THE EFFECTS OF AN ART-BASED ENVIRONMENTAL EDUCATION PROGRAM ON CHILDREN'S ENVIRONMENTAL PERCEPTIONS

by

AMI ALESE FLOWERS

(Under the Direction of Gary T. Green and John P. Carroll)

ABSTRACT

Across the United States, children are becoming increasingly isolated from the natural world, as modern technologically-advanced lifestyles keep or draw children indoors—trading authentic-outdoor experiences for indoor-computerized play. This lack of exposure to nature may have an adverse affect on children's environmental perceptions. Environmental education (EE) is one possible solution that may help children re-connect with nature, however these programs need to use the most effective methods of teaching and learning. The inclusion of art activities is one enhancement to EE curriculum that may improve participant understanding and knowledge of the environment. This study evaluates the effectiveness of using art activities and art evaluations within one-week day-camp summer programs for children, ages six to twelve, in Athens-Clarke County, GA. Results reveal that children participating in both traditional and art-based EE programs develop positive environmental attitudes, greater environmental awareness, increased knowledge and understanding of nature, and are more likely to participate in stewardship activities.

INDEX WORDS: Art, Children, Children's drawings, Environmental attitudes, Environmental awareness, Environmental education, Nature

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AMI ALESE FLOWERS

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AMI ALESE FLOWERS

Major Professor: Gary T. Green
John P. Carroll

Committee: Stacey Neuharth-Pritchett
Gene Wright

Electronic Version Approved:

Maureen Grasso
Dean of the Graduate School
The University of Georgia
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DEDICATION

To my brother, H. Jared Flowers, and my parents, Hank and Debra Flowers, for your unyielding love, support, inspiration, and constant encouragement to do great things.

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INTRODUCTION

Children today are growing-up detached from the natural world, lacking authentic experiences and unstructured free-play in the outdoors—a dis-concerning trend referred to as "nature-deficit disorder" (Larson, Green, & Castleberry, 2011; Louv, 2008). There are many reasons why children are spending more time indoors rather than outdoors including: parental fears of child abduction, accident liability, increased amounts of homework, and overly-planned schedules (e.g., soccer practice, piano lessons, gymnastic meets, baseball games)(Clements, 2004; Louv, 2008). This growing "backseat generation" is mainly exposed to nature while sitting in the backseat of a car, staring out the window on the way to after-school activities, but this exposure is no substitute for hands-on experience with nature (Karstan, 2005; Louv, 2008).

The main factor drawing children indoors is technology. From television to video games, internet to music players, children are interacting more with digital screens than with their local outdoor spaces (Wason-Ellam, 2010). One particular study showed that children 8-18 years-old average 6.5 hours a day of electronic media (Roberts & Foehr, 2008) and can identify cartoon characters like Pikachu© and SpongeBob Squarepants© with ease but cannot identify local oak or pine tree species (Balmford, Clegg, Coulson, & Taylor, 2002). Although children's perceptions of nature are affected by many factors such as family background and previous outdoor experiences, most children are influenced by exposure to idealized nature produced by electronic media (Anderson & Moss, 1993; Keliher, 1997). These stereotypical images show nature as "pristine and peaceful," initiating a learned response in young children where nature is understood to be un-touched by human hands and only exists in places that few get to truly see and experience. Thus children fail to realize that nature is in their own backyards or local parks. As children grow into adults, these perceptions may not change without some form of intervention (Anderson & Moss, 1993; Keliher, 1997).

With global environmental issues on the rise, the future of the world's resources and natural areas may well rest in the hands of many of these children. For this reason and others, it is important that children learn and understand environmental issues and concepts and gain first-hand experience in the great outdoors (Louv, 2008). There are many benefits to children spending time outside in nature. Multiple studies demonstrate that spending time outdoors teaches children to be more creative, builds confidence, develops concentration skills, increases attention spans, improves problem-solving abilities, gives a sense of belonging, and relieves stress as children escape overly planned lives (Burdette & Whitaker, 2005; Matthews, 1992; Wells, 2000; Wells, 2003). Solutions to nature-deficit disorder are possible both within the home and school environment: families can create time and activities in nature such as spending an afternoon at a local park or visiting a zoo, while schools can develop curriculum with more hands-on outdoor activities and use of environmental education (EE) curriculum (Louv, 2008). However, an integrated approach that encompasses both formal and non-formal EE strategies with innovative and engaging program activities such as art, maybe the most promising to combat nature-deficit disorder and get children outdoors (Lieberman & Hoody, 1998).

Problem Statement

Environmental education programs are widely used as a means to help increase children's interactions with, understanding, knowledge, and perceptions of nature. However, the actual impact of these programs and individual curriculum activities remains unclear due to a general lack of research on innovative and engaging approaches to teaching and learning. Furthermore, there also exists a lack of consistent valid and reliable survey instruments for measuring the effects of EE programs on children's environmental perceptions. In fact, a review of existing literature reveals:

1) An insufficient understanding of existing environmental perceptions and knowledge among diverse groups of urban and suburban children;

2) An absence of research on the effect of traditional and art-based EE programs on different aspects of children's environmental perceptions and knowledge;

3) A need for further investigation on the influence of EE programs on children with varying demographic backgrounds (socio-economic status and ethnicity);

4) A lack of consistent valid and reliable survey instruments for measuring the impacts of EE programs on children's environmental perceptions and knowledge;

5) A need for further research on the efficiency of using quantitatively (Likert-type statements) and qualitatively (drawings) assessment methods in EE evaluation; and

6) Insufficient development of scoring rubrics for drawing assessments that are user-friendly (i.e., teachers and educators) and adaptable across a broad spectrum of EE curriculum.

Statement of Purpose and Research Objectives

The purpose of this study was to construct a valid and reliable survey instrument for measuring children's environmental perceptions and then to measure the impact of an art-based environmental education program on children's environmental perceptions and knowledge. The design of this study was based on the following objectives:

1) To develop a valid and reliable survey instrument for measuring children's environmental perceptions using both quantitative (Likert-type statements) and qualitative (drawings) assessment methods;

2) To develop a valid and reliable scoring rubric for assessing the qualitative (drawings) component of the survey instrument;

3) To establish a baseline measure of children's environmental perceptions across different gender (girls and boys), age (6-7, 8-9, 10-12 year olds), ethnic (African American, Asian, Hispanic/Latino, White/Caucasian), and income levels (low, high) using both quantitative (Likert-type statements) and qualitative (drawings) assessment methods; and

4) To evaluate the effects of two types of one-week environmental education programs (one using traditional approaches, one focused on art-based activities) compared to a general one-week summer camp program on children's environmental perceptions across different gender (girls and boys), age (6-7, 8-9, 10-12 year olds), ethnic (African American, Asian, Hispanic/Latino, White/Caucasian), and income levels (low, high) using both quantitative (Likert-type statements) and qualitative (drawings) assessment methods.

Thesis Format

This thesis is written in manuscript format. Chapter I introduces the study and presents general research objectives with purpose statement. Chapter II provides a detailed overview of past research on environmental education programming, art activities, and art evaluation tools. Chapters III and IV are manuscripts that will be submitted for publication, describing the research methodology conducted within this study and associated results, and Chapter V contains a summary and conclusion of the entire research project.

- Chapter I – Introduction, Problem Statement, Statement of Purpose, Research

Objectives, and Thesis Format

- Chapter II – Literature Review
- Chapter III – Using Art in Environmental Education Program Evaluation
- Chapter IV – The Effects of an Art-based Environmental Education Program on Children's Environmental Perceptions
- Chapter V – Summary and Conclusions

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CHAPTER II

LITERATURE REVIEW

Children today are growing-up detached from the natural world, lacking authentic experiences and unstructured free-play in the outdoors—a dis-concerning trend referred to as "nature-deficit disorder" (Larson et al., 2011; Louv, 2008). There are many reasons why children are spending more time indoors rather than outdoors including: parental fears of child abduction, accident liability, increased amounts of homework, and overly-planned schedules (e.g., soccer practice, piano lessons, gymnastic meets, baseball games)(Clements, 2004; Louv, 2008). This growing "backseat generation" is mainly exposed to nature while sitting in the backseat of a car, staring out the window on the way to after-school activities, but this exposure is no substitute for hands-on experience with nature (Karstan, 2005; Louv, 2008).

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With global environmental issues on the rise, the future of the world's resources and natural areas may well rest in the hands of many of these children. For this reason and others, it is important that children learn and understand environmental issues and concepts and gain first-hand experience in the great outdoors (Louv, 2008). There are many benefits to children spending time outside in nature. Multiple studies demonstrate that spending time outdoors teaches children to be more creative, builds confidence, develops concentration skills, increases attention spans, improves problem-solving abilities, gives a sense of belonging, and relieves stress as children escape overly planned lives (Burdette & Whitaker, 2005; Matthews, 1992; Wells, 2000; Wells, 2003). Solutions to nature-deficit disorder are possible both within the home and school environment: families can create time and activities in nature such as spending an afternoon at a local park or visiting a zoo, while schools can develop curriculum with more hands-on outdoor activities and use of environmental education (EE) curriculum (Louv, 2008). However, an integrated approach that encompasses both formal and non-formal EE strategies with innovative and engaging program activities such as art, maybe the most promising to combat nature-deficit disorder and get children outdoors (Lieberman & Hoody, 1998).

The Value of Environmental Education

Environmental education (EE) programs are one possible solution that may help ameliorate the effects of nature-deficit disorder. To understand the value of EE, it is important to consider the origin of the field. On April 22, 1970, the very first Earth Day marked the birth of the modern-day environmental movement. This momentous occasion launched the beginning of a pivotal form of conservation known as environmental education. Spreading internationally, the United Nations adopted the Belgrade Charter in 1976, defining the goal of environmental education as:

> "…to develop a world population that is aware of, and concerned about, the environment and its associated problems, and which has the knowledge, skills, attitudes, motivations, and commitment to work individually and collectively toward solutions of current problems and the prevention of new ones (p. 3)(NAAEE, 2004; UNESCO, 1975)."

The following year, the Tbilisi Declaration was adopted and established three objectives for EE based on the original Belgrade Charter: 1) to foster environmental awareness, 2) to provide opportunities to acquire the knowledge and skills needed to protect and improve the environment; and 3) to promote positive attitudes and behaviors towards the environment (NAAEE, 2004; UNESCO, 1977). In 1990, the United States adopted the National Environmental Education Act creating initiatives to expand EE into public schools (EPA, 1990). The current purpose of EE is to provide individuals with the knowledge, skills, and experience necessary to conserve and preserve the environment for all living organisms and future generations (Moseley et al., 2010). However, whether or to what extent EE may enhance children's environmental literacy, change attitudes and behaviors positively towards environmental stewardship, and thus ameliorate the effects of nature-deficit disorder remains unknown (Inwood, 2012).

Studies show that integrating EE into school curriculum improves student performance on standardize tests and enriches science courses, generating student interest and participation (Bartosh, Tudor, Ferguson, & Taylor, 2006; Paterson, 2010). The National Environmental

Education Foundation (NEEF) found that EE in schools increases GPA, science grades, improves reading and writing skills, critical thinking, and attitudes about learning (Paterson, 2010). During a survey on going "green" in the classroom, 95% of parents agreed that EE should be a larger component of their child's school curriculum (Paterson, 2010). In comparing scores on standardized tests and environmental literacy measures between school children participating in integrated systemic EE curricula (e.g., designed around real-world environmental subjects) or traditional curricula, children who participated in EE programs scored higher than children in traditional school programs (Bartosh et al., 2009). This research suggests children benefit from EE programs throughout multiple disciplines, teaching children how to live sustainably while also helping schools meet testing standards (Bartosh et al., 2009). Two prior studies by Lieberman and Hoody (1999; 2000), also found that children from schools with environment-based programs had higher scores on standardized tests in math, reading, writing, science, and social studies. These studies conclude that school programs integrating EE curriculum provide students with space and time to make connections between school learning and the real world, improving attitudes and motivation towards school, learning, and grades (Bartosh et al., 2009).

Furthermore, EE programs both inside the classroom and at local nature centers are a means of service-learning and transformational teaching; teaching children to care about the world while at the same time making a difference in the world (Aldridge & Goldman, 2007). Children ask questions about local environmental issues, research the issues, brainstorm with one-another to problem-solve, come up with solutions, and then implement the solutions (Strevy & Kirkland, 2010). Through this methodology and others, studies show that EE programs improve children's knowledge of nature, environmental attitudes, and environmental awareness (Larson, Green, & Castleberry, 2010)—the three components that compose environmental literacy (Athman & Monroe, 2007). Consequently, outdoor learning experiences can be more effective than traditional indoor classroom learning, from field trips to neighboring freshwater ecosystems to visiting science centers or participating in summer camps, basic knowledge of environmental concepts and local habitats are enhanced through EE programs (Cronin-Jones, 2005; Zoldosova, 2006).

Larson et al. (2010) investigated the use of one-week EE summer programs at the State Botanical Gardens of Georgia on children's environmental orientations and knowledge, comparing pre- and post-test scores between children (ages 6-13) participating in a EE summer program and those in a non-EE after-school program. Baseline pre-test scores confirmed that both groups had similar environmental knowledge, while post-test scores showed that children participating in the EE summer program improved significantly across environmental orientations and knowledge (Larson et al., 2010). Results suggest non-formal outdoor programs provide ideal platforms for stimulating positive environmental orientations in diverse groups of children (Larson et al., 2010). This research and others highlight the benefits of informal EE as an opportunity to make environmental learning entertaining, fun, and enjoyable while being multi-dimensional through the 'teaching-and-learning' process (Alerby, 2000; Bowker, 2007; Larson et al., 2010; Tofield et al., 2003; Zoldosova, 2006).

Zoldosova (2006) explored the use of informal science education at the Science Field Center in Slovakia where 153 children attended a 5-day long field trip program. Children who attended the field trip program showed greater interest in science related topics and also preferred books with science themes more than children who did not attend (Zoldosova, 2006). Results concluded that the use of informal learning situations enhanced children's preferences and perceptions of science-related-topics (Zoldosova, 2006).

The goal of EE is to help children achieve environmental literacy, with the objectives of: raising environmental awareness, increasing knowledge and understanding of natural systems, promoting positive attitudes and participation, instilling moral and ethical environmental values, and enhancing skills to identify and solve problems (Carr, 2004; Meyers, 2004; UNESCO, 1977). The goal of environmental literacy is to foster and develop informed and competent future stewards of the environment (van Staden, 2006). To do so, EE programs need to be the most effective they possibly can be in order to achieve these objectives within a broad and diverse population of children—every educational opportunity must be transforming (Reinsborough, 2008).

Research has shown that characteristics of effective EE programs include: 1) relevance to the organization, audience, and content of the local area; 2) stakeholder involvement (agency supervisors, teachers, parents, etc) throughout the stages of the program (development to evaluation); 3) empowerment of children with skills necessary to prevent, address, and solve environmental issues while instilling a sense of personal responsibility; 4) accurate and balanced materials, consisting of multiple perspectives and interdisciplinary components; 5) promote quality education and effective teaching across diverse disciplines; 6) instructionally sound, using the best methodologies in education; and finally 7) evaluation with appropriate tools (Athman & Monroe, 2007; Inwood, 2008). Specifically within these characteristics, the most important might be the use of instructionally sound methodologies and evaluation with appropriate tools because of the different ways children learn and comprehend information as they develop.

Children's Cognition Theories

From a young age children value environmental features and experiences because of an inherent appreciation, interest, and concern for animals (Meyers, 2004; Owens, 2005). At age five, children understand animals more so than ecosystems because they can associate with and visualize animals as an individual capable of being helped or harmed (Leach, Driver, Scott, & Wood-Robinson, 1996; Meyers 2004). After age nine, children are better able to form independent reasoning, understanding the connections between an animal and its environment. Research suggests that introducing concepts of ecosystems through specific animals species enhances understanding—specifically by using endangered or mega-fauna species such as whales and elephants (Bunting & Cousins, 1985; Kahn, 1999; Meyers, 2004; Palmer, 1997;). However according to these children, animals that were not keystone species were not worth saving. This being said, animals are still a viable center for expanding upon environmental processes and concepts (Meyers, 2004).

For example, children can learn a lot from deciphering an animal's basic needs for survival: food, water, and shelter. From this starting point, children's perceptions of individual animal needs grow into concern for species, populations, communities, ecosystems, and human actions that may affect them (Meyers 2004). Meyers (2004) explored this theory in his research examining changes with age in children's perceptions of animals' needs, from individual to ecosystem and human conservation. A total of 171 children (ages 4-14) visiting the Brookfield Zoo in Illinois were interviewed and drew pictures in response to questions about their favorite animal. Children's drawings were analyzed across three scales of conservation, ecological, and physiological needs (food, water, and shelter occurring at the highest rate of 44%) (Meyers 2004). On average, children's understanding of ecological and physiological needs of an animal increased with age, but dropped after age ten because older children focused more on conservation needs. Results from this research suggest that children's fascination with a specific animal may provide an alternate route towards introducing and understanding environmental concepts and issues (Meyers 2004), and—a new approach when developing EE curriculum and programs.

Additionally, Piaget's Cognitive Development Theory states that children have a base knowledge which is replaced and updated as new knowledge is acquired—having four cognitive stages of development from birth to adolescence: sensorimotor (active child), preoperational (intuitive student), concrete operation (practical student), and formal operation (reflective student) (Joyce & Weil, 1996). Hence, if children are not cognitively developed enough to understand the presentation of material, they cannot learn the material (Joyce & Weil, 1996). Constructivist theory echoes Piaget's concepts of knowledge, where learning occurs as a result of interactions between physical and social environments—underscoring the value of learning as an active process (Bowker, 2007; Knapp, 1996). Active participants engaging in first-hand environmental experiences is one of the oldest and most natural learning methods, as it helps children explore their surroundings, understand natural systems, and instills memories of significant moments (Dewey 1938; Owens, 2005; Zoldosova, 2006).

Another theory, multiple intelligence, suggests that children learn and comprehend in up to nine different ways, two examples being spatial intelligence (art, visual perceptions, and re-creation) and naturalist intelligence (recognizing and categorizing the natural world) (Gardner, 2000). Falk and Dierking (2000) assert that "few museum experiences are more compelling to visitors than such experiences, which envelop the visitor in the sounds, smells, sights, textures, and even tastes of a place or event (p. 198)"—using all the senses to stimulate modern-day technology-savvy generations (Bowker, 2007). To be successful in teaching the diversity of children throughout the world, EE programs should therefore utilize the most effective methods, materials, and curriculum to harness these multiple intelligences and learning frameworks. The use of art is one possible solution to incorporate a more integrated skill-set within EE curriculum (Carr, 2004; Gardner, 1999), and ultimately reaching and appealing to a wider audience.

The Value of Art in Environmental Education

Modern and Western culture caters to an anthropocentric lifestyle where humans value nature based on usability for human consumption (Kellert, 2005; Thompson & Barton, 1994; Wiseman & Bogner, 2003). In relating to the environment, this view places ecological importance on factors that are similar to humans, meet society's needs, relate to culture, and have aesthetic appeal (Kellert, 1996). The amalgamation of anthropocentricism and the conventional educational approach of technical knowledge as separate subject disconnects children from being part of the natural world (Griffin, 1988; Oliver, 1990; Orr, 1993; Richards, 1962). Art provides a way to reconnect to nature—it simply feels good physically, emotionally, and spiritually—and it harnesses a grounded knowledge as an intimate relationship approach (Fox, 1983; Oliver, 1990).

Hence, art nurtures biocentric or ecocentric perspectives where nature is valued for its own worth, just for being nature, and not for the consumptive benefits to humans (Kellert, 2005; Thompson & Barton, 1994; Wiseman & Bogner, 2003). The biophilia hypothesis suggests that humans have an innate need to relate to surrounding life, genetically wired and naturally selected to need nature's patterns, beauty, and harmony (Kellert & Wilson, 1995). The natural environmental has been an inspiration to artists, musicians, dancers, and playwrights to raise awareness about environmental issues—inventing creative, aesthetic, and sustainable solutions to environmental problems (Carr, 2004; Inwood, 2010). Hence, the integration of the aesthetics of art and the functionality of EE represents a means to facilitate sustainable behavior (Kesson, 2004).

One distinct study from the Chicago Arts Partnerships in Education shows that art integration into school education enhances children's understanding and comprehension of the subject matter, especially by implementing hands-on activities and experiences (CAPE, 2001). Emotions drive human decisions and art fosters emotional connections (Jacobson, McDuff, Monroe, 2006). When emotion is added to a learning experience, the experience becomes personal, exciting, and more memorable as the brain perceives the experience as very important (Jacobson et al., 2006). The creation of art is a means of recording that experience through emotional responses that provides unlimited exploration (Savva, 2004).

In the Black Creek Storytelling Parade, Reinsborough (2008) used community arts practices to involve individual, group, and public engagement opportunities, enhancing community cohesion and participation in environmental issues surrounding the health of the local water system. The program taught the community about environmental responsibility, accountability, and ownership through a transformative art experience (Reinsborough, 2008). For the individual the artistic process garners self-awareness, empowerment, and artistic validation, while bringing cohesion to the community through sharing, research, exploration, expression, and action (Reinsborough, 2008). Blandy and Hoffman (1993) described this as "an art education of place (p. 23)," concentrating on specific environmental concerns and teaching children "about art in a way that promotes understanding of the interdependence and interconnectedness of all things (p. 28)."

Additionally, a similar study showed that the combination of art with place-based education increases the relevancy of school curriculum by connecting children with their local community and natural environments (Inwood, 2008). Place-based education focuses on an environment, defined traditionally as a physical location but also as a site of emotional attachment linked to memory, imagination, or experiences (McKenzie, 2008; Wason-Ellam, 2010). Kruger (2001) explains that “we cherish places not just by what we can get from them but for the way we define ourselves in relation to them...places with stories, memories, meanings, sentiments, and personal significance (p. 178).” Furthering this notion is the description of place as shared interests and experiences at a common location (Ellis, 2002), or the experience itself of friendship, visual arts, performing arts, literature, culture, and/or community (McKenzie, 2008). Therefore, place is a latitudinal and longitudinal coordinate on the map of an individual’s life, a layered location of past, present, and future history and memories (Lippard, 1997).

Place-based education is rooted in EE and combined with art enhances children’s awareness of environmental concepts and issues. This approach fosters partnerships between children and their communities, creating unique opportunities for real-world learning (Inwood, 2008; Powers, 2004). Therefore, if children “develop strong bonds with their place and community physically, politically, emotionally, and spiritually, they are more likely to care for it and seek to improve it over time (p. 30)” (Inwood, 2008). The respect and responsibility children feel for a place becomes articulated in social interactions with peers, adults, animals, and the physical environment (Bakhtin, 1981; Wells, 2000). Linking art with an individual’s sense of place and experience provides opportunities to enhance environmental perceptions and artistic expressions (Savva, 2004). Therefore, integrating the arts with place-based education is one of many innovative approaches to improving EE programming and fostering environmental literacy in children (Inwood, 2008).

In school systems, art education is another dynamic classroom for teaching children about environmental concepts and furthering environmental literacy beyond the boundaries of traditional science-based education (Inwood, 2008). Orr (1992) supports this idea, arguing that environmental literacy will not be instilled in children unless integrated into a wider variety of subject areas, including the arts. Integrating environmental literacy with art education has the potential to make learning personal and encourages creative problem solving, critical thinking, and communication—connecting children's minds with their hands, hearts, and natural environments (Inwood, 2008).

