attended an FK program to identify reading or math skill levels

to know if the FK program focused enough for students to continue to excel on high-stakes testing.

Professional directions

Without teaching any words of concern towards global climate change, a significant impact has presented in the cognitive connection of young FK children to their natural environment. Some of these children were only involved in the program two days a week. More early-childhood, educational experiences need to be developed in this country to begin creating a cohort of adults who embrace an affinity to the natural world and want to protect it.

REFERENCES

Alsop, S., Dippo, D., & Zandvliet, D. B. (2007). Teacher education as or for social and ecological transformation: Place-based reflections on local and global participatory methods and collaborative practices. *Journal of Education for Teaching: International Research and Pedagogy, 33*(2), 207-223. doi:10.1080/02607470701259499

Anglin, J. (1993). Vocabulary development: A morphological analysis. *Monographs of the Society for Research and Child Development, 58*(10).

Australian Government Department of Education, Employment and Workplace Relations for the Council of Australian Governments. (2009). *Belonging, being and becoming: Early years learning framework for Australia.* Retrieved from Australian Government Department of Education, Employment and Workplace Relations website: http://www.deewr.gov.au/Earlychildhood/Policy_Agenda/Quality/Documents/Final%20EYLF%20Framework%20Report%20-%20WEB.pdf

Barrie, J. (Writer/Director). (2005). *Kilowatt ours.* [Motion picture]. United States.

Billig, S., Root, S., & Jesse, D. (2005). The impact of participation in service-learning on high school students' civic engagement. Retrieved from Center for Information & Research on Civic Learning & Engagement website: http://www.civicyouth.org/circle-working-paper-33-the-impact-of-participation-in-service-learning-on-high-school-students-civic-engagement/

Bloom, L. (1973). *One word at a time: The use of single word utterances before sytax.* The Hague: Mouton.

Caillier, S. L., & Riordan, R. C. (2008). Teacher education for the school we need. *Journal of Teacher Education, 60*(5), 489-496. DOI: 10.1177/0022487109348596

Center for Disease Control. (1992, September 4). Public health focus: Effectiveness of smoking-control strategies – United States. *Morbidity and Mortality Weekly Report, 41*(35), 645-647, 653. Retrieved from the Center for Disease Control website: http://www.cdc.gov/mmwr/preview/mmwrhtml/00017511.htm

Chadwick, A. (2001) Coltan mining and East Congo's gorillas. Retrieved
from the National Public Radio website
http://www.npr.org/programs/re/archivesdate/2001/dec/20011220.coltan.html

Chawla, L. (1999). Life paths into effective environmental action, *The Journal of Environmental Education, 31*(1), 15-26.

Chawla, L. (2002). The natural world as prepared environment. *The North American Montessori Teacher's Association, 27*(3), 130-48.

Chukovsky, K. (1968). *Two to five.* Berkeley, CA: University of California Press.

Civic Impulse, 2012. S. 1372 (112th): No Child Left Inside Act of 2011. Retrieved
from GovTrack http://www.govtrack.us/congress/bills/112/s1372

Cobb, E (1959) The ecology of imagination in childhood. *Daedelus, 88*(3), 537-48.

Diachenko, O. (2011). On major developments in preschoolers' imagination.
International Journal of Early Years Education, 19(1), 19-25.
doi.10.1080/09669760.2011.570996

Disinger, J. (1983). Environmental education's definitional problem. ERIC
Clearinghouse for Science, Mathematics and Environmental Education
Information Bulletin, 2. Retrieved from the University of Idaho website
http://www.cnr.uidaho.edu/css487/EE_Definitional_Problem.pdf

Duffin, M., Powers, A.L., Tremblay, G., & PEER Associates. (2004). Place-based
education evaluation collaborative: Report on cross-program research and other
program evaluation activities, 2003-2004. Retrieved from S0179855C-0179858D

Duffin, M., & PEER Associates. (2006). Portrait of an urban elementary school: Place-
based education, school culture, and leadership; An evaluation of Project CO-
SEED at the Dennis C. Haley Elementary School, 2003-2006. Retrieved from
http://www.peecworks.org/PEEC/FV4-0001B458/S01798147-01B63AD3

Duncan, R. M. and Tarulli, D. (2003). Play as the leading activity of the preschool
period: Insights from Vygotsky, Leont'ev, and Bakhtin. *Early Education & Development, 14*(3), 271-292.

Dunlap, R., Van Liere, K., Mertig, A., & Jones, R. (2000). Measuring endorsement of the
New Ecological Paradigm: A revised NEP Scale. *Journal of Social Issues, 56*(3),
pp. 425-442.