For art education to be effective, teachers must also understand and experience how art fosters environmental learning. A teacher's first-hand experience with the curricula only heightens the teacher's success in educating students. Savva (2004) performed a study on an in-service teachers' training program researching the use of the environment as an educational resource within the scope of art education. The goal of the project was to increase art teachers' sensitivity to the environment so that they may apply the same methods and materials in their art classrooms. This research was based off the idea that artistic activities in relation to the environment "can make children feel closer to, and more situated in their environment (p. 5)," expanding and deepening aspects of the environment they already know about, inspiring creative work, and stretching children's symbolic capacities (Engel, 1991). The three-day program took place at a local nature center and surrounding locations in Cyprus, involving fieldwork, lectures, and group discussions with journal writing and visual art activities (Savva, 2004). The study revealed that teachers' relation and sensitivity to the environment was enhanced by emotional engagement through hands-on art activities based on personal exploration and interaction with the people, places, and natural aspects of their local environment (Savva, 2004). With such great success, “it seems hard to envisage a better route to such significance than that afforded by some judicious combination of environmental and arts education (p. 237)” (Carr, 2004).

As art education and environmental education play a pivotal role in greening today’s society, it is no wonder that the integration of these two disciplines is now termed “environmental art education” (EAE) or eco-art education (Inwood, 2012). Building on the traditional science-based foundations of EE and the contemporary methods of community arts and place-based education, EAE integrates knowledge, pedagogy and narrative from these disciplines to develop awareness of and interaction with environmental concepts and issues such as preservation, conservation, restoration, and sustainability (Inwood, 2010; Orr, 1994; Palmer, 1997; Zakai, 2002). Lankford (1997) describes EAE as “purposeful creativity” striving to reconnect children with their environment in positive, restorative, and spiritual methods—contributing to changes in attitudes and behaviors towards the environment (Inwood, 2010). In summary, art engages multiple senses, attracts diverse audiences, emphasizes social interaction, and introduces new perspectives. When combined with EE, art therefore has nearly unparalleled capacity to fosters environmental stewardship (Levinthal, 1988).

The Role of Art in Environmental Education Program Evaluation

The use of art as an evaluation tool to determine the effectiveness of EE is a novel approach to program assessment and provides evidence that helps defend environmental educators choices of curriculum activities (Bartosh et al., 2009). Past EE evaluation efforts have commonly employed traditional paper-and-pencil assessments. These instruments are easy to implement and quantify, but not all students perform well on these types of examinations (Armstrong, 1994; Cronin-Jones, 2005). Using art as an alternative assessment may reveal distinct understandings of individual children and allow them to explore their creativity, expressing a personalized representation of their environmental knowledge and perceptions (Cronin-Jones, 2005; Eisner, 1999).

Tunstall, Tapsell, & House (2004) took an artistic approach to evaluation, using photography as an activity and evaluation tool in research focused on primary school children's use of urban river environments. The use of photography allowed children to lead the research process, creating a task-centered activity that enabled children to express their own ideas and opinions about natural areas (James, Jenks, & Prout, 1998; Tunstall et al., 2004). Over 500 photographs were collected and analyzed, showing that children recognized aesthetically pleasing natural features (trees, flowers, water), opportunities for recreation (walking, fishing, wildlife viewing), human desecration of the river (litter, pollution), dangers (holes, downed logs), and potential future improvements to area based on their photos (addition of benches, wider paths, bridges) (Tunstall et al., 2004).

Additionally, photographs revealed the lack of understanding that urban children possessed concerning the functions of living and decaying riverside vegetation, indicating a need for EE programs addressing this subject (Tunstall et al., 2004). As shown in this example, visual arts are another form of communication for children, a language with its own grammar, to freely express ideas that they are unable to express verbally (Lewis and Green, 1983; Rennie and Jarvis 1995; Van Manen, 1990; Zoldosova, 2006). This visualization also helps children develop an understanding of subjects such as the environment with the aid of creative activity in the form of art (Alerby, 2000).

Specifically, children's drawings may provide insights into children's emotional response, thinking, and cognitive grasps of environmental concepts and issues (Bowker, 2007; Gardner, 1993). Though fairly new to EE evaluation, children's drawings have been used in traditional psychology research to analyze personality traits, reveal emotional indicators, uncover personally important topics, and explore views of issues related to current and future global problems (Barraza, 1999; Koppitz, 1968; Malchiodi, 2003). What children draw and how they think are closely connected and drawing may even be an advanced way of thinking (Vygotsky, 1971), reflecting a child's mental representations and conceptual knowledge about objects drawn. These drawings typically increase in accuracy and detail as children age and gain new experiences (Reith, 1997).

Seibert and Anooshina (1993) studied the relationship between emotion and objects in pencil drawings for 46 elementary school children, finding that most children omit objects from their drawings they do not like and in turn contain more detail and are more realistic for objects they know more about. White and Gunstone (2000) suggest that children first think in images long before thinking in words and drawings are an efficient and effective method of evaluation: "efficient, in that they contain much information in a single sheet that takes little time to complete; and effective in that they are easily assimilated by the person looking at them, especially when the viewer is the drawer (p. 105)." Furthermore, drawings are a relatively quick and easy way to gather information from and about children, are less stressful than traditional assessments (reducing testing anxiety), are enjoyable since most children like drawing, and are free from linguistic barriers enabling comparisons between diverse groups, including children with learning disabilities (Chambers, 1983; King, 1995; Lewis & Greene, 1983; Rennie & Jarvis, 1995).

Though the use of drawings to assess children's environmental perceptions and knowledge is still in the developmental stage (Barraza, 1999; Kress & Van Leeuwen, 2004), recent studies supporting art evaluations have inundated scientific literature (Alerby, 2000;

Aronsson & Andersson, 1996; Barraza,1999; Bowker, 2007; Guichard, 1995; Palmberg & Kuru, 1998; Tunnicliffe & Reiss, 1999). Alerby (2000) used drawings of 109 children (ages 7-16) to visualize thoughts about the environment in Sweden, revealing four themes: 1) the good world, 2) the bad world, 3) reasoning for good world versus bad world, and 4) protecting the environment. The images suggested nuances of unspoiled natural environments, human use of nature for recreation, forms of environmental destruction, and ways to take care of the environment (Alerby, 2000).

Similarly, Barraza (1999) analyzed 741 drawings of English and Mexican children's (ages 7-9) perceptions of the environment, expectations, and concerns for the future to see if culture and school ethos were influencing factors. The research showed more similarities than differences between the drawings, with 90% of children able to draw a representative image of the earth from space and 54% of children drawing the future earth as environmentally worse from the present day (Barraza, 1999).

Bowker (2007) compared children's drawings (ages 9-11) of tropical rainforests before and after participation in the Humid Tropics Biome program at the Eden Project in the United Kingdom. Pre-program drawings depicted trees and plants familiar to the English countryside in the background and the dominance of rainforest animals in the foreground. Post-program drawings consisted of few animals with detailed-tropical plants making up the majority of the images (Bowker, 2007). These three studies support a growing consensus among EE researchers that drawings can provide a plethora of information regarding children's perceptions about the environment and are an effective evaluation method in EE programming.

However, critics have argued that art-based evaluations are too qualitative, subjective, and difficult to grade (Rieck, 2002; White & Gunstone, 1992). The use of quantitative scoring rubrics to assess drawings is one way to ameliorate this issue (Cronin-Jones, 2005). Scoring rubrics provide a uniform assessment of drawings and are adaptable to any environmental subject or component (Cronin-Jones, 2005; Palmquist, 1997). For example, Smith, Meehan, and Castori (2003) used third grader drawings to assess children's perceived relationships with animals after exposure to an Animal Ambassadors program and developed a rubric with four relationship criteria to rate the drawings: 1) positive, negative or neutral; 2) direct, indirect, or no interaction; 3) physical distance; and 4) real or imaginary. The use of children's drawings with scoring rubrics successfully showed how perceived relationships changed with the intervention of EE programming (Smith et al., 2003). Cronin Jones (2005) developed scoring rubrics to analyze drawings made by elementary school children about their perceptions of schoolyard habitats. Using a seven-item rubric with a five-point ranking scale, three different raters evaluated the children's drawings. Results showed that the rubric was a reliable and user-friendly instrument for generating a quantitative score of a qualitative work (Cronin-Jones, 2005).

Most recently, Moseley et al. (2010) used the Draw-An-Environment Test and Rubric to assess the mental models of pre-service teachers about their perceptions of the environment. Using the NAAEE Guidelines for the preparation and professional development of environmental educators, teachers should be able to describe the environment "incorporating concepts of systems, interdependence, and interactions among humans, other living organisms, the physical environment–and the built or designed environment (p. 9)"(NAAEE, 2004). Based on this definition, the drawing rubric employed four factors of the environment with a ranking scale of zero to three based on the presence and interaction of four factors: 1) humans, 2) other living organisms (biotic), 3) physical environment (abiotic), and 4) built or designed environment (Moseley et al., 2010). Pre-service teachers were asked to draw a picture and complete a statement articulating the definition of an environment.

Results demonstrated that the mental models of pre-service teachers are incomplete. Participants generally viewed the environment as an object that was not integrated with personal actions, suggesting a lack of responsibility or stewardship toward nature and a belief that the consequences of human actions do not affect the environment (Moseley et al., 2010). This research supports the use of drawings with scoring rubrics as a reliable and valid method for evaluating EE programs, providing greater insight into children's beliefs and attitudes towards the environment (Cronin-Jones, 2005; Crook, 1985; Moseley et al., 2010; Thomas and Silk, 1990).

In conclusion, the use of drawing and art-based activities in EE programming is supported by multiple studies (Hoot & Foster, 1993; Wilson, 1993). However, there is limited research to validate the use of drawings as an effective EE evaluation tool. Cronin-Jones (2005) insists that further studies are needed to determine if drawings are an efficient means of documenting changes in children's environmental knowledge and perceptions. Of particular interest is the use of drawings as a pre-test to determine children's baseline environmental knowledge and perceptions prior to EE program implementation. Children could complete post-test drawings and differences in pre- and post-test scores could be used to document changes in student environmental knowledge and perceptions, ultimately determining the effectiveness of the EE program (Cronin-Jones, 2005). Although art-based EE evaluations have great theoretical potential, their practical value has not been adequately explored. This study sought to expand the body of knowledge regarding art and EE by exploring the use of art as an EE evaluation tool and evaluating the effects of different types of EE programming (including art-based EE programming) on children's environmental perceptions.

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CHAPTER III

USING ART IN ENVIRONMENTAL EDUCATION PROGRAM EVALUATION[1]

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Abstract

Children today are growing-up detached from the natural world, lacking authentic experiences and unstructured free-play in the outdoors. Environmental education (EE) is one possible solution that may help children re-connect with nature, however to be effective these programs need to use the most comprehensive assessment tools for evaluating program impacts. For example, effective program evaluation should examine depth of understanding and awareness, demonstrate instructional soundness, and display exceptional usability in a variety of contexts. The inclusion of art evaluation is one enhancement to EE assessments that may improve our understanding of EE program effects on children's environmental perceptions. This study examines the effectiveness of using art—specifically drawings—as tool for evaluating one-week day-camp summer programs in Athens-Clarke County, GA. Overall, the drawing-based evaluation process and corresponding outcomes suggest that art could serve as an effective, learner-centered method for evaluating environmental perceptions and the efficacy of EE programs.

Introduction

Children today are growing-up detached from the natural world, lacking authentic experiences and unstructured free-play in the outdoors—a dis-concerning trend referred to as "nature-deficit disorder" (Larson et al., 2011; Louv, 2008). There are many benefits to children spending time outside in nature. Multiple studies show that spending time outdoors teaches children to be more creative, builds confidence, develops concentration skills, increases attention spans, improves problem-solving abilities, gives a sense of belonging, and relieves stress as children escape overly planned lives (Burdette & Whitaker, 2005; Matthews, 1992; Wells, 2000; Wells, 2003). Solutions to nature-deficit disorder are possible on both the home and school front:

families can create time and activities in nature such as spending an afternoon at a local park or visiting a zoo, while schools can develop curriculum with more hands-on outdoor activities and use of environmental education (EE) curriculum (Louv, 2008).

The Value of Environmental Education

Environmental education (EE) programs are one possible solution that may help ameliorate the effects of nature-deficit disorder. The current purpose of EE is to provide individuals with the knowledge, skills, and experience necessary to conserve and preserve the environment for all living organisms and future generations (Moseley, 2010). Studies show that integrating EE into school curriculum improves student performance on standardize tests and enriches science courses, generating student interest and participation (Bartosh et al., 2006; Paterson, 2010). The National Environmental Education Foundation (NEEF) found that EE in schools increases GPA, science grades, improves reading and writing skills, critical thinking, and attitudes about learning (Paterson, 2010). In comparing scores on standardized tests and environmental literacy measures between school children participating in integrated systemic EE curricula (e.g., designed around real-world environmental subjects) or traditional curricula, children who participated in EE programs scored higher than children in traditional school programs (Bartosh et al., 2009). This research suggests children benefit from EE programs throughout multiple disciplines, teaching children how to live sustainably while also helping schools meet testing standards (Bartosh et al., 2009).

Larson et al. (2010) investigated the use of one-week EE summer programs at the State Botanical Gardens of Georgia on children's environmental orientations and knowledge, comparing pre- and post-test scores between children (ages 6-13) participating in the EE summer program and those in a non-EE after-school program. Baseline pre-test scores confirmed that both groups had similar environmental knowledge, while post-test scores showed that children participating in the EE summer program improved significantly across environmental orientations and knowledge (Larson et al., 2010). Results suggest non-formal outdoor programs provide ideal platforms for stimulating positive environmental orientations in diverse groups of children (Larson et al., 2010). This research and others highlight the benefits of informal EE as an opportunity to make environmental learning entertaining, fun, and enjoyable while being multi-dimensional through the 'teaching-and-learning' process (Alerby, 2000; Bowker, 2007; Larson et al., 2010; Tofield et al., 2003; Zoldosova, 2006).

Research has shown that characteristics of effective EE programs include: 1) relevance to the organization, audience, and content of the local area; 2) stakeholder involvement (agency supervisors, teachers, parents, etc) throughout the stages of the program (development to evaluation); 3) empowerment of children with skills necessary to prevent, address, and solve environmental issues while instilling a sense of personal responsibility; 4) accurate and balanced materials, consisting of multiple perspectives and interdisciplinary components; 5) promote quality education and effective teaching across diverse disciplines; 6) instructionally sound, using the best methodologies in education; and finally 7) evaluation with appropriate tools (Athman & Monroe, 2007; Inwood, 2008). Specifically within these characteristics, the most important might be the use of instructionally sound methodologies and the appropriate evaluation tools necessary to assess the effectiveness of these methodologies.

Children's Cognition Theories

From a young age children value environmental features and experiences because of an inherent appreciation, interest, and concern for animals (Meyers, 2004; Owens, 2005). At age five, children understand animals more so than ecosystems because they can associate with and visualize animals as an individual capable of being helped or harmed (Leach et al., 1996; Meyers 2004). After age nine, children are better able to form independent reasoning, understanding the connections between an animal and its environment. Research suggests that introducing concepts of ecosystems through specific animals species enhances understanding—specifically by using endangered or mega-fauna species such as whales and elephants (Bunting & Cousins, 1985; Kahn, 1999; Meyers, 2004; Palmer, 1997). However according to these children, animals that were not keystone species were not worth saving. This being said, animals are still a viable center for expanding upon environmental processes and concepts (Meyers, 2004).

For example, children can learn a lot from deciphering an animal's basic needs for survival: food, water, and shelter. From this starting point, children's perceptions of individual animal needs grow into concern for species, populations, communities, ecosystems, and human actions that may affect them (Meyers 2004). Meyers (2004) explored this theory in his research examining changes with age in children's perceptions of animals' needs, from individual to ecosystem and human conservation. A total of 171 children (ages 4-14) visiting the Brookfield Zoo in Illinois were interviewed and drew pictures in response to questions about their favorite animal. Children's drawings were analyzed across three scales of conservation, ecological, and physiological needs (food, water, and shelter occurring at the highest rate of 44%) (Meyers 2004). On average, children's understanding of ecological and physiological needs of an animal increased with age, but dropped after age ten because older children focused more on conservation needs. Results from this research suggest that children's fascination with a specific animal may provide an alternate route towards introducing and understanding environmental concepts and issues (Meyers 2004), and—a new approach when developing EE curriculum and programs.

Another theory, multiple intelligence, suggests that children learn and comprehend in up to nine different ways, two examples being spatial intelligence (art, visual perceptions, and re-creation) and naturalist intelligence (recognizing and categorizing the natural world) (Gardner, 2000). Falk and Dierking (2000) assert that "few museum experiences are more compelling to visitors than such experiences, which envelop the visitor in the sounds, smells, sights, textures, and even tastes of a place or event (p. 198)"—using all the senses to stimulate modern-day technology-savvy generations (Bowker, 2007). To be successful in teaching the diversity of children throughout the world, EE programs should therefore utilize the most effective methods, materials, and curriculum to these multiple intelligences and learning frameworks. The use of art is one possible solution to incorporate a more integrated skill-set within EE curriculum and evaluation (Carr, 2004; Gardner, 1999), and ultimately reaching and appealing to a wider audience.

The Value of Art in Environmental Education

Modern and Western culture caters to an anthropocentric lifestyle where humans value nature based on usability for human consumption (Kellert, 2005; Thompson & Barton, 1994; Wiseman & Bogner, 2003). In relating to the environment, this view places ecological importance on factors that are similar to humans, meet society's needs, relate to culture, and have aesthetic appeal (Kellert, 1996). The amalgamation of anthropocentricism and the conventional educational approach of technical knowledge as separate subject dis-connects children from being part of the natural world (Griffin, 1988; Oliver, 1990; Orr, 1993; Richards, 1962). Art provides a way to reconnect to nature—it simply feels good physically, emotionally, and spiritually—and it harnesses a grounded knowledge as an intimate relationship approach (Fox, 1983; Oliver, 1990).

Hence, art nurtures biocentric or ecocentric perspectives where nature is valued for its own worth, just for being nature, and not for the consumptive benefits to humans (Kellert, 2005; Thompson & Barton, 1994; Wiseman & Bogner, 2003). The biophilia hypothesis suggests that humans have an innate need to relate to surrounding life, genetically wired and naturally selected to need nature's patterns, beauty, and harmony (Kellert & Wilson, 1995). The natural environmental has been an inspiration to artists, musicians, dancers, and playwrights to raise awareness about environmental issues—inventing creative, aesthetic, and sustainable solutions to environmental problems (Carr, 2004; Inwood, 2010). Therefore, the integration of the aesthetics of art and the functionality of EE represents a means to facilitate sustainable behavior (Kesson, 2004).

One distinct study from the Chicago Arts Partnerships in Education shows that art integration into school education enhances children's understanding and comprehension of the subject matter, especially by implementing hands-on activities and experiences (CAPE, 2001). Emotions drive human decisions and art fosters emotional connections (Jacobson et al., 2006). When emotion is added to a learning experience, the experience becomes personal, exciting, and more memorable as the brain perceives the experience as very important (Jacobson et al., 2006). The creation of art is a means of recording that experience through emotional responses that provides unlimited exploration (Savva, 2004).

Additionally, a similar study showed that the combination of art with place-based education increases the relevancy of school curriculum by connecting children with their local community and natural environments (Inwood, 2008). Place-based education focuses on an environment, defined traditionally as a physical location but also as a site of emotional attachment linked to memory, imagination, or experiences (McKenzie, 2008; Wason-Ellam, 2010). Rooted in EE, place-based education combined with art enhances children's' awareness of environmental concepts and issues. This approach fosters partnerships between children and their communities, creating unique opportunities for real-world learning (Inwood, 2008; Powers, 2004). Linking art with an individual's sense of place and experience provides opportunities to enhance environmental perceptions and artistic expressions (Savva, 2004). Thus, integrating the arts with place-based education is one of many innovative approaches to improving EE programming and fostering environmental literacy in children (Inwood, 2008).

In school systems, art education is another dynamic classroom for teaching children about environmental concepts and furthering environmental literacy beyond the boundaries of traditional science-based education (Inwood, 2008). Orr (1992) supports this idea, arguing that environmental literacy will not be instilled in children unless integrated into a wider variety of subject areas, including the arts. Art education makes learning personal and encourages creative problem solving, critical thinking, and communication—connecting children's minds with their hands, hearts, and natural environments (Inwood, 2008). With such great success, "it seems hard to envisage a better route to such significance than that afforded by some judicious combination of environmental and arts education (p. 237)" (Carr, 2004).

As art education and environmental education play a pivotal role in greening today's society, it is no wonder that the integration of these two disciplines is now termed "environmental art education" (EAE) or eco-art education (Inwood, 2012). Building on the traditional science-based foundations of EE and the contemporary methods of community arts and place-based education, EAE integrates knowledge, pedagogy and narrative from these disciplines to develop awareness of and interaction with environmental concepts and issues such as preservation, conservation, restoration, and sustainability (Inwood, 2010; Orr, 1994; Palmer, 1997; Zakai, 2002). Lankford (1997) describes EAE as “purposeful creativity” striving to reconnect children with their environment in positive, restorative, and spiritual methods—contributing to changes in attitudes and behaviors towards the environment (Inwood, 2010). In summary, art engages multiple senses, attracts diverse audiences, emphasizes social interaction, and introduces new perspectives. When combined with EE, art therefore has nearly unparalleled capacity to fosters environmental stewardship (Levinthal, 1988).

The Role of Art in Environmental Education Program Evaluation

The use of art as an evaluation tool to determine the effectiveness of EE is a novel approach to program assessment and provides evidence that helps defend environmental educators choices of curriculum activities (Bartosh et al., 2009). Past EE evaluation efforts have commonly employed traditional paper-and-pencil assessments. These instruments are easy to implement and quantify, but not all students perform well on these types of examinations (Armstrong, 1994; Cronin-Jones, 2005). Using art as an alternative assessment may reveal distinct understandings of individual children and allow them to explore their creativity, expressing a personalized representation of their environmental knowledge and perceptions (Cronin-Jones, 2005; Eisner, 1999).

Tunstall, Tapsell, & House (2004) took an artistic approach to evaluation, using photography as an activity and evaluation tool in research focused on primary school children’s use of urban river environments. The use of photography allowed children to lead the research process, creating a task-centered activity that enabled children to express their own ideas and opinions about natural areas (James et al., 1998; Tunstall et al., 2004). Over 500 photographs were collected and analyzed, showing that children recognized aesthetically pleasing natural features (trees, flowers, water), opportunities for recreation (walking, fishing, wildlife viewing), human desecration of the river (litter, pollution), dangers (holes, downed logs), and potential future improvements to area based on their photos (addition of benches, wider paths, bridges) (Tunstall et al., 2004).

Additionally, photographs revealed the lack of understanding that urban children possessed concerning the functions of living and decaying riverside vegetation, indicating a need for EE programs addressing this subject (Tunstall et al., 2004). As shown in this example, visual arts are another form of communication for children, a language with its own grammar, to freely express ideas that they are unable to express verbally (Lewis and Green, 1983; Rennie and Jarvis 1995; Van Manen, 1990; Zoldosova, 2006). This visualization also helps children develop an understanding of subjects such as the environment with the aid of creative activity in the form of art (Alerby, 2000).