Edwards, C., Gandini, L., & Forman, G. (Eds.) (1998). *The hundred languages of children: The Reggio Emilia approach – advanced reflections.* Westport, CT: Ablex publishing.

European Commission, Joint Research Centre (JRC)/PBL Netherlands Environmental Assessment Agency (2011). *Emission Database for Global Atmospheric Research (EDGAR), release version 4.2*. http://edgar.jrc.ec.europe.eu

Fenson, L., Dale, P., Reznick, S., Bates, E., Thal, D., Pethick, S., Tomasella, M., Mervis, C., & Stiles, J. (1994). Variability in early communicative development. *Monograph of the Society for Research and Child Development, 59*(5).

Fjørtoft, I. (2001). The natural environment as a playground for children: The impact of outdoor play activities in pre-primary school children. *Early Childhood Education Journal, 29*(2), 111-117.

Freire, P. (1972). *Pedagogy of the Oppressed.* New York, NY: Continuum International Publishing Group.

Friedman, T. (2009, March 7) The inflection is near? *The Washington Post*. Retrieved from http://www.nytimes.com/2009/03/08/opinion/08friedman.html?_r=2

Gobdey, G (2009). *Outdoor recreation, health, and wellness*. Washington, DC: Resources for the Future.

Gopnik, A. (1984). The acquisition of gone and the development of the object concept. *Journal of Child Language, 11*, 273-92.

Gopnik, A, Metlzoff, A., Kuhl, P., (1999) *The scientist in the crib*. New York, NY: William Morrow and Company, Inc.

Gopnik, A., & Metlzoff, A. (1984). Semantic and cognitive development in 15 to 21-month-old children. *Journal of Child Language, 11*, 495-513.

Gopnik, A., & Metlzoff, A. (1992). Categorization and naming: basic-level sorting in eighteen-month-olds and its relation to language. *Child Development, 63*, 1091-1103.

Gopnik, A., & Metlzoff, A. (1997). *Words, thoughts, and theories*. Cambridge, MA: The MIT Press.

Gopnik, A., & Wellman, H., (1994). The theory theory. In L. A. Hirshfeld & S. A. Gelman (Eds.), *Mapping the mind: Domain specificity in cognition and culture*, (pp. 257-93). New York: Cambridge University Press.

Gough, S., & Scott, W. (2007). Higher education and sustainable development: Paradox *and possibility*. London: Routledge.

Gruenewald, D.A. (2003a). The best of both worlds: A critical pedagogy of place. *Educational Researcher*, *32*(4), 3-12.

Gruenewald, D.A., (2003b). At home with the other: Reclaiming the ecological roots of development and literacy. *The Journal of Environmental Education, 35*(1), 33-43.

Gruenewald, D.A., (2003c). Foundations of place: A multidisciplinary framework for place-conscious education. *American Education Research Journal*, *40*(3), 619-654.

Gruenewald, D.A. & Smith, G.A, (Eds.). (2008). *Place-based education in the global age*. New York: Lawrence Erlbaum Associates.

Guilford, J.P. (1956). The structure of intellect. *Psychological Bulletin, 53*(4), 267-93.

Harrington, D., Block J., & Block J. (1983). Predicting creativity in preadolescence from divergent thinking in early childhood. *Journal of Personality and Social Psychology, 45*(3), 609-623.

Hartig, T., Mang, M., & Evans, G. (1991). Restorative effects of natural environment experience. *Environment and Behavior, 23*, 3-26.

Hillcoat, J., Forge, K., Fein, J., & Baker, E. (1995). I think it is really great that someone is listening to us…" *Environmental Education Research, 1*, 159-71.

Hollich, G. J., Hirsh-Pasek, K., Golinkoff, R. M., Brand, R. J., Brown, E., Chung, H. L., Hennon, E., Rocroi, C., Bloom, L. (2000). Breaking the language barrier: An emergentist coalition model for the origins of word learning. *Monographs of the Society for Research in Child Development, 65*(3).

Hungerford, H. & Volk, T. (1990). Changing learner behavior through environmental education. *Journal of Environmental Education, 21*, 8-21.

Inan, H., Trundle, K., Kantor, R. (2010). Understanding natural sciences education in a Reggio Emilia-inspired preschool. *Journal of Research in Science Teaching*, *47*, 1186-1208.

Independent Commission on Environmental Education, (1997). *Are we building environmental literacy?* Washington DC: ICEE.

Jenson, B. (2000). Health knowledge and health education in the democratic health-promoting school. *Health Education 100*(4), 146-153.