Specifically, children's drawings may provide insights into children's emotional response, thinking, and cognitive grasps of environmental concepts and issues (Bowker, 2007; Gardner, 1993). Though fairly new to EE evaluation, children's drawings have been used in traditional psychology research to analyze personality traits, reveal emotional indicators, uncover personally important topics, and explore views of issues related to current and future global problems (Barraza, 1999; Koppitz, 1968; Malchiodi, 2003). What children draw and how they think are closely connected and drawing may even be an advanced way of thinking (Vygotsky, 1971), reflecting a child's mental representations and conceptual knowledge about objects drawn. These drawings typically increase in accuracy and detail as children age and gain new experiences (Reith, 1997).

Seibert and Anooshina (1993) studied the relationship between emotion and objects in pencil drawings for 46 elementary school children, finding that most children omit objects from their drawings they do not like and in turn contain more detail and are more realistic for objects they know more about. White and Gunstone (2000) suggest that children first think in images long before thinking in words and drawings are an efficient and effective method of evaluation: "efficient, in that they contain much information in a single sheet that takes little time to complete; and effective in that they are easily assimilated by the person looking at them, especially when the viewer is the drawer (p. 105)." Furthermore, drawings are a relatively quick and easy way to gather information from and about children, are less stressful than traditional assessments (reducing testing anxiety), are enjoyable since most children like drawing, and are free from linguistic barriers enabling comparisons between diverse groups, including children with learning disabilities (Chambers, 1983; King, 1995; Lewis & Greene, 1983; Rennie & Jarvis, 1995).

Though the use of drawings to assess children's environmental perceptions and knowledge is still in the developmental stage (Barraza, 1999; Kress & Van Leeuwen, 2004), recent studies supporting art evaluations have inundated scientific literature (Alerby, 2000; Aronsson & Andersson, 1996; Barraza,1999; Bowker, 2007; Guichard, 1995; Palmberg & Kuru, 1998; Tunnicliffe & Reiss, 1999). Alerby (2000) used drawings of 109 children (ages 7-16) to visualize thoughts about the environment in Sweden, revealing four themes: 1) the good world, 2) the bad world, 3) reasoning for good world versus bad world, and 4) protecting the environment. The images suggested nuances of unspoiled natural environments, human use of nature for recreation, forms of environmental destruction, and ways to take care of the environment (Alerby, 2000).

Similarly, Barraza (1999) analyzed 741 drawings of English and Mexican children's (ages 7-9) perceptions of the environment, expectations, and concerns for the future to see if culture and school ethos were influencing factors. The research showed more similarities than differences between the drawings, with 90% of children able to draw a representative image of the earth from space and 54% of children drawing the future earth as environmentally worse from the present day (Barraza, 1999).

Bowker (2007) compared children's drawings (ages 9-11) of tropical rainforests before and after participation in the Humid Tropics Biome program at the Eden Project in the United Kingdom. Pre-program drawings depicted trees and plants familiar to the English countryside in the background and the dominance of rainforest animals in the foreground. Post-program drawings consisted of few animals with detailed-tropical plants making up the majority of the images (Bowker, 2007). These three studies support a growing consensus among EE researchers that drawings can provide a plethora of information regarding children's perceptions about the environment and are an effective evaluation method in EE programming.

However, critics have argued that art-based evaluations are too qualitative, subjective, and difficult to grade (Rieck, 2002; White & Gunstone, 1992). The use of quantitative scoring rubrics to assess drawings is one way to ameliorate this issue (Cronin-Jones, 2005). Scoring rubrics provide a uniform assessment of drawings and are adaptable to any environmental subject or component (Cronin-Jones, 2005; Palmquist, 1997). For example, Smith, Meehan, and Castori (2003) used third grader drawings to assess children's perceived relationships with animals after exposure to an Animal Ambassadors program and developed a rubric with four relationship criteria to rate the drawings: 1) positive, negative or neutral; 2) direct, indirect, or no interaction; 3) physical distance; and 4) real or imaginary. The use of children's drawings with scoring rubrics successfully showed how perceived relationships changed with the intervention of EE programming (Smith et al., 2003). Cronin Jones (2005) developed scoring rubrics to analyze drawings made by elementary school children about their perceptions of schoolyard habitats. Using a seven-item rubric with a five-point ranking scale, three different raters evaluated the children's drawings. Results showed that the rubric was a reliable and user-friendly instrument for generating a quantitative score of a qualitative work (Cronin-Jones, 2005).

Most recently, Moseley et al. (2010) used the Draw-An-Environment Test and Rubric to assess the mental models of pre-service teachers about their perceptions of the environment. Using the North American Association for Environmental Education's (NAAEE) Guidelines for the preparation and professional development of environmental educators, teachers should be able to describe the environment "incorporating concepts of systems, interdependence, and interactions among humans, other living organisms, the physical environment–and the built or designed environment (p. 9)"(NAAEE, 2004). Based on this definition, the drawing rubric employed four factors of the environment with a ranking scale of zero to three based on the presence and interaction of four factors: 1) humans, 2) other living organisms (biotic), 3) physical environment (abiotic), and 4) built or designed environment (Moseley et al., 2010). Pre-service teachers were asked to draw a picture and complete a statement articulating the definition of an environment.

Results demonstrated that the mental models of pre-service teachers are incomplete. Participants generally viewed the environment as an object that was not integrated with personal actions, suggesting a lack of responsibility or stewardship toward nature and a belief that the consequences of human actions do not affect the environment (Moseley et al., 2010). This research supports the use of drawings with scoring rubrics as a reliable and valid method for evaluating EE programs, providing greater insight into children's beliefs and attitudes towards the environment (Cronin-Jones, 2005; Crook, 1985; Moseley et al., 2010; Thomas and Silk, 1990).

In conclusion, the use of drawing and art-based activities in EE programming is supported by multiple studies (Hoot & Foster, 1993; Wilson, 1993). However, there is limited research to validate the use of drawings as an effective EE evaluation tool. Cronin-Jones (2005) insists that further studies are needed to determine if drawings are an efficient means of documenting changes in children's environmental knowledge and perceptions. Of particular interest is the use of drawings as a pre-test to determine children's baseline environmental knowledge and perceptions prior to EE program implementation. Children could complete post-test drawings and differences in pre- and post-test scores could be used to document changes in student environmental knowledge and perceptions, ultimately determining the effectiveness of the EE program (Cronin-Jones, 2005). Although art-based EE evaluations have great theoretical potential, their practical value has not been adequately explored. This study sought to expand the body of knowledge regarding art and EE by exploring the use of art as an EE evaluation tool and evaluating the effects of different types of EE programming (including art-based EE programming) on children's environmental perceptions.

Statement of Purpose and Research Objectives

The purpose of this study was to construct a valid and reliable mixed-methods survey instrument for measuring children's environmental perceptions, including the following subscales: eco-affinity, eco-awareness, art-appreciation, and environmental knowledge. The design of this study was based on the following objectives:

1) To develop a valid and reliable survey instrument for measuring children's environmental perceptions using both quantitative (Likert-type statements) and qualitative (drawings) assessment methods; and

2) To develop a valid and reliable scoring rubric for assessing the qualitative (drawings) component of the survey instrument.

Methods

Instrument Development

After conducting an extensive literature review, a survey instrument was developed based upon two existing tools: the Children's Environmental Perceptions Scale (CEPS) (Larson, Green, & Castleberry, 2011) and the Draw-An-Environment-Test (DAET) with Draw-An-Environment-Test Rubric (DAET-R) (Mosely, Desjean-Perrotta, & Utley, 2010). The literature suggests that these two survey methods are valid and reliable tools for assessing children's environmental attitudes, awareness, and knowledge, while also proving to be easy for children to understand, minimal in cost, and time efficient. For these reasons, it was felt that the combination of these two survey methods would be the best fit for this study.

The original CEPS instrument consisted of 16 Likert-type statements, four multiple-choice questions, and one open-ended question (Larson et al., 2011). The 16 Likert-type statements evaluated components of eco-affinity and eco-awareness such as interest in nature, importance of nature, environmental awareness, and environmental stewardship (Larson et al., 2011). The remaining four multiple-choice questions and one open-ended question evaluated the overall environmental content knowledge based on the EE program curriculum (Larson et al, 2011). Mosely et al.'s (2010) DAET addressed a similar issue from a slightly different perspective and consisted of a single-page with two prompts, a drawing and an open-ended sentence (Mosely et al., 2010). Both components evaluated the definition of "the environment" using two different assessment tools: a drawn definition in picture-form and a written definition in sentence-form (Mosely et al., 2010).

The survey instrument used in this study combined the 16 Likert-type statements of the CEPS instrument and the drawing component of the DAET instrument. This combination created two sections for the survey: the first evaluating children's eco-affinity and eco-awareness and the second evaluating children's knowledge of concepts and overall environmental perceptions. Environmental concepts within the survey were based on the EE curriculum themes used at the participating American Camp Association accredited facility, Sandy Creek Nature Center. Activities within Sandy Creek Nature Center's program curriculum meet both Georgia and National Science Education Standards, along with standards set by the North American Association of Environmental Education: Guidelines for Excellence. The overall theme of the curriculum focused on ecosystems and wildlife habitats including specific components (e.g., biotic vs. abiotic), interactions (e.g., predator vs. prey), and processes (e.g., nutrient cycles). The final version of the instrument addressed all of these themes and was called the Children's Environmental Perceptions and Art Survey (CEPAS) (Appendix A).

The first section of the CEPAS included slight adaptations of the original 16 Likert-type statements from the CEPS with an additional four statements pertaining directly to the respondents enjoyment of participating in nature-centered art activities. The original CEPS statements were slightly adapted by giving them stronger adverbs such as "very" and "a lot" compared to the original statements in the CEPS. In total, 20 Likert-type statements were included: four statements related to children's perceptions about art and 16 statements related to children's perceptions of the environment (eight based on eco-affinity, eight based on eco-awareness). These statements were arranged randomly and used simple language that had been pilot tested in previous studies to ensure comprehension among a variety of age groups (e.g., Larson et al., 2011). Children responded by circling one of five responses that were both visually written and cued through the use of thumbs-down and thumbs-up symbols. The five response options included: one = strongly disagree (two thumbs-down), two = disagree (one thumbs-up), three = not sure (question mark), four = agree (one thumbs-up), and five = strongly agree (two thumbs-up).

The second section of the CEPAS included two drawing questions that were modified from the original DAET (Mosely et al., 2010): the Draw-An-Ecosystem Test (DET) and the Draw-An-Animal Test (DAT)(Appendix A). The modified DET differed from the original because it does not ask participants to draw the specific definition of "environment," but asks participants to "draw a habitat or ecosystem that you see or play in almost every day." This modification allowed children to provide a more open-ended and personally relevant response to the question, encouraging illustrations based upon what they have learned about ecosystems and their own real-life experiences and observations. Continuing this same theme, the DAT asks participants to "draw your favorite animal, the habitat or ecosystem where it lives, and the things it needs to survive."

Rubric Development

To evaluate the DET and DAT drawings questions of CEPAS, three reviewers initially met and discussed changes to the original DAET-R by Mosely et al. (2010) that would accurately evaluate children's drawings. These three reviewers were chosen specifically for their experience with qualitative research and EE programs. Two reviewers were primary researchers on this project and had worked extensively with EE programs at Sandy Creek Nature Center, and the third reviewer was a current EE activity leader at Sandy Creek Nature Center. To examine the reliability of the modified rubric coding metric, a subset of 51 surveys was randomly selected and independently scored by the three reviewers. The process of random selection was performed by placing corresponding numbers for each weekly camp group, one through eight, in a hat and then drawing two of the numbers. Camp groups for weeks four and five were drawn and the combined surveys from those weeks totaled 51. The three reviewer scores were compared, potential problems were discussed, and changes were made to the rubrics to clarify the scale and increase scoring accuracy among reviewers. Two of the original three reviewers (the primary researchers) tested the refined rubrics using the same subset of 51 surveys and a higher inter-rater reliability was obtained.

The first drawing, DET, was assessed using the Draw-An-Ecosystem-Test Rubric (DET-R), which included four habitat factors: humans, biotic (living organisms), abiotic (physical habitat), and human built or designed structures (Table 3.1). The second drawing, DAT, was assessed using the Draw-An-Animal-Test Rubric (DAT-R), which included four factors related to an animal's survival: ecosystem complexity (habitat), food, water, and shelter (Table 3.2). Additionally, both rubrics contained five degrees of factor interaction with associated scores: zero = factor not present, one = factor present, two = factor displays basic interaction, three = factor displays complex interaction, and four = factor displays explicit interaction. Total scores ranged from 0 to 16, with higher scores representing the highest extent of factor interaction.

To further assess the DET and DAT drawings, two separate factors outside of the rubric were used to determine the type of habitat depicted and the presence of environmental components. The factor "habitat type" determined what type of habitat was illustrated and each drawing was scored as either: zero = indoor habitat, one = backyard habitat, two = park/playground habitat, three = natural outdoor habitat. The factor "environmental components" determined the presence and number of 16 natural elements (e.g., presence of wild animals, presence of water, number of mammals, number of trees, etc) along with the number of colors used to illustrate the drawing. The number of colors represented a level of creativity, detail, and accuracy of drawn elements (e.g., water = blue, grass = green, tiger = orange with black stripes, elephant = gray, etc).

Instrument Implementation

The CEPAS instrument was administered to eight groups whom each attended a one-week, day-camp summer program in Athens-Clarke County (ACC), GA during June and July of 2010-2011. Day-camp hours were from 9am to 4pm, Monday through Friday. Sandy Creek Day Camp (SCDC) and Memorial Park Day Camp (MPDC) were chosen out of the seven ACC day-camps because of their similar summer camp activities, indoor and outdoor amenities, attendance numbers, and camper demographics. Common indoor and outdoor camp activities included: swimming, canoeing, archery, playground time, sports (basketball, volleyball, soccer, four squares), board games, arts and crafts, team building challenges, educational programs, movies, field trips, and special guest programs (Appendix B, C, & D). These two summer camps occurred at ACC facilities: SCDC takes place at both Sandy Creek Nature Center and Sandy Creek Park, and MPDC is based at Memorial Park. During the course of the summer camp programs, field trips are scheduled for groups to visit other ACC parks with different amenities and local area attractions. Standard enrollment at each camp was 90 campers per week ranging in age from 6 to 12 years old and grade levels K through 6.

A total of 327 campers were surveyed, with 285 successfully completing the pre-and post-test survey sets (87.2 % response rate) gathered at Sandy Creek Nature Center (n = 210) and Memorial Park (n = 75). Participant enrollment at the two facilities was determined by a first-come, first-serve camp registration event that took place in April prior to the start of the summer camps in June. Camp registration costs per week were: $61 for ACC residents, $92 for non-ACC residents at Sandy Creek Nature Center (Appendix E); $35 for ACC residents, $53 non-ACC residents at Memorial Park (Appendix F). To provide equal opportunity to all socioeconomic groups within ACC, parents could register with the ACC Leisure Services Department Scholarship Program for discounted summer camp rates. Scholarships were awarded based on the number of persons residing in a single household and the corresponding annual, monthly, or weekly household income (Appendix G).

During this study, random selection of participants was not possible due to the nature of the registration process and the limited number of children the camp could accommodate; hence with the sample obtained inference of any results back to the general population is not possible. Of the 285 campers, 266 (93.3%) were residents of Athens-Clarke County and the remaining 19 (6.7%) were residents of neighboring counties: Jackson, Madison and Oconee. Campers attended 37 local elementary and middle schools from grades K through 6 and ranged in ages 6 to12 years old (Table 3.3). However, it is worth noting that the camper's gender and ethnic diversity closely matched the demographics of ACC's population (Table 3.4)(U.S. Census Bureau, 2011).

The CEPAS instrument was administered at the beginning (pre-test) and end (post-test) of each weekly summer-camp program by trained camp counselors and directors. During the mandatory one-week pre-camp training, counselors and directors were taught how to administer the survey and answer participants' likely questions. Counselors and directors also completed the survey to gain a better understanding of the material. To distribute the survey, groups of 10 to 15 campers would gather in a room with two counselors who passed out the survey along with a basket of crayons. The counselors explained the survey activity to the campers and then read aloud the survey directions. The first section of CEPAS with 20 Likert-type statements was read out loud, one item at a time by one counselor, while the second counselor answered any questions that campers had about the items. Each item was read aloud twice, and campers had 30-40 seconds to complete each item. Approximately 15 minutes were allotted for the first section. The second portion of CEPAS was read aloud to campers with a time allotment of approximately eight to ten minutes per drawing. In total, the CEPAS instrument took approximately 30 minutes to complete, with older age groups (10-12) completing the instrument in approximately 20 minutes.

Limitations

A limitation of this study was that random selection of participants was not possible due to the nature of the registration process and the limited number of children the camp could accommodate; hence with the sample obtained, inference of any results back to the general population is not possible. Although the camp director was present during camp activities and the administering of the survey instrument, camp counselors who lead activities and helped administer the survey instruments were different for each group. Despite standardized training for both activities and survey administration, some differences in camper scores could be attributed to facilitator effects. Campers completed the pre-test survey with enjoyment and had very few complaints at the beginning of the week, however at the end of the week campers were not as eager to complete the identical survey as a post-test and some dissension set in amongst some campers, especially within the older age groups (age 10-12). This factor may have also impacted to some extent the differences in camper scores. Finally, all survey responses were self-reported by campers with the expectation that the answers were personally honest and without external influences from other campers. Aware of these limitations, a substantial effort was made to reduce confounding variation as much as possible.

Data Analysis

Statistical analysis of the data was performed using IBM SPSS Version 19.0. Reliability among Likert-type items was measured using Cronbach's alpha. Kaiser-Meyer-Olkin (KMO) and Bartlett's test of sphericity were conducted to confirm Likert-type item data were appropriate for factor analysis. Exploratory factor analysis (EFA), specifically Principal Axis Factoring and Catell's scree test, were used to assess discriminant and convergent validity of the Likert-type statements. Content validity was examined using item content. The inter-rater reliability of the coding procedures and rubrics associated with the drawing portion of the CEPAS were analyzed using the Kappa Measure of Agreement and Pearson's product-moment correlation coefficient. Cross-validation was performed using Pearson's product-moment correlation coefficient to compare the three factors of the CEPAS Likert-type statements with scores from the DET and DAT: eco-affinity with habitat type, eco-awareness with DET-R and DAT-R scores, and art-appreciation with environmental creativity scores.

Results

Quantitative Component: Likert-type Statements

The overall reliability scores for Likert-type items on the CEPAS scale was relatively high on both the pre-test (Cronbach's alpha = 0.842) and the post-test (Cronbach's alpha = 0.866). The Kaiser-Meyer-Olkin (KMO) measure of sampling adequacy (0.848 pre-test, 0.847 post-test) and Bartlett's test of sphericity (<0.001) indicated that EFA was appropriate for the 20 items. Catell's scree test showed a clear break after the third factor (Figure 3.1) and principal axis factoring with oblimin rotation revealed an optimal three-factor solution that accounted for 45.1% and 49.6% of the total scale variance on the pre-test and post-test, respectively. On the pre-test, eigenvalues were 5.61 (28.0% of the variance) for factor one, 2.02 (10.1%) for factor two, and 1.39 (7.0%) for factor three. On the post-test, eigenvalues were 6.13 (30.6% of the variance) for factor one, 2.33 (11.7%) for factor two, and 1.46 (7.3%) for factor three. Based on item content and previous research (Larson et al., 2011), the factors extracted in the EFA were named eco-affinity, eco-awareness, and art-appreciation (Table 3.5 & 3.6).

On the pre-test, a total of seven items loaded strongly on the eco-affinity factor (≥ 0.4), three items loaded strongly on the eco-awareness factor (≥ 0.4), and three items loaded strongly on the art-appreciation factor (≥ 0.4; Table 3.5). In the post-test, a total of eight items loaded strongly on factor one (≥ 0.4), five items loaded strongly on factor two (≥ 0.4), and three items loaded strongly on factor three (≥ 0.4; Table 3.6). Although low loadings (< 0.4) and cross-loadings were obtained for five eco-awareness items and two art appreciation items, all items with relevant content were retained for further assessment. For instance, despite their low factor loading scores, eco-awareness items addressing the importance of plants and animals represented an important component of the eco-awareness construct. Furthermore, the two art-appreciation items “I like to draw and color plants and animals” and “I like to make arts and crafts about nature” which cross-loaded onto the eco-affinity scale may simultaneously reflect the participants’ liking for activities that involve plants, animals, and nature as well as art. The oblique rotation strategy used in the factor analysis accounted for correlations among the factors, supporting the idea that each construct was related to the others.

Overall mean scores for each item within the three factors were consistent for both pre- and post-test (Table 3.7). The eco-affinity pre-test mean score was 3.929 and after completion of the one-week day camp programs, the post-test mean score increased by 0.035 to 3.964. Similarly, the eco-awareness pre-test mean score was 4.460 and the post-test mean score increased by .064 to 4.388. The art-appreciation pre-test mean score was 3.785, with an increase of 0.080 on the post-test mean score resulting in 3.865. Complete statistical analysis of pre- and post-test scores related to demographics and specific one-week day camp summer programs is reported in Chapter IV, *The Effects of an Art-based Environmental Education Program on Children's Environmental Perceptions*.

Qualitative Component: Rubrics

To accurately assess the drawing portion of CEPAS, a detailed scoring rubric was designed for each drawing (Table 3.1 & 3.2). The main goal of the two scoring rubrics was so that any reviewer could use the rubric and come to the same score for a single drawing. Also, the overall design of the rubric could be easily adapted to other subject matters and themes within EE programs. Using a subset of 51 surveys, the first inter-rater rubric assessment revealed a moderate consistency between the three reviewers' inter-rater reliability scores, with percent agreement ranging from 74.5% to 98.0% on five rubric factors (Table 3.8). To further improve reviewer consistency, the rubrics were modified to clarify discrepancies among the three reviewers concerning the four factors distinct to each drawing and the specific definitions of the degrees of interaction.

The main discrepancy among reviewers was how to define an "interaction" and the interpretation of an interaction within children's drawings. The first rubric had four levels of interaction: not present, present, interaction with other factors (drawn interaction), and explicit interaction (drawn interaction with written description). Jumping on a trampoline, swimming, or walking a dog were easy to interpret as interactions, but many other drawings were far more vague. For example, if a house was sitting on a grassy yard, was it interacting with the grass (Figure 3.2)? If a bird was flying in the sky, but no sky was actually drawn, was the bird interacting with the sky? After the initial review, it was determined that the category "interaction with other factors" would be divided to define basic interaction and complex interaction. The basic interaction level covered the vague interactions (e.g., factors were touching but not necessarily having an effect upon one another) and the complex interaction level covered the more clear interactions (e.g., factors were having an effect upon one another). Hence, the final rubric design contained five levels of interaction for each of the four specific drawing factors (Table 3.1 & 3.2).

Another discrepancy among reviewers was how to score the use of words in the drawings. Children were asked to label their drawings so that reviewers understood what was being drawn. However, instead of drawing objects and labeling them, some children chose to write words without drawings. For example, when asked to draw their favorite animal and the things it needs to survive, some children drew the animal, but wrote the words "food, water, shelter" instead of actually drawing the objects (Figure 3.2). Overall, the children understood the needs of the animal, but may not have been confident in their drawing abilities or may not have exactly known what those specific factors were for their favorite animal. Drawing the shelter for a favorite pet—a doghouse for a dog—was easy to understand, but what exactly constitutes a shelter for an elephant or whale? This required greater knowledge and critical thinking skills that younger aged children are still in the process of developing. Hence, it was determined that words would be scored as drawn elements and thus the factor definitions were modified on the final rubric design to say "pictures or words" (Table 3.1 & 3.2).