Kals, E., Schumacher, D., & Montada, L. (1999). Emotional affinity toward nature as a motivational basis to protect nature. *Environment and Behavior, 31*(2), 178-202.

King, L. (2008). About last night. *Larry King Live*. Retrieved from http://www.youtube.com/watch?v=irKZV2JYJOE

Kramer, D., Mayo, J., Schaul, K., & Zawilksi, M. (2012, November 27). 2012 Washington state election results. *The Seattle Times*. Retrieved from http://seattletimes.com/flatpages/politics/2012-washington-election-results.html

Kudryavtsev, V.T. (2011). The phenomenon of child creativity. *International Journal of Early Years Education, 19*(1), 45-53. doi:10.1080/09669760.2011.570999

Kuhl, P. K., (1987). Perception to speech and sound in early infancy. In P. Salapatek & L. Cohen (Eds.) *Handboook of infant perception: Vol. 2. From perception to cognition* (pp. 275-382). New York: Academic Press.

Leopold, A. (1949). *A sand county almanac: with essays on conservation from Round River*. United States: Oxford University Press, Inc. Retrieved from http://eebweb.arizona.edu/faculty/Bonine/Leopold1949_GreenLagoons-150-158.pdf

Louv, R. (2008). *Last child in the woods*. Chapel Hill, NC: Algonquin Press.

McCune-Nicolich, L. (1981). The cognitive bases of relational words in the single word period. *Journal of Child Language, 8*, 15-34.

Moore, R. C. (1986). The power of nature: Orientations of girls and boys toward biotic and abiotic play settings on a reconstructed schoolyard. *Children 's Environments Quarterly, 3*, 52-69.

National Environmental Education Advisory Council (1996). REPORT Assessing environmental education in the United States and the implementation of the national environmental education act of 1990. Retrieved from http://www.d.umn.edu/~tbates/educ5236-1/report.pdf

National Research Council Institute of Medicine. (2000). *From neurons to neighborhoods*. Washington, D.C.: National Academy Press.

Nelson, C. A., & Bloom, F. E. (1997). Child development and neuroscience. *Child* Development, 68, 970-987.

North American Association for Environmental Education (2012). What is environmental education? Retrieved from http://www.naaee.net/what-is-ee

Pease, J., Rankin, M., Verdon, K., Reisz, R.(1997). Why landowners restore wetlands: A national survey. *Iowa State University: University Extension*, Ames, Iowa.

Perry, T. (October, 2009). Some troops have a sixth sense for bombs. *LA Times*. Retrieved from http://articles.latimes.com/print/2009/oct/28/world/fg-bombs-vision28

Piaget, J. (1937/1954). *The construction of reality in the child.* New York: Basic Cooks. (Original work published 1937).

Pink, D. (2005). *A Whole New Mind*. Riverhead Books: New York, NY.

Pisik, B. (2009). Congo's mineral wealth lures exploiters. *The Washington Times*, Retrieved from http://www.washingtontimes.com/news/2009/sep/8/congo-mineral-wealth-lures-exploiters/?page=all

Porter, J., Craven, B., Khan, R., Chang, S., Kang, I., Judkewitz, B., Volpe, J., Settles, G., & Sobel, N. (2007). Mechanisms of scent tracking in humans. *Nature Neuroscience, 10*(1), 27-29. doi:10.1038/nn1819

Price, H. E. (2010). Does No Child Left Behind really capture school quality? Evidence from an urban school district. *Educational Policy, 24*(5), 779-814. DOI: 10.1177/0895904710376564

Redmond, I. (2001) Coltan boom, gorilla bust: The impact of coltan mining on gorillas and other wildlife in the Eastern DR Congo. Retrieved from http://www.bornfree.org.uk/animals/gorillas/conservation-research/

Robertson, J. (2008). Swedish Forest Schools. United Kingdom: Creative STAR Learning Company.

Robinson, K. (2010, October 14). RSA Animate – Changing Education Paradigms [Podcast]. Retrieved from http://www.youtube.com/watch?v=zDZFcDGpL4U

Rogers, T. (1979). *Those first affections. An anthology of poems composed between the ages of two and eight.* London: Routledge & Kegan Paul.