Two of the initial reviewers independently re-scored the 51 surveys using the final rubric design and inter-rater reliability improved substantially between the two reviewers with percent agreement ranging from 88.2% to 96.1% on five rubric factors (Table 3.8). It is worth noting that the environmental component factor (presence of drawn elements and colors within the drawings) was straightforward to assess and after initial discussion, the reviewers determined that is was not a factor of discrepancy that needed to be considered when conducting the inter-rater reliability.

Qualitative Component: Drawings

Overall mean scores for each drawing were consistent for both pre- and post-test (Table 3.9). The DET pre-test mean score was 13.820 and after completion of the one-week day camp programs, the post-test mean score increased by 2.481 points to 16.301. The individual DET-R scores increase by 0.070 points, from 4.480 to 4.550, showing a greater presence and interaction of factors. Habitat type stayed the same for the DET on both pre- and post-test, with the average habitat type being a backyard to park or playground habitat (mean score 1.67 pre-test, 1.6 post-test). The environmental component mean score increased by 2.481 points, from 7.670 on the pre-test to 10.151 on the post-test. Examples of DET drawings with associated scores are presented in Figure 3.3 and 3.4.

What did children draw on the DET? Concerning the four factors within the DET-R, children drew more biotic (75.4% pre-test, 72.3% post-test) and human built (65.3% pre-test, 71.9% post-test) items in both the pre- and post-test than humans (21.4% pre-test, 24.9% post-test) and abiotic (47.7% pre-test, 56.4% post-test) items (Table 3.10). Over 40% of drawings were of backyard habitats in both the pre- and post-test, with natural outdoor habitats composing nearly 30% of drawings in the pre-test and 20% of drawings in the post-test (Table 3.10).

Within the environmental component scores, wild animals were included in 20% of pre-test drawings and 28.1% of the post-test drawings (Table 3.10). Specifically, mammals were drawn the most (27% pre-test, 37.9% post-test) followed by birds (8.1% pre-test, 15.8% post-test). Reptiles and amphibians were drawn the least in the pre-test (2.8%) and fish were drawn the least in the post-test (3.2%). Plants were drawn more than animals (70.2% pre-test, 67.7% post-test), with roughly 50% of pre- and post-test drawings having the presence of both trees and grass (Table 3.11). The presence of water (18.2% pre-test, 18,9% post-test), the sun (16.5% pre-test, 27.4% post-test), and clouds (11.9% pre-test, 19.3% post-test) were also commonly drawn natural elements within the DET. Children were most likely to use at least 1 to 3 crayons to create their drawings 60% of the time for the pre-test and 53.3% for the post-test. Rarely, did children use more than 10 crayons (0.0% pre-test, 3.5% post-test), but commonly did choose to use 4 to 9 crayons (40.0% pre-test, 43.1% post-test).

Similarly, the DAT pre-test mean score was 14.975 and the post-test mean score increased by 1.864 points to 16.839. The individual DAT-R scores increase by 0.020 points, from 5.330 to 5.350, showing a greater presence and interaction of factors. As in the DET, habitat type also stayed the same for the DAT on both pre- and post-test, with the average habitat type being a park or playground habitat (mean score 2.27 pre-test, 2.32 post-test). The environmental component mean score increased by 1.794 points, from 7.375 on the pre-test to 9.169 on the post-test. Examples of DAT drawings with associated scores are presented in Figure 3.5 and 3.6. Complete statistical analysis of pre- and post-test scores related to demographics and specific one-week day camp summer programs is reported in Chapter IV, *The Effects of an Art-based Environmental Education Program on Children's Environmental Perceptions*.

What did children draw on the DAT? Concerning the four factors within the DAT-R, children drew more complex habitats (88.1% pre-test, 93.7% post-test) and shelter (78.9% pre-test, 87.0% post-test) items in both the pre- and post-test, followed closely by food (56.8% pre-test, 64.2% post-test) and water (41.1% pre-test, 42.8% post-test) items (Table 3.10). Over 65% of drawings were of natural outdoor habitats in both the pre- and post-test, with backyard habitats making up nearly 17% of drawings in the pre-test and 20% of drawings in the post-test (Table 3.11).

Within the environmental component scores, wild animals were included in 67.7% of pre-test drawings and 71.9% of the post-test drawings (Table 3.11). Domestic animals were included in over 25% of pre- and post-test drawings. Specifically, mammals made of the majority of animals in the DAT (68.1% pre-test, 70.9% post-test) followed by fish (14.7% pre-test, 16.5% post-test), birds (9.8% pre-test, 16.1% post-test), and reptiles and amphibians (14.0% pre-test, 14.7% post-test). Insects were drawn in less than 10% of the DAT in both pre- and post-test. Plants were drawn less than animals (46.0% pre-test, 54.0% post-test), with an average occurrence of 30% for both trees and grass (Table 3.11). The presence of water (38.9% pre-test, 41.8% post-test), the sun (14.7% pre-test, 22.5% post-test), and clouds (6.7% pre-test, 13.3% post-test) were also commonly drawn natural elements within the DAT. Children were most likely to use at least 1 to 3 crayons to create their drawings 67.4% of the time for the pre-test and 53.0% for the post-test. Rarely, did children use more than 10 crayons (0.0% pre-test, 1.8% post-test), but commonly did choose to use 4 to 9 crayons (32.7% pre-test, 44.9% post-test).

Cross-validation of Likert-type Statements and Drawings

Cross-validation between the Likert-type statement items and drawings items of CEPAS was performed using Pearson's product-moment coefficient. Comparisons were made between the three factors of Likert-type statements (eco-affinity, eco-awareness, and art-appreciation) and the three factors from the DET and DAT scoring (habitat type, DET-R and DAT-R, and environmental components). Eco-affinity was compared with habitat type because it was reasoned that children's "liking" or "feelings" for nature would be expressed in the preferred habitat that they chose to draw. Eco-awareness was compared with the DET-R and DAT-R because these two factors represent children's understanding and knowledge about nature—what components are in nature (e.g., abiotic, biotic, humans), how these components interact and the effect one's actions have on the environment (e.g., predator vs. prey, cutting down a tree to build a house), and the natural occurring processes (e.g., nutrient cycles, forest disturbance and regeneration). Art-appreciation was compared with environmental components because it was reasoned that if children enjoy art, than they are more apt to produce creative and diverse drawings to represent their thoughts, feelings, and knowledge about the environment.

For the analysis, the Likert-type statement scores were grouped into three levels: low (1.00 to 2.00), medium (3.00 to 3.99), and high (4.00 to 5.00). The DET and DAT three factor scores were averaged between the two drawings. These scores were then combined for both the pre-test and post-test. Overall, Pearson correlation's revealed a positive relationship between each factor (Figure 3.7, 3.8, 3.9). Higher scores on eco-affinity corresponded to drawings of outdoor habitat types ($r = 0.131$, Figure 3.7); higher scores on eco-awareness corresponded to higher scores on the DET-R and DAT-R ($r = 0.042$, Figure 3.8); and higher art-appreciation scores corresponded with higher scores of environmental components ($r = 0.072$, Figure 3.9).

Discussion

The inclusion of art evaluations is one enhancement to EE program assessment that may improve our understanding of EE program effects on children's environmental perceptions. The purpose of this study was to construct a valid and reliable mixed-methods survey instrument for measuring children's environmental perceptions and knowledge in a two-step process that involved: 1) development of a valid and reliable survey instrument for measuring children's environmental perceptions using both quantitative (Likert-type statements) and qualitative (drawings) assessment methods, and 2) development a valid and reliable scoring rubric for assessing the qualitative (drawings) component of the survey instrument. Results from this study suggest that the combination of both quantitative (Likert-type statements) and qualitative (drawings) assessment tools represent a very useful strategy for evaluating children's environmental perceptions and potential EE program impacts.

Quantitative Component: Likert-type Statements

Although the total variance explained by the three-factor solution for Likert-type statements was low, the internal consistency of these CEPAS items was acceptable across subscales. Exploratory factor analysis indicated three factors within CEPAS Likert-type statements: eco-affinity, eco-awareness, and art-appreciation. The first two subscales have been supported by previous research (Larson et al., 2011), and reflect elements of environmental attitudes and awareness: eco-affinity items suggest personal interest and engagement in nature and eco-awareness relates to cognitive grasp and intellectual thinking on environmental issues.

The eco-affinity pre- and post-test mean scores suggest that children generally agree that they have a personal interest in nature and enjoy participating in nature-based activities—reading, learning, caring, protecting, spending time, and spending money on nature. Similarly, the eco-awareness pre- and post-test mean scores suggest children generally agree to strongly agree that plants and animals are affected by human activity and nature is an important component to human survival (Leach et al., 1996; Meyers 2004). This supports findings from Meyers (2004) and Owens (2005) that from a young age children value and have an appreciation, interest, and concern for animals and their environments. These qualities demonstrate a biocentric perspective in which humans value nature not just for its consumptive purpose to meet human needs, but innately relate to the environment for its presence, beauty, and harmony in everyday life (Kellert, 2005; Kellert & Wilson, 1995; Thompson & Barton, 1994; Wiseman &

Bogner, 2003). Within Gardner's Multiple Intelligence Theory, this could be perceived as "naturalist intelligence" where children recognize and categorize the natural world around them (Gardner, 2000).

The third subscale of Likert-type statements within CEPAS is art-appreciation, denoting preference for art activities within EE programming. Specifically, exploring children's enjoyment for participating in the activities of drawing, coloring, and creating crafts centered about plants, animals, and nature. Research suggest that informal EE activities such as art are multi-dimensional and make the learning process entertaining, fun, and enjoyable (Alerby, 2000; Bowker, 2007; Larson et al., 2010; Tofield et al., 2003; Zoldosova, 2006). Art provides hands-on experiences and fosters emotional connections, making learning more personal and memorable while allowing for untethered creative exploration and self-expression (CAPE, 2011; Jacobson et al., 2006; Savva, 2004).

The art-appreciation pre- and post-test mean scores show children generally agree that they enjoy participating in art activities and completing craft projects centered about plants, animals, and nature. These results support the movement for integration of art education and EE—a framework built upon traditional science foundations of EE and contemporary methods of the arts—developing awareness of and interaction with environmental concepts and issues (Inwood, 2010; Orr, 1994; Palmer, 1997; Zakai, 2002). Corresponding with the idea of "purposeful creativity" connecting children with nature through art: engaging multiple senses, attracting diverse audiences, emphasizing social interaction, and fostering environmental stewardship (Lankford, 1997; Levinthal, 1988). Within Gardner's Multiple Intelligence Theory, this could be perceived as "spatial intelligence" where children learn best through art, visual perceptions, and recreation (Gardner, 2000).

Qualitative Component: Rubrics

Environmental knowledge was assessed using the drawing section of CEPAS: the Draw-an-Ecosystem-Test and the Draw-an-Animal Test. These drawings were scored using the Draw-an-Ecosystem-Test Rubric and the Draw-an-Animal-Test Rubric, respectively. The main goal of the two scoring rubrics was that any reviewer could use the rubric and come to the same score for a single drawing. Also, the overall design of the rubric could be easily adapted to other subject matters and themes within EE programs. These objectives have been echoed in previous research, highlighting the instrument as user-friendly and easily adaptable (Cronin-Jones, 2005; Palmquist, 1997; Smith et al., 2003).

Results revealed a reasonable inter-rater reliability score for each grading rubric. Scoring rubrics rated drawings based on five scoring factors and associated degrees of presence and interaction for each of those factors. The use of scoring rubrics to evaluate drawings has been supported by previous research (Moseley et al, 2010), and was found to be a reliable and valid method for generating a quantitative score of a qualitative work (Cronin-Jones, 2005; Crook, 1985; Moseley et al., 2010; Thomas and Silk, 1990).

Qualitative Component: Drawings

Within this study, the use of drawings (DET and DAT) sought to visually reflect the environmental knowledge children had prior to and after completing one-week day-camp summer programs. The two main environmental themes explored by the survey included: the components that make up an ecosystem (DET) and the things an animal needs to survive (DAT). From children's photographs to simple pencil drawings, art evaluations allow children to explore their creativity and express their ideas and opinions in a hands-on task-centered activity (James, Jenks, & Prout, 1998; Tunstall et al., 2004; Seibert and Anooshina, 1993). What children draw and how children think are closely connected (Vygotsky, 1971), reflecting a child's mental representations and conceptual knowledge about objects drawn. Hence, the use of drawings to evaluate environmental knowledge was chosen because of recent trends in EE research literature (Alerby, 2000; Aronsson & Andersson, 1996; Barraza,1999; Bowker, 2007; Guichard, 1995; Palmberg & Kuru, 1998; Tunnicliffe & Reiss, 1999).

Findings within this research reveal a general knowledge of basic environmental concepts for both pre-test drawings. Overall mean scores improved on the post-test for both drawings related to levels of interaction, presence and drawing accuracy. These results are consistent with previous studies where children's drawings improved in accuracy and children's environmental knowledge increased after participating in EE programs (Bowker, 2007; Larson et al., 2010; Smith et al., 2003). Children scored higher on the pre-test DAT than the DET, but post-test scores improved more for the DET than the DAT. This finding may reflect children's underlining fascination with animals from an early age and thus greater knowledge of the subject matter (Meyers, 2004). Many researchers propose that educators can harness this animal fascination within children by connecting individual animals to larger ecosystems and use this avenue to further knowledge and understanding of environmental concepts and issues (Bunting & Cousins, 1985; Kahn, 1999; Meyers, 2004; Palmer, 1997).

The Draw-an-Ecosystem-Test (DET) addressed the question: what are children's perceptions of an ecosystem? Results suggest that children within this study see their local ecosystem as being comprised mainly of biotic factors (e.g., plants and animals), human built structures (e.g., houses, cars, and playgrounds), and generally in a backyard setting. This result is to be expected since the majority of children in this study were from Athens-Clarke County, Georgia—a relatively urban to suburban environment. This result changed very little between the pre- and post-test. After EE program implementation, the presence of wild animals did improve slightly from pre- to post-test, however plants were drawn much more frequently than animals in both drawings. These findings are similar to Alerby (200) in that children show an understanding for both natural environments and the influence of humans in nature.

The Draw-an-Animal-Test (DAT) addressed the question: what do children perceive are survival needs for animals? Results show that children generally understand the premise of the three basic animal needs in the order of shelter, food, and water. These animals were depicted in a natural outdoor habitat the majority of the time, which is consistent with the higher rate of wild animals drawn compared to domestic animals. This was an interesting results considering the majority of these children were from urban environments. The rate of plants drawn did decrease as compared to the DET, however this was to be expected since the drawing prompt was specific to animals and not plants.

Cross-validation of Likert-type Statements and Drawings

The use of cross-validation confirmed a positive correlation between high scores on Likert-type item subscales with high scores on DET/DAT item subscales, suggesting the combination of these two types of survey methods (quantitative and qualitative) work well together in accuracy depicting children's environmental perceptions. Children responded well to the survey format—the Likert-type statements were easy to understand by the visual response cues of thumbs-up and thumbs-down and the drawing provided a fun, hands-on creative activity. The combination of Likert-type statements and drawings proved to be a relatively quick and easy way to gather information from and about children, was less stressful than traditional assessments (reducing testing anxiety), was an enjoyable camp activity, and was generally free from linguistic barriers enabling comparisons between diverse groups, including children with learning disabilities (Chambers, 1983; King, 1995; Lewis & Greene, 1983; Rennie & Jarvis, 1995).

Implications and Future Research

In conclusion, this study shows that using both quantitative (Likert-type statements) and qualitative (drawings) assessment tools in a survey instrument are valid and reliable for measuring the effects of EE programs on children's environmental perceptions and knowledge. The drawing-based evaluation process and corresponding outcomes suggest that art could serve as an effective, learner-centered method for evaluating environmental awareness and the efficacy of EE programs. Future research should continue to examine the potential use of art as an interdisciplinary teaching, learning, and assessment tool for EE programs. Future studies should also explore the various mediums of art (e.g., music, theatre, writing, etc) within EE program assessments and activities—how they work in combination with one another and the affects they have on children from varying backgrounds (e.g., cultural upbringing, geographical location, mental capabilities, etc).

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Table 3.1

Draw-an-Ecosystem-Test Rubric (DET-R) Used to Assess the Draw-an-Ecosystem-Test (DET) Component of the Children's Environmental Perceptions and Art Survey (CEPAS).

Draw-an-Ecosystem-Test Rubric (DET-R)

Factor	Not Present	Present	Basic Interactions	Complex Interactions	Explicit Interactions	Score
	0 Point	1 Point	2 Points	3 Points	4 Points	
Human	Drawing **does not contain pictures or words** depicting humans.	Drawing contains **pictures or words** depicting human(s) **without any apparent interaction** with other factors.	Drawing contains **pictures or words** depicting human(s) **interacting by only touching** other humans and/or another factor. e.g. human standing on ground or bridge, etc	Drawing contains **pictures or words** depicting human (s) **interacting** with other human(s) and/or another factor. e.g. human walking on bridge, riding a bike, etc	Drawing contains **pictures and descriptions** (labels or arrows) depicting human(s) with **deliberate emphasis** placed on the interaction with one or more factors and the influence of that interaction on the environment.	
Biotic	Drawing **does not contain pictures or words** depicting biotic factors.	Drawing contains **pictures or words** depicting biotic factors **without any apparent interaction** with other factors. e.g. animals, trees, grass, flowers, insects, etc	Drawing contains **pictures or words** depicting biotic factors **interacting by only touching** other biotic factors and/or another factor. e.g. trees touching grass, animal on ground, etc	Drawing contains **pictures or words** depicting biotic factors **interacting** with other biotic and/or another factor. e.g. animal running on grass, bird perching in tree, etc	Drawing contains **pictures and descriptions** (labels or arrows) depicting biotic factors with **deliberate emphasis** placed on the interaction with one or more factors and the influence of that interaction on the environment.	
Abiotic	Drawing **does not contain pictures or words** depicting abiotic factors.	Drawing contains **pictures or words** depicting abiotic factors drawn **without any apparent interaction** with other factors. e.g. mountains, rivers sun, clouds, rain, rainbow, etc	Drawing contains **pictures or words** depicting abiotic factors drawn **interacting by only touching** other abiotic factors and/or another factor. e.g. water touching ground, sky touching grass, etc	Drawing contains **pictures or words** depicting abiotic factors **interacting** with other abiotic factors and/or another factor. e.g. wing blowing leaves, rain puddling on the ground, etc	Drawing contains **pictures and descriptions** (labels or arrows) depicting abiotic factors with **deliberate emphasis** placed on the interaction with one or more factors and the influence of that interaction on the environment.	
Human Built or Designed	Drawing **does not contain pictures or words** depicting human built factors.	Drawing contains **pictures or words** depicting human built factors drawn **without any apparent interaction** with other factors. e.g. buildings, automobiles, bridges, swing sets, etc	Drawing contains **pictures or words** depicting human built factors drawn **interacting by only touching** other human built factors and/or another factor. e.g. house touching grass, car touching driveway, etc.	Drawing contains **pictures or words** depicting human built factors **interacting** with other human built factors and/or another factor. e.g. smoke from chimney, car driving on road, etc	Drawing contains **pictures and descriptions** (labels or arrows) depicting human built factors with **deliberate emphasis** placed on the interaction with one or more factors and the influence of that interaction on the environment.	
					Total Points out of 16	

Table 3.2

Draw-an-Animal-Test Rubric (DAT-R) Used to Assess the Draw-an-Animal-Test (DAT) Component of the Children's Environmental Perceptions and Art Survey (CEPAS).

Draw-an-Animal-Test Rubric (DAT-R)

Factor	Not Present	Present	Basic Interactions	Complex Interactions	Explicit Interactions	Score
	0 Point	1 Point	2 Points	3 Points	4 Points	
Ecosystem Complexity	Drawing **does not contain pictures or words** depicting biotic or abiotic factors, other than the favorite animal.	Drawing contains **pictures or words** depicting biotic or abiotic factors **without any apparent interaction** with favorite animal. e.g. sun, clouds, trees, grass, man-made structures, etc	Drawing contains **pictures or words** depicting biotic or abiotic factors **interacting by only touching** favorite animal. e.g. animal on ground, bird in air, fish in water, etc	Drawing contains **pictures or words** depicting biotic or abiotic factors **interacting** with favorite animal. e.g. animal running on grass, "bird flys in the air", etc	Drawing contains **pictures and descriptions** (labels or arrows) depicting biotic or abiotic factors with **deliberate emphasis** placed on the interaction with the favorite animal.	
Food	**Drawing does not contain pictures or words** depicting food sources for the favorite animal.	Drawing contains **pictures or words** depicting food sources **without any apparent interaction** with favorite animal. e.g. plants, animals, bones, domestic animal food, etc	Drawing contains **pictures or words** depicting food sources **interacting by only touching** favorite animal. e.g. food source touching ground or bowl, etc	Drawing contains **pictures or words** depicting food sources **interacting** with favorite animal. e.g. food source being eaten, "cat eats the food", etc	Drawing contains **pictures and descriptions** (labels or arrows) depicting food sources with **deliberate emphasis** placed on the interaction with the favorite animal.	
Water	Drawing **does not contain pictures or words** depicting water sources for the favorite animal.	Drawing contains pictures **or** words depicting water sources **without any apparent interaction** with favorite animal. e.g. puddles, lakes, domestic animal water bowl, etc.	Drawing contains **pictures or words** depicting water sources **interacting by only touching** favorite animal. e.g. water source touching ground or bowl, etc	Drawing contains **pictures or words** depicting water sources **interacting** with favorite animal. e.g. water source drunk, "dog drinks the water", etc	Drawing contains **pictures and descriptions** (labels or arrows) depicting water sources with **deliberate emphasis** placed on the interaction with the favorite animal.	
Shelter	Drawing **does not contain pictures or words** depicting shelter sources for the favorite animal.	Drawing contains pictures **or** words depicting shelter sources **without any apparent interaction** with favorite animal. e.g. tree cavities, nest, forest, burrows, doghouse, etc	Drawing contains **pictures or words** depicting shelter sources **interacting by only touching** favorite animal. e.g. bird at nest, rabbit at burrow, dog at doghouse, etc	Drawing contains **pictures or words** depicting shelter sources **interacting** with favorite animal. e.g. bird in nest, "rabbit lives in the borrow", etc	Drawing contains **pictures and descriptions** (labels or arrows) depicting shelter sources with **deliberate emphasis** placed on the interaction with the favorite animal.	
					Total out of 16 points	

Table 3.3

Demographics of Survey Participants from Sandy Creek Day Camp and Memorial Park Day Camp in Athens-Clarke County, GA.

Variable	Count (n=285)	Percentage (%)
Gender		
Male	166	58.2
Female	119	41.8
Age		
6 to 7	90	31.6
8 to 9	103	36.1
10 to 12	92	32.3
Ethnicity		
African American	82	28.8
Asian	30	10.5
Hispanic/Latino	19	6.7
White	154	54.0
Grade		
K	15	5.3
1	62	21.8
2	62	21.8
3	46	16.1
4	42	14.7
5	34	11.9
6	24	8.4
Scholarship Level*		
0%	160	56.1
20%	4	1.4
40%	1	0.4
60%	12	4.2
80%	83	29.1
100%	25	8.8

Note: All information obtained by permission from camp registration forms provided by parents of camp participants.

*Scholarship levels determined by Athens-Clarke County Leisure Services Department based on household size and annual income

Table 3.4

Demographic Comparison between Survey Participants from Sandy Creek Day Camp and Memorial Park Day Camp and the Population from Athens-Clarke County, GA.

Variable	One-week Day-camp [a] (n=285) Percentage (%)	Athens-Clarke County [b] (N=116,714) Percentage (%)
Gender		
Male	58.2	48.3
Female	41.8	51.7
Ethnicity		
African American	28.8	26.6
Asian	10.5	4.2
Hispanic/Latino	6.7	10.4
White	54.0	61.9

a. All information obtained by permission from camp registration forms provided by parents of camp participants.
b. Based on the 2010 U.S. Census fact sheet on Athens-Clarke County, GA.

Table 3.5

Pre-test Pattern and Structure Matrix Coefficients of Three Factors of The Children's Environmental Perceptions and Art Survey (CEPAS): Eco-affinity, Eco-awareness, and Art-appreciation.

	Pre-test (n=285)					
	Pattern			Structure		
Factor / Item[a]	**A**	**B**	**C**	**A**	**B**	**C**
A. Eco-Affinity[b]						
# 17	**0.859**	-0.160	-0.035	**0.793**	0.102	0.354
# 5	**0.661**	-0.022	0.010	**0.659**	0.182	0.317
# 15	**0.654**	0.041	-0.070	**0.634**	0.238	0.239
# 7	**0.614**	0.010	0.148	**0.686**	0.210	**0.436**
# 18	**0.612**	-0.010	0.004	**0.610**	0.179	0.288
# 13	**0.546**	-0.084	0.218	**0.622**	0.101	**0.467**
# 9	**0.499**	0.166	0.164	**0.626**	0.332	**0.409**
# 12	0.385	0.133	0.234	**0.535**	0.269	**0.424**
B. Eco-Awareness[c]						
# 20	-0.144	**0.629**	-0.029	0.036	**0.582**	-0.049
# 11	-0.103	**0.571**	-0.133	0.010	**0.529**	-0.139
#19	0.121	**0.510**	0.162	0.353	**0.559**	0.256
# 16	0.080	0.353	0.055	0.214	0.382	0.118
# 10	0.351	0.284	-0.205	0.343	0.377	-0.020
# 14	0.240	0.275	0.162	**0.400**	0.361	0.295
# 6	0.220	0.269	0.054	0.328	0.340	0.176
# 8	0.052	0.255	0.283	0.262	0.292	0.326
C. Art-Appreciation[d]						
# 3	-0.067	0.049	**0.747**	0.297	0.084	**0.719**
# 4	0.326	-0.097	**0.600**	**0.576**	0.048	**0.745**
# 1	-0.007	-0.023	**0.429**	0.186	0.007	**0.424**
# 2	0.235	-0.041	0.363	0.392	0.058	**0.470**

Note: Major factor loading coefficients (≥ 0.400) for each item are in bold.

a. Cronbach's alpha for twenty Likert-scale type items was 0.842, 45.1% total variance.
b. Cronbach's alpha for eight eco-affinity items was 0.851, 28.0% total variance.
c. Cronbach's alpha for eight eco-awareness items was 0.643, 10.1% total variance.
d. Cronbach's alpha for four art-appreciation items was 0.700, 7.0% total variance.

Table 3.6

Post-test Pattern and Structure Matrix Coefficients of Three Factors of The Children's Environmental Perceptions and Art Survey (CEPAS): Eco-affinity, Eco-awareness, and Art-appreciation.

	Post-test (n=285)					
	Pattern			Structure		
Factor / Item[a]	**A**	**B**	**C**	**A**	**B**	**C**
A. Eco-Affinity[b]						
# 17	**0.782**	-0.024	0.011	**0.778**	0.235	0.295
# 7	**0.776**	0.050	-0.038	**0.778**	0.304	0.248
# 13	**0.742**	-0.035	0.060	**0.752**	0.213	0.329
# 9	**0.714**	0.001	-0.031	**0.703**	0.236	0.230
# 12	**0.686**	-0.042	0.016	**0.678**	0.186	0.264
# 5	**0.643**	0.022	0.107	**0.689**	0.239	0.343
# 15	**0.577**	0.001	0.027	**0.587**	0.193	0.237
# 18	**0.560**	0.042	0.104	**0.611**	0.232	0.310
B. Eco-Awareness[c]						
# 20	-0.116	**0.668**	-0.001	0.104	**0.630**	-0.012
# 11	-0.169	**0.647**	0.005	0.047	**0.592**	-0.207
#19	0.025	**0.552**	0.064	0.230	**0.563**	0.098
# 10	0.039	**0.448**	0.074	0.214	**0.464**	0.109
# 8	0.059	**0.439**	0.077	0.233	**0.462**	0.120
# 16	0.211	0.365	-0.089	0.299	**0.430**	0.005
# 6	0.195	0.326	-0.053	0.284	0.388	0.033
# 14	0.342	0.284	-0.142	0.385	0.391	-0.003
C. Art-Appreciation[d]						
# 1	-0.014	0.032	**0.678**	0.243	0.059	**0.674**
# 3	0.049	0.186	**0.596**	0.327	0.230	**0.622**
# 2	0.367	-0.129	**0.569**	**0.541**	0.022	**0.700**
# 4	**0.528**	-0.018	0.391	**0.665**	0.175	**0.582**

Note: Major factor loading coefficients (≥ 0.400) for each item in bold.

a. Cronbach's alpha for twenty Likert-scale type items was 0.866, 49.6% total variance.
b. Cronbach's alpha for eight eco-affinity items was 0.884, 30.6% total variance.
c. Cronbach's alpha for eight eco-awareness items was 0.712, 11.7% total variance.
d. Cronbach's alpha for four art-appreciation items was 0.767, 7.3% total variance.

Table 3.7

Pre- and Post-test Mean Scores (M) and Standard Deviations (SD) for Twenty Likert-type Items within Three Factors of The Children's Environmental Perceptions and Art Survey (CEPAS): Eco-affinity, Eco-awareness, and Art-appreciation.

		Pre-test (n=285)		Post-test (n=285)	
Factor / Item		**M**	**SD**	**M**	**SD**
A. Eco-affinity		3.929	1.071	3.964	1.049
# 5	I like to learn a lot about plants and animals.	3.810	1.150	3.980	1.078
# 7	I like to read a lot about plants and animals.	3.590	1.182	3.740	1.143
# 9	I want to learn ways to help protect plants and animals.	4.220	0.933	4.240	0.908
# 12	I would give a lot of my own money to help plants and animals.	3.740	1.179	3.740	1.149
# 13	I would spend time after school working to fix problems in nature.	3.710	1.137	3.760	1.066
# 15	I like to spend a lot of time in places that have plants and animals.	4.100	1.058	4.070	1.067
# 17	I like to learn a lot about nature.	4.000	1.075	3.980	1.083
# 18	I would help to protect plants and animals in my neighborhood.	4.260	0.853	4.200	0.900
B. Eco-awareness		4.324	0.973	4.388	0.937
# 6	Plants and animals are very important to people.	4.530	0.837	4.530	0.811
# 8	Plants and animals are very easily hurt by people.	4.030	1.138	4.260	0.970
# 10	People really need plants to survive.	4.590	0.715	4.670	0.695
# 11	My life would change a lot if there were no trees.	4.460	1.066	4.480	1.086
# 14	People need to take much better care of nature.	4.580	0.665	4.530	0.705
# 16	Building new homes and stores are bad for nature.	3.830	1.207	3.980	1.133
#19	Nature is very easily hurt by people.	4.110	1.071	4.250	0.970
# 20	My life would change a lot if there were no plants and animals.	4.460	1.082	4.400	1.127
C. Art-appreciation		3.785	1.173	3.865	1.128
# 1	I like to spend time drawing and coloring.	3.820	1.161	3.950	1.055
# 2	I like to make arts and crafts about nature.	3.580	1.216	3.730	1.156
# 3	I like to draw and color plants and animals.	4.070	1.111	4.060	1.076
# 4	I like to make arts and crafts.	3.670	1.205	3.720	1.226

Note: Each item included five response choices: one = strongly disagree to five = strongly agree.

Table 3.8

Inter-rater Reliability (Kappa and Pearson's Correlations) for Five Factors of Drawing Rubrics Among Three Reviewers: Initial Rubric Review (A) and Final Rubric Review (B).

	Reviewer 1 vs. Reviewer 2				Reviewer 1 vs. Reviewer 3		Reviewer 2 vs. Reviewer 3	
	Kappa		Pearson's		Kappa	Pearson's	Kappa	Pearson's
Factor	**A**	**B**	**A**	**B**	**A**	**A**	**A**	**A**
Draw-an-Ecosystem-Test Rubric (DET-R)								
Human	0.926	0.893	0.958	0.985	0.963	0.992	0.926	0.983
Biotic	0.853	1.000	0.944	1.000	0.853	0.944	0.884	0.949
Abiotic	0.712	0.797	0.766	0.917	0.660	0.835	0.641	0.807
Human Built	0.884	0.871	0.927	0.976	0.827	0.942	0.745	0.910
Habitat Type	0.835	1.000	0.889	1.000	0.835	0.889	0.869	0.912
Draw-an-Animal-Test Rubric (DAT-R)								
Habitat Complexity	0.736	0.914	0.800	0.966	0.775	0.908	0.566	0.686
Food	0.846	0.851	0.917	0.959	0.849	0.926	0.812	0.898
Water	0.880	0.922	0.922	0.950	0.920	0.942	0.959	0.970
Shelter	0.706	0.842	0.829	0.922	0.849	0.870	0.733	0.872
Habitat Type	0.709	0.923	0.776	0.933	0.800	0.809	0.744	0.897

Table 3.9

Pre- and Post-test Mean Scores (M) and Standard Deviations (SD) for Draw-an-Ecosystem-Test (DET) and Draw-an-Animal-Test (DAT) of The Children's Environmental Perceptions and Art Survey (CEPAS).

	Pre-test (n=285)		Post-test (n=285)	
Drawing /Rubric Factor	**M**	**SD**	**M**	**SD**
Draw-an-Ecosystem-Test Rubric[a]				
Human	0.540	1.121	0.640	1.175
Biotic	1.600	1.098	1.670	1.182
Abiotic	0.970	1.124	1.380	1.317
Human Built	1.390	1.192	1.640	1.216
Total Rubric Score	4.480	2.429	4.550	2.675
Habitat Type[b]	1.670	1.006	1.600	0.958
Environmental Component[c]	7.670	5.316	10.151	9.820
Total Drawing Score	13.820	8.751	16.301	13.453
Draw-An-Animal-Test Rubric [a]				
Habitat Complexity	1.810	0.950	2.060	0.949
Food	0.810	0.933	1.000	1.005
Water	0.510	0.700	0.610	0.847
Shelter	1.420	1.002	1.670	0.983
Total Rubric Score	5.330	2.734	5.350	2.921
Habitat Type[b]	2.270	1.082	2.320	1.044
Environmental Component[c]	7.375	5.316	9.169	5.576
Total Drawing Score	14.975	9.132	16.839	9.541

a. Factor scored based on five levels of interaction: zero = not present, one = present, two = basic interaction, three = complex interaction, four = explicit interaction.
b. Habitat Type scored based on four choices: zero = indoor habitat, one = backyard habitat, two = park/playground habitat, three = natural outdoor habitat.
c. Environmental Component scored based on presence and number of 16 natural elements and colors.

Table 3.10

Percent Presence of Rubric Factors Within the Draw-an-Ecosystem-Test (DET) of the Children's Environmental Perceptions and Art Survey (CEPAS) for Campers Attending Sandy Creek Day Camp and Memorial Park Day Camp in Athens-Clarke County, GA.

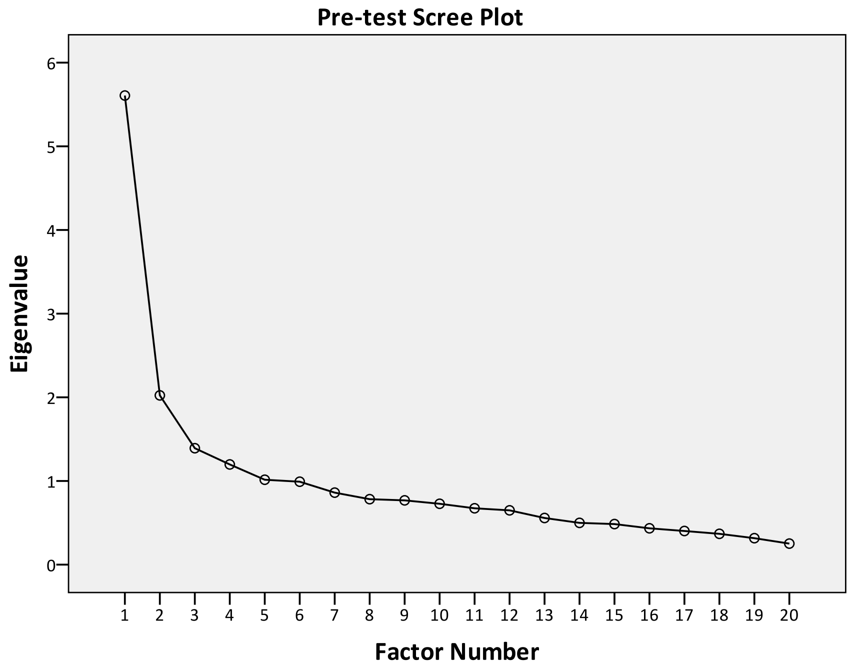
	Pre-test (n=285)		Post-test (n=285)	
Rubric Factor	**Count**	**Frequency**	**Count**	**Frequency**
Draw-an-Ecosystem-Test Rubric				
Human	61	21.4%	71	24.9%
Biotic	215	75.4%	206	72.3%
Abiotic	136	47.7%	161	56.5%
Human Built	186	65.3%	205	71.9%
Habitat Type				
Indoor	28	9.8%	28	9.8%
Backyard	123	43.2%	126	44.2%
Park or Playground	50	17.5%	63	22.1%
Natural Outdoor	84	29.5%	68	23.9%
Environmental Components				
Wild Animals	57	20.0%	80	28.1%
Domestic Animals	21	7.4%	21	7.4%
Mammals	77	27.0%	108	37.9%
Birds	23	8.1%	45	15.8%
Herps	8	2.8%	21	7.4%
Fish	10	3.5%	9	3.2%
Insects	11	3.9%	19	6.7%
Plants	200	70.2%	193	67.7%
Bushes	16	5.6%	23	8.1%
Grass	139	48.8%	141	49.5%
Trees	150	52.6%	150	52.6%
Flowers	21	7.4%	30	10.5%
Water	52	18.2%	54	18.9%
Sun	47	16.5%	78	27.4%
Clouds	34	11.9%	55	19.3%
Crayon Colors				
1 to 3	171	60.0%	152	53.3%
4 to 6	91	31.9%	83	29.1%
7 to 9	23	8.1%	40	14.0%
10+	0	0.0%	10	3.5%

Table 3.11

Percent Presence of Rubric Factors Within the Draw-an-Animal-Test (DET) of the Children's Environmental Perceptions and Art Survey (CEPAS) for Campers Attending Sandy Creek Day Camp and Memorial Park Day Camp in Athens-Clarke County, GA.

	Pre-test (n=285)		Post-test (n=285)	
Rubric Factor	**Count**	**Frequency**	**Count**	**Frequency**
Draw-an-Animal-Test Rubric				
Habitat Complexity	251	88.1%	267	93.7%
Food	162	56.8%	183	64.2%
Water	117	41.1%	122	42.8%
Shelter	225	78.9%	248	87.0%
Habitat Type				
Indoor	30	10.5%	23	8.1%
Backyard	48	16.8%	55	19.3%
Park or Playground	21	7.4%	16	5.6%
Natural Outdoor	186	65.3%	191	67.0%
Environmental Components				
Wild Animals	193	67.7%	205	71.9%
Domestic Animals	80	28.1%	75	26.3%
Mammals	194	68.1%	202	70.9%
Birds	28	9.8%	46	16.1%
Herps	40	14.0%	42	14.7%
Fish	42	14.7%	47	16.5%
Insects	11	3.9%	25	8.8%
Plants	131	46.0%	154	54.0%
Bushes	4	1.4%	7	2.5%
Grass	91	31.9%	112	39.3%
Trees	71	24.9%	80	28.1%
Flowers	9	3.2%	16	5.6%
Water	111	38.9%	119	41.8%
Sun	42	14.7%	64	22.5%
Clouds	19	6.7%	38	13.3%
Crayon Colors				
1 to 3	192	67.4%	151	53.0%
4 to 6	78	27.4%	92	32.3%
7 to 9	15	5.3%	36	12.6%
10+	0	0.0%	5	1.8%

A.



B.

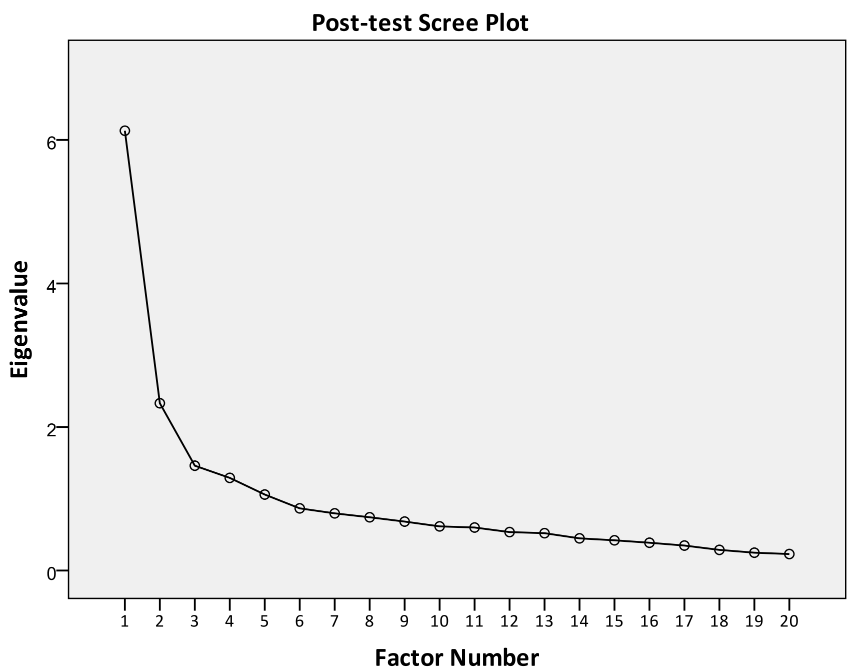


Figure 3.1

Exploratory Factor Analysis Scree Plots with Corresponding Eigenvalues for Twenty Likert-type Items on Children's Environmental Perceptions and Art Survey (CEPAS): Pre-test (A) and Post-test (B).

A.

B.

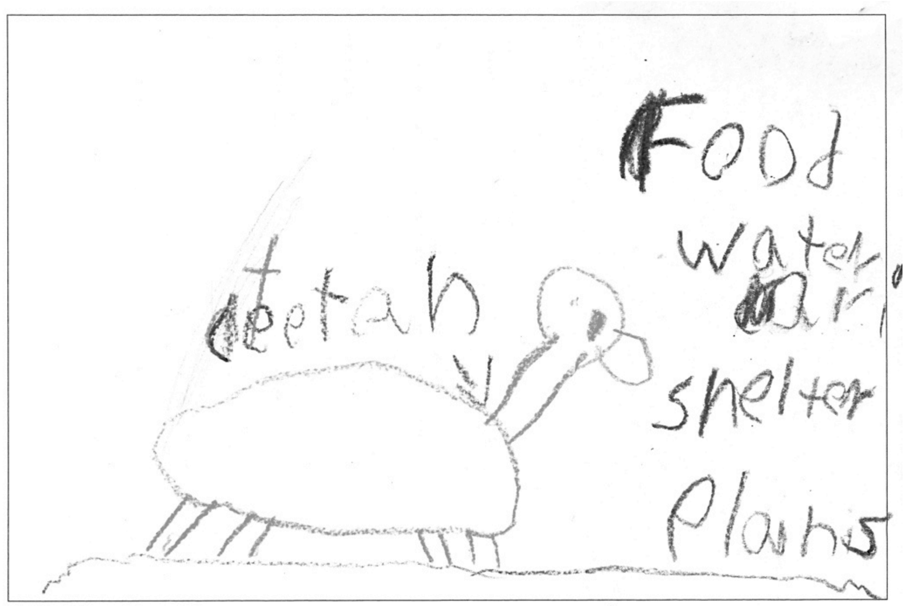


Figure 3.2

Examples of Draw-an-Ecosystem-Test Rubric (DET-R) and Draw-an-Animal-Test Rubric (DAT-R) Discrepancies Among Levels of Interaction (A) and Use of Words (B).

A.

Pre-test DET-R	Score
Human	2
Biotic	2
Abiotic	1
Human Built	2
Total Rubric Score	7
Habitat Type	1
Environmental Component	12
Total Drawing Score	**20**

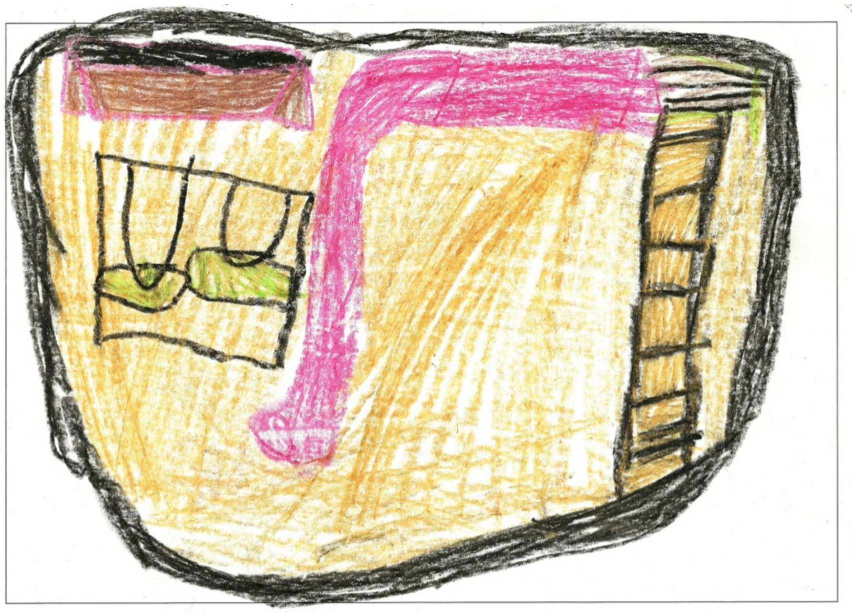
B.

Post-test DET-R	Score
Human	2
Biotic	3
Abiotic	3
Human Built	2
Total Rubric Score	10
Habitat Type	1
Environmental Component	20
Total Drawing Score	**31**

Figure 3.3

Examples of Draw-an-Ecosystem-Test (DET) and Associated Scoring on the Children's Environmental Perceptions and Art Survey (CEPAS): Pre-test (A) and Post-test (B) Drawings Completed by the Same Boy, Age 9.

A.