Rollins, P. (2003). Caregivers' contingent comments to 9 month infants: Relationships with later language. *Journal of Applied Psycholinguistics, 24*(2), 221-234. DOI: 10.1017/S0142716403000110

Romm, J. (2009) Is the global economy a Ponzi scheme? Retrieved from

http://thinkprogress.org/romm/2009/03/08/203784/ponzi-scheme-madoff-friedman-natural-capital-renewable-resources/

Rose, K., Morgan, I., Ip, J., Kifley, A., Hyun, S., Smith, W., & Mitchell, P. (2008). Outdoor activity reduces the prevalence of myopia in children. *Ophthamology, 115*(8), 1279-1285. doi: 10.1016/j.ophtha.2007.12.019

Runco, M. & Mraz, W. (1992). Scoring divergent thinking tests using total ideational output and a creativity index. *Educational and Psychological Measurement, 52*, 213-221. doi: 10.1177/001316449205200126

Saylan, C. & Blumstein, D. (2011). *The failure of environmental education*. University of California Press: Berkeley

Shusler, T., Krasny, M., Peters, S., & Decker, D. (2009). Developing citizens and communities through youth environmental action. *Environmental Education Research, 15*(1), 111-127.

Smith, R. (2012). Cheap natural gas unplugs U.S. nuclear-power revival. *The Wall Street Journal.* Retrieved from http://online.wsj.com/article/SB100014240527023044598045772814901291536 10.html?mod=WSJ_article_forsub

Sobel, D. (1996). *Beyond Ecophobia: Reclaiming the heart in nature education.* Great Barrington, MA: Orion Society.

Sobel, D. (1998). *Mapmaking with children: Sense of place education for the elementary years.* Portsmouth, New Hampshire: Heinemann.

Sobel, D. (2008). *Childhood and nature: Design principles for educators*. Portland, Maine: Stenhouse Publishers.

Sobel, D. (2012, July). Look, don't touch. Orion Magazine, Retrieved from http://www.orionmagazine.org/index.php/articles/artcle/6929

Tanner, T. (1980). Significant life experiences: a new research area in environmental Education. *Journal of Environmental Education, 11*(4), 20-24.

Tomasello, M., and Farrar , M. J. (1984). Cognitive bases of lexical development: Object permanence and relational words. *Journal of Child Language, 11*, 495-505.

Torrance, E.P. (1981). Creativity teaching makes a difference. In JC Gowan, J. Khatena, and EP Torrance (Eds.) *Perspectives in Creativity*, pp. 278-296. Chicago: Aldine.

Tronto, J. (1993). *Moral Boundaries: A political argument for an ethic of care.* New

York: Routledge.

Tuan, Y. (1979). *Topophilia: a study of environmental perception, attitudes, and values*. New York: Columbia University Press.

Urbina, I. (2011). Insiders sound alarm amid natural gas rush. *NY Times.* Retrieved from http://www.nytimes.com/2011/06/26/us/26gas.html?_r=2&hp

US Department of Education. (2008). Overview: Four pillars of NCLB. Retrieved from http://www2.ed.gov/nclb/overview/intro/4pillars.html

Veraksa, N. (2011). Development of cognitive capacities in preschool age. *International Journal of Early Years Education, 19*(1), 79-87. doi: 10.1080/09669760.2011.571003

Vygotsky. L. S. (1978). *Mind and Society: The development of higher psychological processes*. Cambridge, MA: Harvard University Press.

Wallach, M. & Kogan, N. (1965). *Modes of thinking in young children.* New York, NY: Holt, Rinehart, and Winston, Inc.

Ward, W. (1968). Creativity in young children. *Child Development, 39*(3), 737-754.

Wells, N., Lekies, K. (2006). Nature and the life course: Pathways from childhood nature experiences to adult environmentalism. *Children, Youth and Environments, 16*(1), 1-24.

Worster, A.M. & Abrams, E. (2005). Sense of place among New England commercial fishermen and organic farmers: implications for socially constructed environmental education. *Environmental Education Research, 11*(5), 525-535. doi: 10.1080/13504620500169676

APPENDIX A

INFORMED CONSENT

You are receiving this letter because your child is currently between the ages of three and six years old and attends a childcare facility that has volunteered to participate in this research. I am conducting a study on the impact of school environments on childhood imagination and language development. This form seeks your permission for your child to be involved as a participant in the study. Please understand that in no way does your granting permission mandate your child's participation. If at any time your child elects not to participate he/she can end the game and return to class.

I would also like you to complete the survey following this permission form. Family demographics, open-ended questions about your perceptions of your child's interests, and a quick survey about your activities will help identify family differences between the programs that may influence the outcomes. Your survey will be anonymous.

Nature of the study

Developmental theorist, Lev Vygotsky, believed that a child's thinking and language develop along separate lines in the first years of life. As the child gets older, the two lines intertwine and influence each other. The purpose of this study is to identify if differences exist in divergent thinking (a component of creativity) and language use by students going through different types of early childcare.