Pre-test DET-R	Score
Human	0
Biotic	0
Abiotic	2
Human Built	2
Total Rubric Score	4
Habitat Type	2
Environmental Component	5
Total Drawing Score	**11**

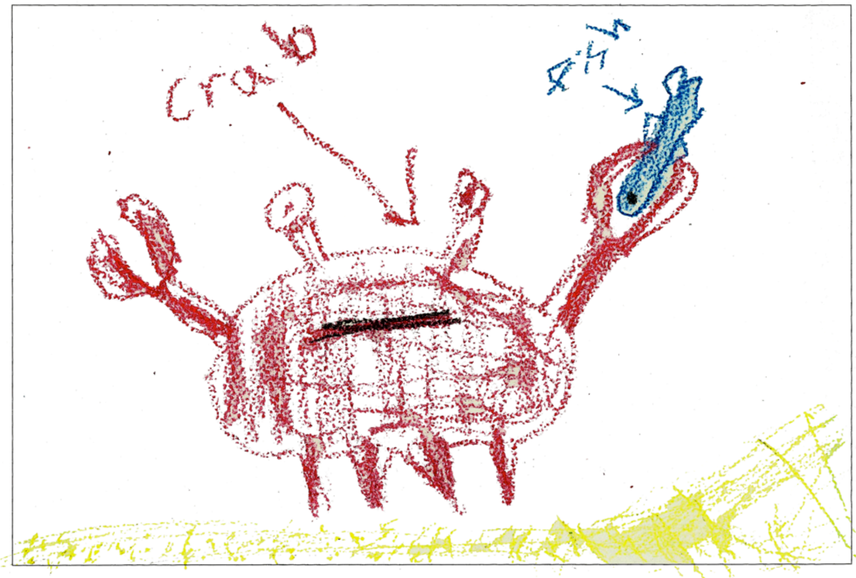
B.

Post-test DET-R	Score
Human	3
Biotic	3
Abiotic	3
Human Built	3
Total Rubric Score	12
Habitat Type	2
Environmental Component	15
Total Drawing Score	**29**

Figure 3.4

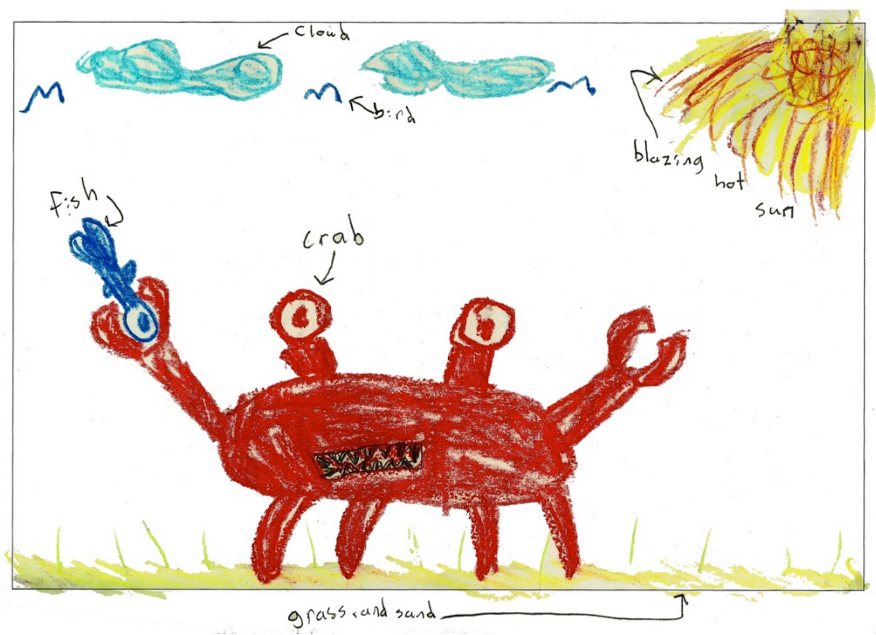
Examples of Draw-an-Ecosystem-Test (DET) and Associated Scoring on the Children's Environmental Perceptions and Art Survey: Pre-test (A) and Post-test (B) Drawings Completed by the Same Girl, Age 7.

A.



Pre-test DAT-R	Score
Habitat Complexity	2
Food	3
Water	0
Shelter	1
Total Rubric Score	6
Habitat Type	3
Environmental Component	7
Total Drawing Score	**16**

B.

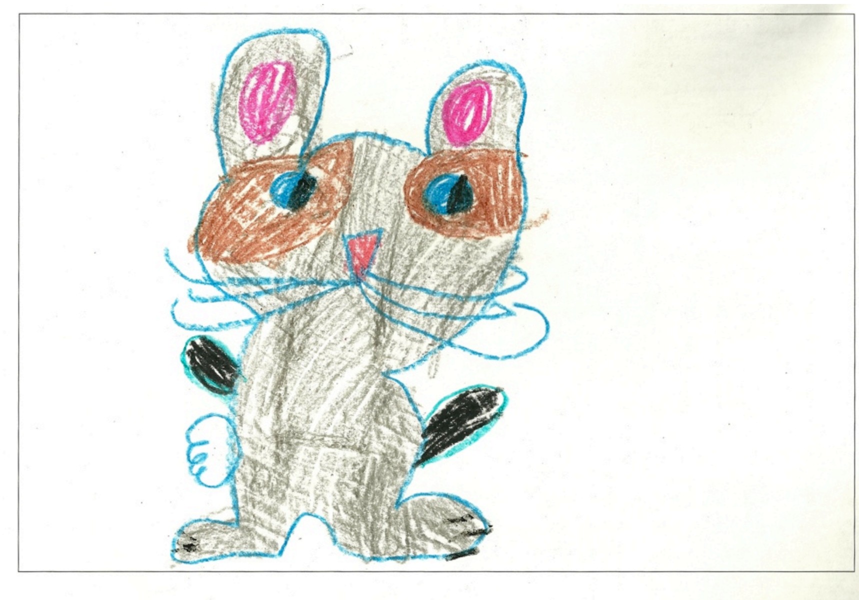


Post-test DAT-R	Score
Habitat Complexity	4
Food	3
Water	0
Shelter	2
Total Rubric Score	9
Habitat Type	3
Environmental Component	16
Total Drawing Score	**28**

Figure 3.5

Examples of Draw-an-Animal-Test (DAT) and Associated Scoring on the Children's Environmental Perceptions and Art Survey (CEPAS): Pre-test (A) and Post-test (B) Drawings Completed by the Same Boy, Age 9.

A.



Pre-test DAT-R	Score
Habitat Complexity	1
Food	0
Water	0
Shelter	0
Total Rubric Score	1
Habitat Type	3
Environmental Component	5
Total Drawing Score	**9**

B.

Post-test DAT-R	Score
Habitat Complexity	3
Food	3
Water	0
Shelter	2
Total Rubric Score	8
Habitat Type	3
Environmental Component	16
Total Drawing Score	**27**

Figure 3.6

Examples of Draw-an-Animal-Test (DAT) and Associated Scoring on the Children's Environmental Perceptions and Art Survey (CEPAS): Pre-test (A) and Post-test (B) Drawings Completed by the Same Girl, Age 7.

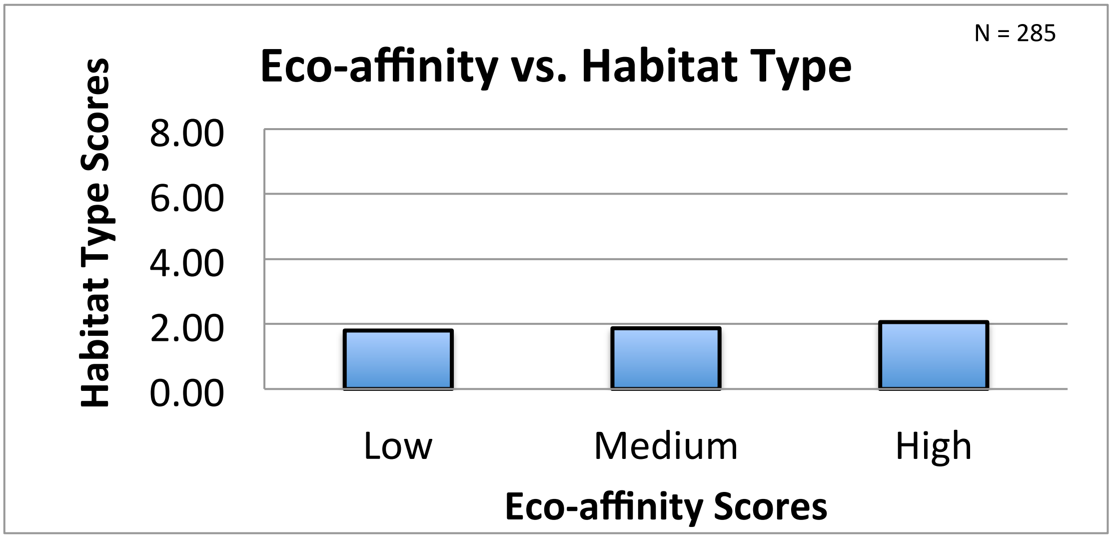


Figure 3.7

Cross-validation of Pre- and Post-test Mean Scores: Eco-affinity vs. Habitat Type (r = 0.131), on the Children's Environmental Perceptions and Art Survey (CEPAS).

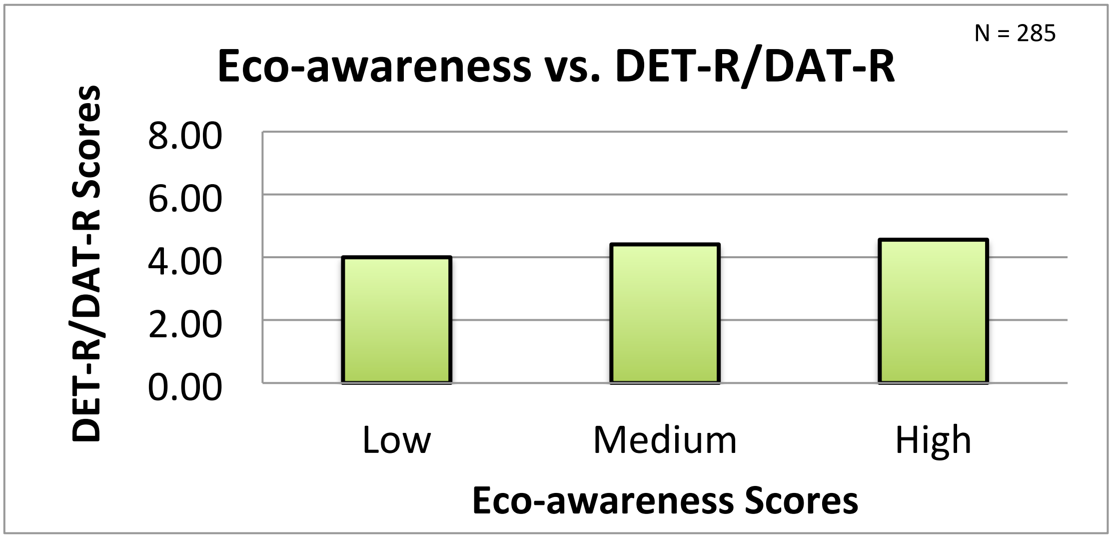


Figure 3.8

Cross-validation of Pre- and Post-test Mean Scores: Eco-awareness vs. DET-R/DAT-R (r = 0.042), on the Children's Environmental Perceptions and Art Survey (CEPAS).

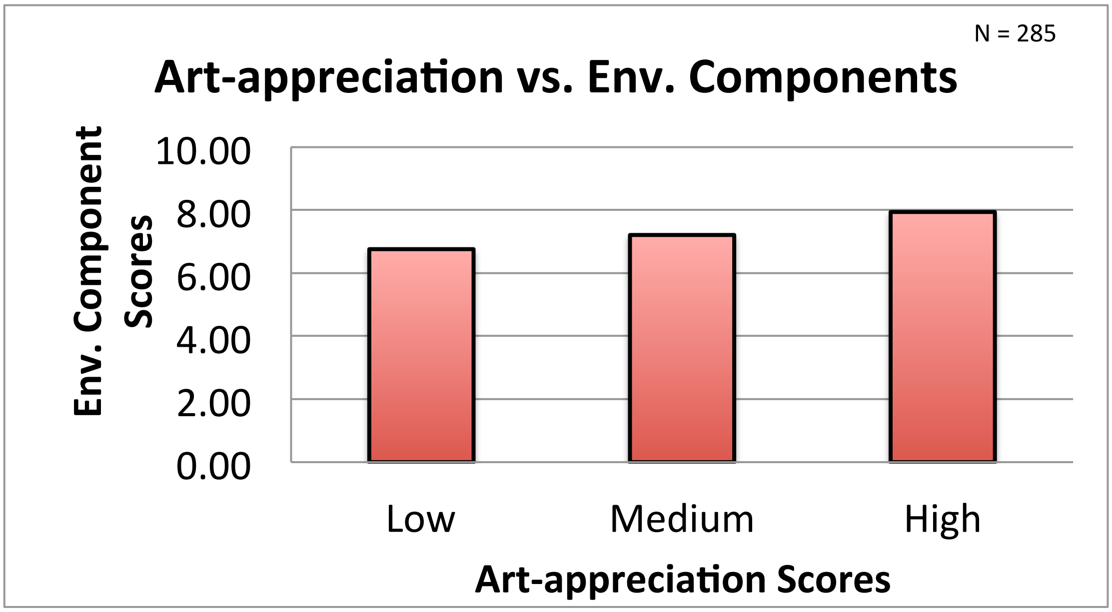


Figure 3.9

Cross-validation of Pre- and Post-test Mean Scores: Art-appreciation vs. Environmental Components (Env. Components) (r = 0.072), on the Children's Environmental Perceptions and Art Survey (CEPAS).

CHAPTER IV

THE EFFECTS OF AN ART-BASED ENVIRONMENTAL EDUCATION PROGRAM ON CHILDREN'S ENVIRONMENTAL PERCEPTIONS[2]

Flowers, A.A., Green, G.T., and Carroll, J.P. to be submitted to *Environmental Education Research.*

Abstract

Across the United States, children are becoming increasingly isolated from the natural world, as modern technologically-advanced lifestyles keep or draw children indoors—trading authentic-outdoor experiences for indoor-computerized play. This lack of exposure to nature has appears to be having an adverse affect on children's environmental perceptions. Environmental education (EE) is one possible solution that may help children re-connect with nature, however these programs need to use the most effective methods of teaching and learning. The inclusion of art activities is one enhancement to EE curriculum that may improve participant understanding and knowledge of the environment. This study evaluates the effectiveness of using art activities and art evaluations within one-week day-camp summer programs in Athens-Clarke County, GA. Results reveal that children participating in both traditional and art-based EE programs develop positive environmental attitudes, greater environmental awareness, increased knowledge and understanding of nature, and are more likely to participate in stewardship activities.

Introduction

Children today are growing-up detached from the natural world, lacking authentic experiences and unstructured free-play in the outdoors—a dis-concerning trend referred to as "nature-deficit disorder" (Larson et al., 2011; Louv, 2008). There are many reasons why children are spending more time indoors rather than outdoors including: parental fears of child abduction and accident liability, increased amounts of homework and overly-planned schedules (e.g., soccer practice, piano lessons, gymnastic meets, baseball games)(Clements, 2004; Louv, 2008). The main factor drawing children indoors is technology. From television to video games, internet to music players, children are interacting more with digital screens than with their local outdoor spaces (Wason-Ellam, 2010). One particular study showed that children 8-18 years-old average

6.5 hours a day of electronic media (Roberts & Foehr, 2008) and can identify cartoon characters like Pikachu© and SpongeBob Squarepants© with ease but cannot identify local oak or pine tree species (Balmford et al., 2002).

There are many benefits to children spending time outside in nature. Multiple studies show that spending time outdoors teaches children to be more creative, builds confidence, develops concentration skills, increases attention spans, improves problem-solving abilities, gives a sense of belonging, and relieves stress as children escape overly planned lives (Burdette & Whitaker, 2005; Matthews, 1992; Wells, 2000; Wells, 2003). Solutions to nature-deficit disorder are possible both within the home and school environment: families can create time and activities in nature such as spending an afternoon at a local park or visiting a zoo, while schools can develop curriculum with more hands-on outdoor activities and use of environmental education (EE) curriculum (Louv, 2008). However, an integrated approach that encompasses both formal and non-formal EE strategies is the most promising to combat nature-deficit disorder and get children outdoors (Lieberman & Hoody, 1998).

The Value of Environmental Education

Environmental education (EE) programs are one possible solution that may help ameliorate the effects of nature-deficit disorder. To understand the value of EE, it is important to consider the origin of the field. On April 22, 1970, the very first Earth Day marked the birth of the modern-day environmental movement. This momentous occasion launched the beginning of a pivotal form of conservation known as environmental education (EE). Spreading internationally, the United Nations adopted the Belgrade Charter in 1976, defining the goal of environmental education as:

"…to develop a world population that is aware of, and concerned about, the environment

> and its associated problems, and which has the knowledge, skills, attitudes, motivations, and commitment to work individually and collectively toward solutions of current problems and the prevention of new ones (p. 3)(NAAEE, 2004; UNESCO, 1975)."

The following year, the Tbilisi Declaration was adopted and established three objectives for EE based on the original Belgrade Charter: 1) to foster environmental awareness, 2) to provide opportunities to acquire the knowledge and skills needed to protect and improve the environment; and 3) to promote positive attitudes and behaviors towards the environment (NAAEE, 2004; UNESCO, 1977). In 1990, the United States adopted the National Environmental Education Act creating initiatives to expand EE into public schools (EPA, 1990). The current purpose of EE is to provide individuals with the knowledge, skills, and experience necessary to conserve and preserve the environment for all living organisms and future generations (Moseley et al., 2010). However, whether or to what extent EE may enhance children's environmental literacy, change attitudes and behaviors positively towards environmental stewardship, and thus ameliorate the effects of nature-deficit disorder remains unknown (Inwood, 2012).

Studies show that integrating EE into school curriculum improves student performance on standardize tests and enriches science courses, generating student interest and participation (Bartosh et al., 2006; Paterson, 2010). The National Environmental Education Foundation (NEEF) found that EE in schools increases GPA, science grades, improves reading and writing skills, critical thinking, and attitudes about learning (Paterson, 2010). During a survey on going 'green' in the classroom, 95% of parents agreed that EE should be a larger component of their child's school curriculum (Paterson, 2010). In comparing scores on standardized tests and environmental literacy measures between school children participating in integrated systemic EE curricula (e.g., designed around real-world environmental subjects) or traditional curricula, children who participated in EE programs scored higher than children in traditional school programs (Bartosh et al., 2009). This research suggests children benefit from EE programs throughout multiple disciplines, teaching children how to live sustainably while also helping schools meet testing standards (Bartosh et al., 2009). Two prior studies by Lieberman and Hoody (1999; 2000), also found that children from schools with environment-based programs had higher scores on standardized tests in math, reading, writing, science, and social studies. These studies conclude that school programs integrating EE curriculum provide students with space and time to make connections between school learning and the real world, improving attitudes and motivation towards school, learning, and grades (Bartosh et al., 2009).

Furthermore, EE programs both inside the classroom and at local nature centers are a means of service-learning and transformational teaching; teaching children to care about the world while at he same time trying to make a difference in the world (Aldridge & Goldman, 2007). Children ask questions about local environmental issues, research the issues, brainstorm with one-another to problem-solve, come up with solutions, and then implement the solutions (Strevy & Kirkland, 2010). Through this methodology and others, studies show that EE programs improve children's knowledge of nature, environmental attitudes, and environmental awareness (Larson, Green, & Castleberry, 2010)—the three components that compose environmental literacy (Athman & Monroe, 2007). Consequently, outdoor learning experiences can be more effective than traditional indoor classroom learning, from field trips to neighboring freshwater ecosystems to visiting science centers or participating in summer camps, basic knowledge of environmental concepts and local habitats are enhanced through EE programs (Cronin-Jones, 2005; Zoldosova, 2006).

Larson et al. (2010) investigated the use of one-week EE summer programs at the State Botanical Gardens of Georgia on children's environmental orientations and knowledge, comparing pre- and post-test scores between children (ages 6-13) participating in the EE summer program and those in a non-EE after-school program. Baseline pre-test scores confirmed that both groups had similar environmental knowledge, while post-test scores showed that children participating in the EE summer program improved significantly across environmental orientations and knowledge (Larson et al., 2010). Results suggest non-formal outdoor programs provide ideal platforms for stimulating positive environmental orientations in diverse groups of children (Larson et al., 2010). This research and others highlight the benefits of informal EE as an opportunity to make environmental learning entertaining, fun, and enjoyable while being multi-dimensional through the 'teaching-and-learning' process (Alerby, 2000; Bowker, 2007; Larson et al., 2010; Tofield et al., 2003; Zoldosova, 2006).

Zoldosova (2006) explored the use of informal science education at the Science Field Center in Slovakia where 153 children attended a 5-day long field trip program. Children who attended the field trip program showed greater interest in science related topics and also preferred books with science themes more than children who did not attend (Zoldosova, 2006). Results concluded that the use of informal learning situations enhanced children's preferences and perceptions of science-related-topics (Zoldosova, 2006).

The goal of EE is to help children achieve environmental literacy, with the objectives of: raising environmental awareness, increasing knowledge and understanding of natural systems, promoting positive attitudes and participation, instilling moral and ethical environmental values, and enhancing skills to identify and solve problems (Carr, 2004; Meyers, 2004; UNESCO, 1977). The goal of environmental literacy is to foster and develop informed and competent future stewards of the environment (van Staden, 2006). To do so, EE programs need to be the most effective they possibly can be in order to achieve these objectives within a broad and diverse population of children—every educational opportunity must be transforming (Reinsborough, 2008).

Research has shown that characteristics of effective EE programs include: 1) relevance to the organization, audience, and content of the local area; 2) stakeholder involvement (agency supervisors, teachers, parents, etc) throughout the stages of the program (development to evaluation); 3) empowerment of children with skills necessary to prevent, address, and solve environmental issues while instilling a sense of personal responsibility; 4) accurate and balanced materials, consisting of multiple perspectives and interdisciplinary components; 5) promote quality education and effective teaching across diverse disciplines; 6) instructionally sound, using the best methodologies in education; and finally 7) evaluation with appropriate tools (Athman & Monroe, 2007; Inwood, 2008). Specifically within these characteristics, the most important might be the use of instructionally sound methodologies because of the different ways children learn and comprehend information as they develop.

Children's Cognition Theories

From a young age children value environmental features and experiences because of an inherent appreciation, interest, and concern for animals (Meyers, 2004; Owens, 2005). At age five, children understand animals more so than ecosystems because they can associate with and visualize animals as an individual capable of being helped or harmed (Leach, Driver, Scott, & Wood-Robinson, 1996; Meyers 2004). After age nine, children are better able to form independent reasoning, understanding the connections between an animal and its environment. Research suggests that introducing concepts of ecosystems through specific animals species enhances understanding—specifically by using endangered or mega-fauna species such as whales and elephants (Bunting & Cousins, 1985; Kahn, 1999; Meyers, 2004; Palmer, 1997;). However according to these children, animals that were not keystone species were not worth saving. This being said, animals are still a viable center for expanding upon environmental processes and concepts (Meyers, 2004).

For example, children can learn a lot from deciphering an animal's basic needs for survival: food, water, and shelter. From this starting point, children's perceptions of individual animal needs grow into concern for species, populations, communities, ecosystems, and human actions that may affect them (Meyers 2004). Meyers (2004) explored this theory in his research examining changes with age in children's perceptions of animals' needs, from individual to ecosystem and human conservation. A total of 171 children (ages 4-14) visiting the Brookfield Zoo in Illinois were interviewed and drew pictures in response to questions about their favorite animal. Children's drawings were analyzed across three scales of conservation, ecological, and physiological needs (food, water, and shelter occurring at the highest rate of 44%) (Meyers 2004). On average, children's understanding of ecological and physiological needs of an animal increased with age, but dropped after age ten because older children focused more on conservation needs. Results from this research suggest that children's fascination with a specific animal may provide an alternate route towards introducing and understanding environmental concepts and issues (Meyers 2004), and—a new approach when developing EE curriculum and programs.

Additionally, Piaget's Cognitive Development Theory states that children have a base knowledge which is replaced and updated as new knowledge is acquired—having four cognitive stages of development from birth to adolescence: sensorimotor (active child), preoperational (intuitive student), concrete operation (practical student), and formal operation (reflective student) (Joyce & Weil, 1996). Hence, if children are not cognitively developed enough to understand the presentation of material, they cannot learn the material (Joyce & Weil, 1996). Constructivist theory echoes Piaget's concepts of knowledge, where learning occurs as a result of interactions between physical and social environments—underscoring the value of learning as an active process (Bowker, 2007; Knapp, 1996). Active participants engaging in first-hand environmental experiences is one of the oldest and most natural learning methods, as it helps children explore their surroundings, understand natural systems, and instills memories of significant moments (Dewey 1938; Owens, 2005; Zoldosova, 2006).

Another theory, multiple intelligence, suggests that children learn and comprehend in up to nine different ways, two examples being spatial intelligence (art, visual perceptions, and re-creation) and naturalist intelligence (recognizing and categorizing the natural world) (Gardner, 2000). Falk and Dierking (2000) assert that "few museum experiences are more compelling to visitors than such experiences, which envelop the visitor in the sounds, smells, sights, textures, and even tastes of a place or event (p. 198)"—using all the senses to stimulate modern-day technology-savvy generations (Bowker, 2007). To be successful in teaching the diversity of children throughout the world, EE programs should therefore utilize the most effective methods, materials, and curriculum to these multiple intelligences and learning frameworks. The use of art is one possible solution to incorporate a more integrated skill-set within EE curriculum (Carr, 2004; Gardner, 1999), and ultimately reaching and appealing to a wider audience.

The Value of Art in Environmental Education

Modern and Western culture caters to an anthropocentric lifestyle where humans value nature based on usability for human consumption (Kellert, 2005; Thompson & Barton, 1994;

Wiseman & Bogner, 2003). In relating to the environment, this view places ecological importance on factors that are similar to humans, meet society's needs, relate to culture, and have aesthetic appeal (Kellert, 1996). The amalgamation of anthropocentricism and the conventional educational approach of technical knowledge as separate subject disconnects children from being part of the natural world (Griffin, 1988; Oliver, 1990; Orr, 1993; Richards, 1962). Art provides a way to reconnect to nature—it simply feels good physically, emotionally, and spiritually—and it harnesses a grounded knowledge as an intimate relationship approach (Fox, 1983; Oliver, 1990).

Hence, art nurtures biocentric or ecocentric perspectives where nature is valued for its own worth, just for being nature, and not for the consumptive benefits to humans (Kellert, 2005; Thompson & Barton, 1994; Wiseman & Bogner, 2003). The biophilia hypothesis suggests that humans have an innate need to relate to surrounding life, genetically wired and naturally selected to need nature's patterns, beauty, and harmony (Kellert & Wilson, 1995). The natural environmental has been an inspiration to artists, musicians, dancers, and playwrights to raise awareness about environmental issues—inventing creative, aesthetic, and sustainable solutions to environmental problems (Carr, 2004; Inwood, 2010). Hence, the integration of the aesthetics of art and the functionality of EE represents a means to facilitate sustainable behavior (Kesson, 2004).

One distinct study shows that art integration into school education enhances children's understanding and comprehension of the subject matter, especially by implementing hands-on activities and experiences (CAPE, 2001). Emotions drive human decisions and art fosters emotional connections (Jacobson, McDuff, Monroe, 2006). When emotion is added to a learning experience, the experience becomes personal, exciting, and more memorable as the brain perceives the experience as very important (Jacobson et al., 2006). The creation of art is a means of recording that experience through emotional responses that provides unlimited exploration (Savva, 2004).

In the Black Creek Storytelling Parade, Reinsborough (2008) used community arts practices to involve individual, group, and public engagement opportunities, enhancing community cohesion and participation in environmental issues surrounding the health of the local water system. The program taught the community about environmental responsibility, accountability, and ownership through a transformative art experience (Reinsborough, 2008). For the individual the artistic process garners self-awareness, empowerment, and artistic validation, while bringing cohesion to the community through sharing, research, exploration, expression, and action (Reinsborough, 2008). Blandy and Hoffman (1993) described this as "an art education of place (p. 23)," concentrating on specific environmental concerns and teaching children "about art in a way that promotes understanding of the interdependence and interconnectedness of all things (p. 28)."

Additionally, a similar study showed that the combination of art with place-based education increases the relevancy of school curriculum by connecting children with their local community and natural environments (Inwood, 2008). Place-based education focuses on an environment, defined traditionally as a physical location but also as a site of emotional attachment linked to memory, imagination, or experiences (McKenzie, 2008; Wason-Ellam, 2010). Kruger (2001) explains that "we cherish places not just by what we can get from them but for the way we define ourselves in relation to them...places with stories, memories, meanings, sentiments and personal significance (p. 178)." Furthering this notion is the description of place as shared interests and experiences at a common location (Ellis, 2002), or the experience itself of friendship, visual arts, performing arts, literature, culture, and/or community (McKenzie, 2008).

Therefore, place is a latitudinal and longitudinal coordinate on the map of an individual's life, a layered location of past, present, and future history and memories (Lippard, 1997).

Place-based education is rooted in EE and combined with art enhances children's' awareness of environmental concepts and issues. This approach fosters partnerships between children and their communities, creating unique opportunities for real-world learning (Inwood, 2008; Powers, 2004). Therefore, if children "develop strong bonds with their place and community physically, politically, emotionally, and spiritually, they are more likely to care for it and seek to improve it over time (p. 30)" (Inwood, 2008). The respect and responsibility children feel for a place becomes articulated in social interactions with peers, adults, animals, and the physical environment (Bakhtin, 1981; Wells, 2000). Linking art with an individual's sense of place and experience provides opportunities to enhance environmental perceptions and artistic expressions (Savva, 2004). Therefore, integrating the arts with place-based education is one of many innovative approaches to improving EE programming and fostering environmental literacy in children (Inwood, 2008).

In school systems, art education is another dynamic classroom for teaching children about environmental concepts and furthering environmental literacy beyond the boundaries of traditional science-based education (Inwood, 2008). Orr (1992) supports this idea, arguing that environmental literacy will not be instilled in children unless integrated into a wider variety of subject areas, including the arts. Integrating environmental literacy with art education has the potential to make learning personal and encourages creative problem solving, critical thinking, and communication—connecting children's minds with their hands, hearts, and natural environments (Inwood, 2008).

For art education to be effective, teachers must also understand and experience how art fosters environmental learning. A teacher's first-hand experience with the curricula only heightens the teacher's success in educating students. Savva (2004) performed a study on an in-service teachers' training program researching the use of the environment as an educational resource within the scope of art education. The goal of the project was to increase art teachers' sensitivity to the environment so that they may apply the same methods and materials in their art classrooms. This research was based off the idea that artistic activities in relation to the environment "can make children feel closer to, and more situated in their environment (p. 5)," expanding and deepening aspects of the environment they already know about, inspiring creative work, and stretching children's symbolic capacities (Engel, 1991). The three-day program took place at a local nature center and surrounding locations in Cyprus, involving fieldwork, lectures, and group discussions with journal writing and visual art activities (Savva, 2004). The study revealed that teachers' relation and sensitivity to the environment was enhanced by emotional engagement through hands-on art activities based on personal exploration and interaction with the people, places, and natural aspects of their local environment (Savva, 2004). With such great success, "it seems hard to envisage a better route to such significance than that afforded by some judicious combination of environmental and arts education (p. 237)" (Carr, 2004).

As art education and environmental education play a pivotal role in greening today's society, it is no wonder that the integration of these two disciplines is now termed "environmental art education" (EAE) or eco-art education (Inwood, 2012). Building on the traditional science-based foundations of EE and the contemporary methods of community arts and place-based education, EAE integrates knowledge, pedagogy and narrative from these disciplines to develop awareness of and interaction with environmental concepts and issues such as preservation, conservation, restoration, and sustainability (Inwood, 2010; Orr, 1994; Palmer, 1997; Zakai, 2002). Lankford (1997) describes EAE as “purposeful creativity” striving to reconnect children with their environment in positive, restorative, and spiritual methods—contributing to changes in attitudes and behaviors towards the environment (Inwood, 2010). In summary, art engages multiple senses, attracts diverse audiences, emphasizes social interaction, and introduces new perspectives. When combined with EE, art therefore has nearly unparalleled capacity to fosters environmental stewardship (Levinthal, 1988).

The Role of Art in Environmental Education Program Evaluation

The use of art as an evaluation tool to determine the effectiveness of EE is a novel approach to program assessment and provides evidence that helps defend environmental educators choices of curriculum activities (Bartosh et al., 2009). Past EE evaluation efforts have commonly employed traditional paper-and-pencil assessments. These instruments are easy to implement and quantify, but not all students perform well on these types of examinations (Armstrong, 1994; Cronin-Jones, 2005). Using art as an alternative assessment may reveal distinct understandings of individual children and allow them to explore their creativity, expressing a personalized representation of their environmental knowledge and perceptions (Cronin-Jones, 2005; Eisner, 1999).

Specifically, children’s drawings may provide insights into children’s emotional response, thinking, and cognitive grasps of environmental concepts and issues (Bowker, 2007; Gardner, 1993). Though fairly new to EE evaluation, children’s drawings have been used in traditional psychology research to analyze personality traits, reveal emotional indicators, uncover personally important topics, and explore views of issues related to current and future global problems (Barraza, 1999; Koppitz, 1968; Malchiodo, 2003). What children draw and how they think are closely connected and drawing may even be an advanced way of thinking (Vygotsky, 1971), reflecting a child's mental representations and conceptual knowledge about objects drawn. These drawings typically increase in accuracy and detail as children age and gain new experiences (Reith, 1997).

Seibert and Anooshina (1993) studied the relationship between emotion and objects in pencil drawings for 46 elementary school children, finding that most children omit objects from their drawings they do not like and in turn contain more detail and are more realistic for objects they know more about. White and Gunstone (2000) suggest that children first think in images long before thinking in words and drawings are an efficient and effective method of evaluation: "efficient, in that they contain much information in a single sheet that takes little time to complete; and effective in that they are easily assimilated by the person looking at them, especially when the viewer is the drawer (p. 105)." Furthermore, drawings are a relatively quick and easy way to gather information from and about children, are less stressful than traditional assessments (reducing testing anxiety), are enjoyable since most children like drawing, and are free from linguistic barriers enabling comparisons between diverse groups, including children with learning disabilities (Chambers, 1983; King, 1995; Lewis & Greene, 1983; Rennie & Jarvis, 1995).

Though the use of drawings to assess children's environmental perceptions and knowledge is still in the developmental stage (Barraza, 1999; Kress & Van Leeuwen, 2004), recent studies supporting art evaluations have inundated scientific literature (Alerby, 2000; Aronsson & Andersson, 1996; Barraza,1999; Bowker, 2007; Guichard, 1995; Palmberg & Kuru, 1998; Tunnicliffe & Reiss, 1999). Alerby (2000) used drawings of 109 children (ages 7-16) to visualize thoughts about the environment in Sweden, revealing four themes: 1) the good world, 2) the bad world, 3) reasoning for good world versus bad world, and 4) protecting the environment. The images suggested nuances of unspoiled natural environments, human use of nature for recreation, forms of environmental destruction, and ways to take care of the environment (Alerby, 2000).

Similarly, Barraza (1999) analyzed 741 drawings of English and Mexican children's (ages 7-9) perceptions of the environment, expectations, and concerns for the future to see if culture and school ethos were influencing factors. The research showed more similarities than differences between the drawings, with 90% of children able to draw a representative image of the earth from space and 54% of children drawing the future earth as environmentally worse from the present day (Barraza, 1999).

Most recently, Moseley et al. (2010) used the Draw-An-Environment Test and Rubric to assess the mental models of pre-service teachers about their perceptions of the environment. Using the NAAEE Guidelines for the preparation and professional development of environmental educators, teachers should be able to describe the environment "incorporating concepts of systems, interdependence, and interactions among humans, other living organisms, the physical environment–and the built or designed environment (p. 9)"(NAAEE, 2004). Based on this definition, the drawing rubric employed four factors of the environment with a ranking scale of zero to three based on the presence and interaction of four factors: 1) humans, 2) other living organisms (biotic), 3) physical environment (abiotic), and 4) built or designed environment (Moseley et al., 2010). Pre-service teachers were asked to draw a picture and complete a statement articulating the definition of an environment.

Results demonstrated that the mental models of pre-service teachers are incomplete. Participants generally viewed the environment as an object that was not integrated with personal actions, suggesting a lack of responsibility or stewardship toward nature and a belief that the consequences of human actions do not affect the environment (Moseley et al., 2010). This research supports the use of drawings with scoring rubrics as a reliable and valid method for evaluating EE programs, providing greater insight into children's beliefs and attitudes towards the environment (Cronin-Jones, 2005; Crook, 1985; Moseley et al., 2010; Thomas and Silk, 1990).

In conclusion, the use of drawing and art-based activities in EE programming is supported by multiple studies (Hoot & Foster, 1993; Wilson, 1993). However, there is limited research to validate the use of drawings as an effective EE evaluation tool. Cronin-Jones (2005) insists that further studies are needed to determine if drawings are an efficient means of documenting changes in children's environmental knowledge and perceptions. Of particular interest is the use of drawings as a pre-test to determine children's baseline environmental knowledge and perceptions prior to EE program implementation. Children could complete post-test drawings and differences in pre- and post-test scores could be used to document changes in student environmental knowledge and perceptions, ultimately determining the effectiveness of the EE program (Cronin-Jones, 2005). Although art-based EE evaluations have great theoretical potential, their practical value has not been adequately explored. This study sought to expand the body of knowledge regarding art and EE by exploring the use of art as an EE evaluation tool and evaluating the effects of different types of EE programming (including art-based EE programming) on children's environmental perceptions.

Statement of Purpose and Research Objectives

The purpose of this study was to measure the impact of an art-based environmental education program on children's environmental perceptions through the use of a mixed-methods survey instrument and corresponding scoring rubrics. The design of this study was based on the following objectives:

1) To establish a baseline measure of children's environmental perceptions across different gender (girls and boys), age (6-7, 8-9, 10-12 year olds), ethnic (African American, Asian, Hispanic/Latino, White), and income levels (low, high) using both quantitative (Likert-type statements) and qualitative (drawings) assessment methods; and

2) To evaluate the effects of two types of one-week environmental education programs (one using traditional approaches, one focused on art-based activities) compared to a general one-week summer camp program (control group) on children's environmental perceptions across different gender (girls and boys), age (6-7, 8-9, 10-12 year olds), ethnic (African American, Asian, Hispanic/Latino, White), and income levels (low, high) using both quantitative (Likert-type statements) and qualitative (drawings) assessment methods.

Methods

Development of Survey Instrument

Children's environmental perceptions were measured using the Children's Environmental Perceptions and Art Survey (CEPAS)(Appendix A). The CEPAS was designed to evaluate the potential effects of an art-based environmental education program on children's perceptions of the environment. Environmental concepts within the survey were based on the EE curriculum themes used at the participating American Camp Association accredited facility, Sandy Creek Nature Center. Activities within Sandy Creek Nature Center's program curriculum meet both Georgia and National Science Education Standards, along with standards set by the North American Association of Environmental Education: Guidelines for Excellence. The overall theme of the curriculum focused on ecosystems and wildlife habitats, specific components (e.g., biotic vs. abiotic), interactions (e.g., predator vs. prey), and processes (e.g., nutrient cycles).

The CEPAS was developed in multiple stages after conducting an extensive literature review, and was based closely upon the Children's Environmental Perceptions Scale (CEPS) (Larson, Green, & Castleberry, 2011) and the Draw-An-Environment-Test (DAET) with Draw-An-Environment Test Rubric (DAET-R) (Mosely, Desjean-Perrotta, & Utley, 2010). The original CEPS instrument consisted of 16 Likert-type statements, four multiple-choice questions, and one open-ended question (Larson et al, 2011). The 16 Likert-type statements evaluated components of eco-affinity and eco-awareness such as interest in nature, importance of nature, environmental awareness, and environmental stewardship (Larson et al., 2011). The remaining four multiple-choice questions and one open-ended question evaluated the overall environmental content knowledge based on the EE program curriculum (Larson et al, 2011). Mosely et al.'s (2010) DAET addressed a similar issue from a slightly different perspective and consisted of a single-page with two prompts, a drawing and an open-ended sentence (Mosely et al., 2010). Both components evaluated the definition of "the environment" using two different assessment tools: a drawn definition in picture-form and a written definition in sentence-form (Mosely et al., 2010).

The survey instrument used in this study combined the 16 Likert-type statements of the CEPS instrument and the drawing component of the DAET instrument with DAET-R. For more information related to the development of the CEPAS instrument, please refer to Chapter III, *Using Art in Environmental Education Program Evaluation*.

Survey Instrument

The CEPAS instrument used in this study was composed of two distinct sections. Section one contained 20 Likert-type statements based on the original CEPS instrument (Larson et al.,

2011) (Appendix A). These statements were broken down into eight eco-affinity statements (interest in nature and environmental stewardship behavior), eight eco-awareness statements (importance of nature and awareness of environmental issues), and an additional four art-appreciation statements (preference to engage in art activities and enjoyment). Children responded by circling one of five response options: one = strongly disagree (two thumbs-down), two = disagree (one thumbs-up), three = not sure (question mark), four = agree (one thumbs-up), and five = strongly agree (two thumbs-up).

Section two contained two open-ended drawing questions evaluating children's environmental perceptions and knowledge of nature-related concepts based on the original DEAT instrument with DEAT-R (Mosely et al., 2010). The Draw-An-Ecosystem Test (DET) prompted campers to "draw a habitat or ecosystem that you see or play in almost every day" (Appendix A). The Draw-An-Animal Test (DAT) prompted campers to "draw your favorite animal, the habitat or ecosystem where it lives, and the things it needs to survive" (Appendix A). These two open-ended questions allowed children to create drawings based upon what they have learned about ecosystems and their own real-life experiences and observations.

Drawing Rubrics

The first drawing, DET, was assessed using the Draw-An-Ecosystem Test Rubric (DET-R), which included four habitat factors: humans, biotic (living organisms), abiotic (physical habitat), and human built or designed structures (Table 4.1). The second drawing, DAT, was assessed using the Draw-An-Animal Test Rubric (DAT-R), which included four factors related to an animal's survival: ecosystem complexity (habitat), food, water, and shelter (Table 4.2). Additionally, both rubrics contained five degrees of factor interaction with associated scores: zero = factor not present, one = factor present, two = factor displays basic interaction, three =

factor displays complex interaction, and four = factor displays explicit interaction. Total scores ranged from 0 to 16, with higher scores representing the highest extent of factor interaction.

To further assess the DET and DAT drawings, two separate factors outside of the rubric were used to determine the type of habitat depicted and the presence of environmental components. The factor "habitat type" determined what type of habitat was illustrated and each drawing was scored as either: zero = indoor habitat, one = backyard habitat, two = park/playground habitat, three = natural outdoor habitat. The factor "environmental components" determined the presence and number of 16 natural elements (e.g., presence of wild animals, presence of water, number of mammals, number of trees, etc) along with the number of colors used to illustrate the drawing. The number of colors represented a level of creativity, detail, and accuracy of drawn elements (e.g., water = blue, grass = green, tiger = orange with black stripes, elephant = gray, etc).

Study Site

The CEPAS instrument was administered to eight groups whom each attended a one-week, day-camp summer program in Athens-Clarke County (ACC), GA during June and July of 2010-2011. Day-camp hours were from 9am to 4pm, Monday through Friday. Sandy Creek Day Camp (SCDC) and Memorial Park Day Camp (MPDC) were chosen out of the seven ACC day-camps because of their similar summer camp activities, indoor and outdoor amenities, attendance numbers, and camper demographics. Common indoor and outdoor camp activities included: swimming, canoeing, archery, playground time, sports (basketball, volleyball, soccer, four squares), board games, arts and crafts, team building challenges, educational programs, movies, field trips, and special guest programs (Appendix B, C, & D). These two summer camps occurred at ACC facilities: SCDC takes place at both Sandy Creek Nature Center and Sandy

Creek Park, and MPDC is based at Memorial Park. During the course of the summer camp programs, field trips are scheduled for groups to visit other ACC parks with different amenities and local area attractions. Standard enrollment at each camp was 90 campers per week ranging in age from 6 to 12 years old and grade levels K through 6.

Participant enrollment at the two facilities was determined by first-come, first-serve camp registration event that took place in April prior to the start of the summer camps in June. Camp registration costs per week were: $61 for ACC residents, $92 for non-ACC residents at Sandy Creek Nature Center (Appendix E); $35 for ACC residents, $53 non-ACC residents at Memorial Park (Appendix F). To provide equal-opportunity to all socioeconomic groups within ACC, parents could register with the ACC Leisure Services Department Scholarship Program for discounted summer camp rates. Scholarships were awarded based on the number of persons residing in a single household and the corresponding annual, monthly, or weekly household income (Appendix G).

Control and Treatment Groups

Participants in this study were randomly assigned to one of three experiment groups: a control group, an EE treatment group, or an art-based EE treatment group (Table 4.3). The control group was solely located at MPDC and the Facility Director randomly chose one week out of the eight-week day camp schedule to complete the CEPAS. The MPDC was chosen as the control group site because it had a traditional summer camp program centered about sports and games with little to no formal EE curriculum (Appendix B).

The EE treatment group and the art-based EE treatment group were located at SCDC. The SCDC was chosen as the treatment groups' site because it had the combination of an EE facility and program integrated with traditional summer camp sports activities. There were seven weeks of day camp at SCDC, each enrolled with 90 campers that were sub-divided into ten teams per weekly program. Camp directors assigned eight to ten campers to each team based on age and gender. The reason for this was to keep similar age groups together, have a balance of genders in each team, and allow for controllable team sizes that one camp counselor could easily manage. These ten teams were then randomly assigned as an experiment group at the beginning of each week by placing the numbers one through ten in a hat and drawing four numbers at random. The four numbers that were chosen were assigned as art EE treatment groups and the remaining six numbers were assigned as traditional EE treatment groups.

The day camp program for both treatment groups contained a combination of EE activities from Project Learning Tree, Project WET, and Project WILD. Activities chosen were specific to age and grade levels, but had a common theme of ecosystems and wildlife habitats: specific components (e.g., biotic vs. abiotic), interactions (e.g., predator vs. prey), and processes (e.g., nutrient cycles). While both groups utilized a variety of teaching and learning methods, the art EE treatment group focused on learning through hands-on art projects all five days of camp (Appendix C), while the traditional EE treatment group only utilized art as a supplemental activity two days of camp (Appendix D).

Specifically, the art projects within the curriculum went along with the day's theme and included but where not limited to drawing, coloring, making collages, sculptures, puppets, mobiles, posters, etc. For example, campers would participate in a creek walk where they explored aquatic ecosystems, seining for fish and taking water samples to look at macro-invertebrates under the microscope. Campers then returned to the classroom to design and make their own 3-D fish that had specific anatomical parts needed to live in its preferred habitat and eat its preferred food source. Campers combined the jaws of a shark with the nose of a swordfish and the colors of a salmon, and then campers explained to the group why they chose those specific features.