No unique programming will be added to your child's day. This study is considered ex post facto meaning I am assessing differences that may already exist. The interview procedures will also be done in as minimally disruptive a manner as possible to your child's day.

Procedures

Your child will be invited be his/her teacher to play a game. The game will take approximately ten minutes in a one-on-one scenario. There are two parts to the game. In the first part your child will be presented with a recognizable object, such as a pencil, and asked to identify all of the ways the object can be used. In the second part the student will be given a category, such as things that are big, and asked to name as many different things that fit into that category.

Sessions will be audio and video recorded as a means of accurately transcribing student responses. Both audio and video records will be destroyed as soon as transcription is complete.

Risks

Again, both scenarios will be entirely done by your child's teacher so no unknown individuals will be introduced. There are no foreseeable risks to the child as the activities are based upon normal daily activities. Your child may, at any time, elect to stop participating without any repercussions.

Please refer to the following website for parental consent and parent survey.
www.surveymonkey.com (website to be identified soon)

Thank you
Feel free to contact me with any questions
Reid Fisher   Reid_A_Fisher@hotmail.com

APPENDIX B

NEW ECOLOGICAL PARADIGM SURVEY

5-point Likert scale questionnaire.

1)   We are approaching the limit of the number of people the earth can support
2)   Humans have the right to modify the natural environment
3)   When humans interfere with nature it often produces disastrous consequences
4)   Human ingenuity will insure that we do NOT make the earth unlivable
5)   Humans are severely abusing the environment
6)   The earth has plenty of natural resources if we just learn how to develop them
7)   Plants and animals have as much right as humans to exist
8)   The balance of nature is strong enough to cope with the impacts of modern industrial nations
9)   Despite our special abilities humans are still subject to the laws of nature
10)   The so-called "ecological crisis" facing humankind has been greatly exaggerated
11)   The earth is like a spaceship with very limited room and resources
12)   Humans were meant to rule over the rest of nature
13)   The balance of nature is very delicate and easily upset
14)   Humans will eventually learn enough about how nature works to be able to control it
15)   If things continue on their present course, we will soon experience a major ecological catastrophe

Survey details
Five hypothesized facets of an ecological worldview
1)   reality of limits to growth (1, 6, 11)
2)   antianthropocentrism (2, 7, 12)
3)   fragility of nature's balance (3, 8, 13)
4)   rejection of exemptionalism (4, 9, 14)
5)   possibility of an ecocrisis (5, 10,15)

APPENDIX C

PARENT SURVEY

PARENT SURVEY

Zip code of your house (to identify inside/outside of the town of Sewanee)

How many children are in your household?

Ages?

Highest level of your education

Occupation

Does your family use a recycling bin in the home?

What do you like to do to relax?

What do you like to do in your free time? Hobbies?

Where did you go for your last vacation?

Where would you like to go on your next vacation?

What kinds of things do you like to do on holiday/long weekends?

Describe a typical weekend?

Describe your evening routine with your family from the time your kids get home from school through bedtime.

Does your child help make dinner on a regular basis?

Let's now focus on the child(ren) involved in this study,

On average, how much time does your child spend on any electronics at home? What kinds?

Can your child manipulate a mouse without assistance?

Does your child typically watch television after school?

Before bed?

Does your child have a television in his/her room?

What are your child's favorite books? If it makes it easier – what are the themes of preferred books?

VITA

Reid Fisher hails from many places around this country. He was born in Albany, Oregon, to parents Rand and Christi Fisher and still loves to take long walks on the beach near Waldport. From the age of four until twelve he resided in the great state of Texas where he was thoroughly brain-washed into the larger-than-life Texan culture. High school in Atlanta furthered an appreciation for southern culture and pecan pie. After completing his undergraduate education at Southwestern University he moved with his new bride, A'ndrea, to Sewanee, TN where he earned his master's degree in Health and Human Performance from the University of Tennessee-Chattanooga. A brief two-year interlude to work as the head athletic trainer and faculty for Eastern Nazarene College in Quincy, MA with adjunct work directing the cadaver lab for Northeastern University's athletic training education program allowed Reid and A'ndrea to appreciate the fortune they had in southern living and return to Sewanee for another 6 years. St Andrew's-Sewanee School opened a whole new world of opportunities as Reid was able to use his outdoor background from Oregon and his doctoral pursuits in education to teach adventure education to middle-school students. Near the completion of his degree he moved his wife and two young children back to the motherland of the Texan hill country to take a faculty position in athletic training and rehabilitation science at the University of the Incarnate Word. He lives in New Braunfels, TX with amazing wife, two rockin children, two dogs, and a rabbit named Turtle.