A similar example takes campers on a thicket walk where they search for seeds, plants, insects, and other organisms that live in grassland ecosystems. Returning to the classroom, the campers then received puzzle pieces of insects that they had to individually color and assemble correctly – an activity we called "build-a-bug." The campers then came together as a group and created an ecosystem for their insects on poster board and pasted in their insects in the correct habitat location (e.g., butterfly in the sky, grasshopper in the grass, dragonfly near a pond, etc). This activity worked well for both the younger and older groups: younger groups understood location of insects within their habitat, while older groups had greater knowledge about ecosystem complexity and diversity (Figure 4.1).

Another example includes a favorite camp pick-up game called "camouflage" which is very similar to the classic game of hide-and-go-seek. One camper is chosen to be "it" and counts to ten with eyes closed, while the other campers hide. The camper who is "it" must then spot those who are hiding, but must do so from a stationary location. To help campers understand the concept of camouflage we discuss forest ecosystems, the animals that reside there, and how different anatomical adaptations (e.g., color, fur texture, feathers, body shape and size, etc) help animals blend into their environment. The campers play the game camouflage in their regular clothing (which generally consisted of bright neon-colored camp shirts) and see how easy it is to spot one another. Next, campers create and color their own animal masks out of paper plates and animal coats out of paper grocery store bags that would help camouflage them in the forest. Needless to say, some campers chose black bears or brown deer, while others chose more exotic creatures such as orange tigers and blue elephants. The campers re-play the game in their new garb and see how much harder (or easier) it is to see one-another when they are dressed as animals.

Survey Implementation

The CEPAS instrument was administered at the beginning (pre-test) and end (post-test) of each weekly summer-camp program by trained camp counselors and directors. During the mandatory one-week pre-camp training, counselors and directors were taught how to administer the survey and answer participants' questions. Counselors and directors also completed the survey to gain a better understanding of the material. To distribute the survey, groups of 10 to 15 campers would gather in a room with two counselors who passed out the survey along with a basket of crayons. The counselors explained the survey activity to the campers and then read aloud the survey directions. The first section of CEPAS with 20 Likert-type statements was read out loud, one item at a time by one counselor, while the second counselor answered any questions that campers had about the items. Each item was read aloud twice, and campers had 30-40 seconds to complete each item. Approximately 15 minutes were allotted for the first section. The second portion of CEPAS was read aloud to campers with a time allotment of approximately eight to ten minutes per drawing. In total, the CEPAS instrument took approximately 30 minutes to complete, with older age groups (10-12) completing the instrument in approximately 20 minutes.

Participants

A total of 327 campers were surveyed, with 285 successfully completing the pre-test and post-test surveys (87.2 % response rate) at Sandy Creek Nature Center (n = 210) and Memorial Park (n = 75). Of the 285 campers, 266 (93.3%) were residents of Athens-Clarke County and the remaining 19 (6.7%) were residents of neighboring counties: Jackson, Madison, and Oconee.

Campers attended 37 local elementary and middle schools from grades K through 6 and ranged in ages 6 to12 years old (Table 4.3). However, it is worth noting that the camper's gender and ethnic diversity closely matched the demographics of ACC's population (U.S. Census Bureau, 2011). Gender for the camp consisted of 58.2% male and 41.8% females, compared to ACC populations of 48.3% male and 51.7% female (Table 4.4.). Comparison of ethnic diversity within the camp versus the population of ACC are as follows: African American, 28.8% camp, 26.6% ACC; Asian, 10.5% camp, 4.2% ACC; Hispanic/Latino, 6.7% camp, 10.4% ACC; and White/Caucasian, 54% camp, 61.9% ACC (Table 4.4). All camper information was obtained from camp registration forms completed by the parents/guardians of the campers with written consent.

Limitations

A limitation of this study was that random selection of participants was not possible due to the nature of the registration process and the limited number of children the camp could accommodate; hence with the sample obtained, inference of any results back to the general population is not possible. Although the camp director was present during camp activities and the administering of the survey instrument, camp counselors who lead activities and helped administer the survey instruments were different for each group. Despite standardized training for both activities and survey administration, some differences in camper scores could be attributed to facilitator effects. Campers completed the pre-test survey with enjoyment and had very few complaints at the beginning of the week, however at the end of the week campers were not as eager to complete the identical survey as a post-test and some dissension set in amongst some campers, especially within the older age groups (ten to twelve). This factor may have also to some extent impacted the differences in camper scores. Finally, all survey responses were self-reported by campers with the expectation that the answers were personally honest and without external influences from other campers. Aware of these limitations, a substantial effort was made to reduce confounding variation as much as possible.

Data Analysis

Statistical analysis of the data was performed using IBM SPSS Version 19.0. Pre-test baseline scores for Likert-type items (art-appreciation, eco-affinity, and eco-awareness) and DET/ DAT items (DET-R/DAT-R, habitat type, and environmental creativity) among demographic groups (age, gender, ethnicity, income level, and school) were compared using analyses of variance (ANOVA). Ages were classified into age groups (six and seven year olds; eight and nine year olds; ten, eleven, and twelve year olds) based on learning levels and to maintain equal sample sizes. Income levels were classified into low and high groups: low income received higher scholarships (50% to 100% of camp fees paid) while high income received lower scholarships (0% to 49% of camp fees paid). The remaining demographic groups were categorized as: gender groups were female vs. male; ethnicity groups were African American, Asian, Hispanic/Latino, White; and school groups were private vs. public. Interactions between age vs. gender, age vs. ethnicity, and gender vs. ethnicity were included in the analysis. Preliminary tests were performed to verify that assumptions of normality and equal variances were not violated.

Analyses of covariance (ANCOVA) with one covariate were used to evaluate program effects on mean post-test scores for Likert-type items (art-appreciation, eco-affinity, and eco-awareness) and DET and DAT items (DET-R and DAT-R, habitat type, and environmental components). The independent variables within the analysis included the experiment groups (control, EE treatment, and art EE treatment) and the demographic groups (age, gender, ethnicity, and income level). Interactions between the experiment groups and the demographic groups were included in the analysis. Pre-test scores on the respective items functioned as the covariate. Preliminary tests were performed to make sure the assumptions of reliable covariate measurement, normality, linearity, homoscedasticity, and homogeneity of regression slopes were not violated. For all analyses, a statistical threshold of $\alpha = 0.05$ was set.

Results

Pre-test: Baseline Environmental Perceptions

Pre-test baseline means and standard deviations for CEPAS Likert-type item scores and DET/DAT item scores are presented in Table 4.5 and Table 4.6. In general, there were significant differences in pre-test scores among the demographic groups of age, gender, ethnicity, and income level within Likert-type items. The ANOVA revealed significant differences in age groups within eco-affinity, $F(2, 261) = 4.09$, $p = 0.018$, $\eta^2 = 0.025$ and eco-awareness $F(2, 261) = 5.45$, $p = 0.005$, $\eta^2 = 0.036$. Younger children (age 6-7) generally displayed higher levels of eco-affinity and lower levels of eco-awareness as compared to the older children (age 10-12)(Figure 4.2). Differences among ethnic groups were also present for eco-affinity, $F(3, 261) = 7.48$, $p = 0.001$, $\eta^2 = 0.069$ and eco-awareness, $F(3, 261) = 7.70$, $p = 0.001$, $\eta^2 = 0.076$. Hispanic/Latino and White ethnicity groups generally scored higher on eco-affinity and eco-awareness than African American and Asian ethnicities (Figure 4.2). Significant differences in eco-affinity were also observed for the interaction terms of gender*ethnicity, $F(3, 261) = 3.80$, $p = 0.01$, $\eta^2 = 0.035$, and age*ethnicity groups, $F(6, 261) = 2.57$, $p = 0.020$, $\eta^2 = 0.047$. Females who were Hispanic/Latino or White generally scored higher on eco-affinity than boys who were African American or Asian, while all Hispanic/Latino ethnicity age groups scored higher on eco-affinity compared to all other ethnicity age groups. The ANOVA did not reveal significant differences in gender groups or income levels for these two subscales, however mean scores did vary slightly (Table 4.7). In addition, art-appreciation showed significant differences among gender groups, $F(1, 261) = 4.33$, $p = 0.039$, $\eta^2 = 0.015$ and income levels, $F(1, 261) = 6.02$, $p = 0.015$, $\eta^2 = 0.021$ with females and lower income children displaying a slightly stronger preference for art activities as compared to males and higher income children (Figure 4.3).

Within the pre-test DET/DAT items of CEPAS, there were significant differences in mean scores among gender and ethnic groups. The ANOVA revealed significant differences in ethnicity groups within DET-R, $F(3, 261) = 3.23$, $p = 0.023$, $\eta^2 = 0.034$ and environmental components $F(3, 261) = 3.93$, $p = 0.001$, $\eta^2 = 0.056$. Significant gender differences were observed for DAT-R, $F(1, 261) = 5.54$, $p = 0.019$, $\eta^2 = 0.020$ and environmental component scores, $F(1, 261) = 25.07$, $p = 0.001$, $\eta^2 = 0.080$ (Figure 4.4). Both females and Hispanic/Latinos scored higher on DET/DAT items and environmental components when compared to males and the three other ethic groups respectively (Figure 4.4). The ANOVA did not reveal significant differences in demographic groups for the habitat type subscale, however mean scores did vary (Table 4.6).

Post-test: EE and Art-based EE Treatment Effects

After implementation of the one-week day-camp programs, overall CEPAS mean score changes (post – pre) indicated that three groups (control, EE treatment, and art EE treatment) affected different aspects of children’s environmental perceptions to varying degrees (Table 4.7). Participants in the traditional EE treatment and art EE treatment groups generally showed larger improvements than the control group across both Likert-type items and DET/DAT items. Mean score differences (post – pre) and standard deviations for CEPAS Likert-type item scores and DET/DAT item scores across demographic variables are presented in Table 4.8 and Table 4.9.

Across Likert-type item subscales, treatment effects showed significant differences in adjusted mean scores for eco-awareness, $F(2, 257) = 5.26$, $p = 0.006$, $\eta^2 = 0.019$, especially among the EE treatment group (Figure 4.6). However, eco-affinity $F(2, 257) = 0.982$, $p = 0.276$, $\eta^2 = 0.003$ and art-appreciation, $F(2,257) = 0.025$, $p = 0.975$, $\eta^2 = 0.0001$ showed no significant differences among experiment groups. Eco-awareness also showed significance differences concerning the interactions of experiment groups vs. SCDC previous attendance, $F(2, 257) = 3.28$, $p = 0.039$, $\eta^2 = 0.001$. There were no other significant differences among interactions between experiment groups and the remaining demographic variables.

Furthermore, experiment groups showed significant differences in adjusted mean scores among three DET/DAT items: DET-R, $F(2, 257) = 6.02$, $p = 0.003$, $\eta^2 = 0.006$; DAT-R, $F(2, 257) = 4.62$, $p = 0.011$, $\eta^2 = 0.006$; and environmental components $F(2, 257) = 4.18$, $p = 0.016$, $\eta^2 = 0.003$ (Figure 4.7). Of the three experiment groups, the EE treatment group had the greatest difference in scores from pre-test to post-test within the DET/DAT items when compared to the control and art EE treatment group. No significant differences occurred among experiment groups for habitat type, $F(2, 257) = 0.187$, $p = 0.829$, $\eta^2 = 0.001$.

Overall, the EE treatment group appeared to have higher post-test scores than both the art EE treatment group and the control group (Figure 4.6, Figure 4.7). Surprisingly, the control group mean score differences improved on eco-affinity and eco-awareness Likert-type item subscales, but declined across all subscales of DAT/DET items. Since DAT/DET items assess knowledge and understanding of environmental concepts, this result reflects the generally lack of

EE curriculum within the control group day-camp program. The improvement across eco-affinity and eco-awareness maybe a result from participating in activities located in outdoor settings.

Discussion

The inclusion of art activities is one enhancement to EE program curriculum that may improve children's understanding of environmental knowledge and promote positive environmental perceptions. The purpose of this study was to measure the impact of an art-based environmental education program on children's environmental perceptions through the use of a mixed-methods survey instrument and corresponding scoring rubrics. Research was conducted in a two-step process that involved: 1) establishment of a baseline measure of children's environmental perceptions across different gender (girls and boys), age (6-7, 8-9, 10-12 year olds), ethnic (African American, Asian, Hispanic/Latino, White), and income levels (low, high) using both quantitative (Likert-type statements) and qualitative (drawings) assessment methods; and 2) evaluation of the effects of two types of one-week environmental education programs (one using traditional approaches, one focused on art-based activities) compared to a general one-week summer camp program (control group) on children's environmental perceptions across different gender (girls and boys), age (6-7, 8-9, 10-12 year olds), ethnic (African American, Asian, Hispanic/Latino, White), and income levels (low, high) using both quantitative (Likert-type statements) and qualitative (drawings) assessment methods. Results from this study suggest that both traditional EE and art-based EE programs have a positive effect on children's environmental perceptions and knowledge.

Pre-test: Baseline Environmental Perceptions

The CEPAS instrument containing both quantitative (Likert-type statements) and qualitative (drawings) assessment tools was used in this study to measure the effect of an art-based EE program of children's environmental perceptions. Established as reliable and valid during this research project (Chapter III) and in previous studies (Larson et al, 2011; Moseley et al., 2010), the CEPAS instrument measured children's environmental perceptions and knowledge through three subscales of Likert-type items (eco-affinity, eco-awareness, and art-appreciation) and drawings items (DET-R/DAT-R, habitat type, environmental components).

Baseline mean scores for Likert-type items across demographics groups revealed that younger children display higher levels of eco-affinity and lower levels of eco-awareness. Previous studies have also found this to be true, as younger children have a natural appreciation, interest, and concern for animals (Meyers, 2004; Owens, 2005). As children grow and begin to develop cognitively, their appreciation for an individual animal grows into concern for the species, ecosystem, and effects from human actions (Meyers 2004). Meyers (2004) found that a child's interest in an animal's ecological and physiological needs decreased after age ten while interest and knowledge in environmental issues and conservation increased.

Subsequently, children from Hispanic/Latino and White ethnicity groups generally scored higher on eco-affinity and eco-awareness. This may possibly be because of cultural appreciation for nature and/or preference for activities that generally take place outdoors. Along the same trend, females who were Hispanic/Latino or White generally scored higher on eco-affinity than boys who were African American or Asian. Overall, Hispanic/Latino ethnicity age groups scored higher on eco-affinity compared to all other ethnicity age groups. Again, suggesting that the possible influence maybe from cultural customs, beliefs, and activities the children tend to participate.

Interestingly, females and lower income children displayed greater preference for art activities according to the Liket-type items. These findings were reflected in the drawing subscales as well. Both females and Hispanic/Latinos scored higher on DET/DAT items and environmental components when compared to males and the remaining three ethnic groups. Reasoning for higher art-appreciation scores in females maybe because of developmental maturity at a younger age as compared to boys. Boys generally have a preference for more active recreation, rather than the static nature and required focus for art activities. Preference for art activities in Hispanic/Latinos may again be because of cultural influence and possibly related to income—cost of basic art supplies for entertainment versus the cost of electronic media and games.

Post-test: EE and Art-based EE Treatment Effects

After implementation of the one-week day-camp programs, overall CEPAS mean score changes (pre – post) indicated that three groups (control, EE treatment, and art EE treatment) affected different aspects of children's environmental perceptions. Children in the traditional EE treatment and art-based EE treatment groups generally had larger improvements in scores than the control group. Within Likert-type items, children in the traditional EE treatment and art-based EE treatment groups scored higher on eco-awareness within the post-test as compared to the control group. The control group mean score did improve slightly for the eco-affinity and eco-awareness subscales, but the change in score was not statistically significant. This result is plausible since the control group lacked formal EE within its summer camp program, but did spend considerable time outdoors. Both the traditional EE and art-based EE program curriculum contained the same themes and thus may have acquired a heightened awareness of environmental issues during the program.

Similarly, both the traditional EE and the art-based EE treatment groups scored higher on DET-R/DAT-R and environmental components of the post-test than the control group. These results suggest campers increased their knowledge of ecosystems and understanding of animal needs for survival. Again, this is likely due to the nature of the camp programs and prior research has revealed similar results with the use of EE programming within formal and non-formal education settings (Bartosh et al., 2009; Larson et al., Zoldosova, 2006). Surprisingly, the control group post-test mean scores declined across all subscales of DET/DAT items. Since DAT/DET items assess knowledge and understanding of environmental concepts, this result reflects the generally lack of formal EE curriculum within the control group day-camp program.

Overall, the traditional EE treatment group appeared to have higher post-test scores than both the art EE treatment group and the control group. One possible reason for this is because the EE treatment group contained a greater variety of activities for campers to participate within the program. Since children learn in varying ways (Gardner, 2000), the higher amount of art activities within the art-based EE treatment group may have been overwhelming for some campers. A general dislike for activities creates a dis-interest in the subject matter, and thus campers within the art-based EE treatment group may have simply been tired of making art. The art-based EE programming might be more suitable for a particular audience that enjoys art or does not work well in social-group settings. The traditional EE treatment group provided a well–rounded program of activities that engaged campers in learning using a variety of methods. For EE programs to succeed, program diversity is key to reach increasingly diverse populations.

Implications and Future Research

In conclusion, this research study shows that both traditional EE and art-based EE programs have a positive effect on children's environmental perceptions and knowledge. The art-based approach to EE could help educators better understand children's beliefs and ways of thinking, illuminating their cognitive grasp of complex environmental issues through creative expression. Results of this study could provide a conceptual base and produce subsequent recommendations for methods, materials, and resources that integrate art (both visual and performing) into EE programming. These methods include the integration of EE programs with both place-based and art education (Inwood, 2008; Orr, 1992; Powers, 2004), culminating into the new genre of environmental art education (Inwood 2012). From this genre stems endless possibilities for the development of new and innovative materials and resources, as both science and art educators have the opportunity to work together to instill environmental literacy within their students. These unique and novel collaborations will only expand the breath of knowledge and skills covered by formal and non-formal EE programming.

Future research should continue to examine the potential use of art as an interdisciplinary teaching and learning tool for EE programs. Future studies should explore the various mediums of art (e.g., music, theatre, writing, etc) within EE program activities—how they work in combination with one another and the affects they have on children from varying backgrounds (e.g., age groups, cultural upbringing, geographical location, learning abilities, etc). Future studies should also consider the long-term effects art-based EE programs have upon children and what would happen if children where continuously exposed to EE curriculum throughout the entirety of their academic careers (pre-K to twelfth grade)—not just during a one-week day-camp summer program.

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Table 4.1

Draw-an-Ecosystem-Test Rubric (DET-R) Used to Assess the Draw-an-Ecosystem-Test (DET) Component of the Children's Environmental Perceptions and Art Survey (CEPAS).

Draw-an-Ecosystem-Test Rubric (DET-R)

Factor	Not Present	Present	Basic Interactions	Complex Interactions	Explicit Interactions	Score
	0 Point	1 Point	2 Points	3 Points	4 Points	
Human	Drawing **does not contain pictures or words** depicting humans.	Drawing contains **pictures or words** depicting human(s) **without any apparent interaction** with other factors.	Drawing contains **pictures or words** depicting human(s) **interacting by only touching** other humans and/or another factor. e.g. human standing on ground or bridge, etc	Drawing contains **pictures or words** depicting human (s) **interacting** with other human(s) and/or another factor. e.g. human walking on bridge, riding a bike, etc	Drawing contains **pictures and descriptions** (labels or arrows) depicting human(s) with **deliberate emphasis** placed on the interaction with one or more factors and the influence of that interaction on the environment.	
Biotic	Drawing **does not contain pictures or words** depicting biotic factors.	Drawing contains **pictures or words** depicting biotic factors **without any apparent interaction** with other factors. e.g. animals, trees, grass, flowers, insects, etc	Drawing contains **pictures or words** depicting biotic factors **interacting by only touching** other biotic factors and/or another factor. e.g. trees touching grass, animal on ground, etc	Drawing contains **pictures or words** depicting biotic factors **interacting** with other biotic and/or another factor. e.g. animal running on grass, bird perching in tree, etc	Drawing contains **pictures and descriptions** (labels or arrows) depicting biotic factors with **deliberate emphasis** placed on the interaction with one or more factors and the influence of that interaction on the environment.	
Abiotic	Drawing **does not contain pictures or words** depicting abiotic factors.	Drawing contains **pictures or words** depicting abiotic factors drawn **without any apparent interaction** with other factors. e.g. mountains, rivers sun, clouds, rain, rainbow, etc	Drawing contains **pictures or words** depicting abiotic factors drawn **interacting by only touching** other abiotic factors and/or another factor. e.g. water touching ground, sky touching grass, etc	Drawing contains **pictures or words** depicting abiotic factors **interacting** with other abiotic factors and/or another factor. e.g. wing blowing leaves, rain puddling on the ground, etc	Drawing contains **pictures and descriptions** (labels or arrows) depicting abiotic factors with **deliberate emphasis** placed on the interaction with one or more factors and the influence of that interaction on the environment.	
Human Built or Designed	Drawing **does not contain pictures or words** depicting human built factors.	Drawing contains **pictures or words** depicting human built factors drawn **without any apparent interaction** with other factors. e.g. buildings, automobiles, bridges, swing sets, etc	Drawing contains **pictures or words** depicting human built factors drawn **interacting by only touching** other human built factors and/or another factor. e.g. house touching grass, car touching driveway, etc.	Drawing contains **pictures or words** depicting human built factors **interacting** with other human built factors and/or another factor. e.g. smoke from chimney, car driving on road, etc	Drawing contains **pictures and descriptions** (labels or arrows) depicting human built factors with **deliberate emphasis** placed on the interaction with one or more factors and the influence of that interaction on the environment.	
					Total Points out of 16	

Table 4.2

Draw-an-Animal-Test Rubric (DAT-R) Used to Assess the Draw-an-Animal-Test (DAT) Component of the Children's Environmental Perceptions and Art Survey (CEPAS).

Draw-an-Animal-Test Rubric (DAT-R)

Factor	Not Present	Present	Basic Interactions	Complex Interactions	Explicit Interactions	Score
	0 Point	1 Point	2 Points	3 Points	4 Points	
Ecosystem Complexity	Drawing **does not contain pictures or words** depicting biotic or abiotic factors, other than the favorite animal.	Drawing contains **pictures or words** depicting biotic or abiotic factors **without any apparent interaction** with favorite animal. e.g. sun, clouds, trees, grass, man-made structures, etc	Drawing contains **pictures or words** depicting biotic or abiotic factors **interacting by only touching** favorite animal. e.g. animal on ground, bird in air, fish in water, etc	Drawing contains **pictures or words** depicting biotic or abiotic factors **interacting** with favorite animal. e.g. animal running on grass, "bird flys in the air", etc	Drawing contains **pictures and descriptions** (labels or arrows) depicting biotic or abiotic factors with **deliberate emphasis** placed on the interaction with the favorite animal.	
Food	**Drawing does not contain pictures or words** depicting food sources for the favorite animal.	Drawing contains **pictures or words** depicting food sources **without any apparent interaction** with favorite animal. e.g. plants, animals, bones, domestic animal food, etc	Drawing contains **pictures or words** depicting food sources **interacting by only touching** favorite animal. e.g. food source touching ground or bowl, etc	Drawing contains **pictures or words** depicting food sources **interacting** with favorite animal. e.g. food source being eaten, "cat eats the food", etc	Drawing contains **pictures and descriptions** (labels or arrows) depicting food sources with **deliberate emphasis** placed on the interaction with the favorite animal.	
Water	Drawing **does not contain pictures or words** depicting water sources for the favorite animal.	Drawing contains pictures **or** words depicting water sources **without any apparent interaction** with favorite animal. e.g. puddles, lakes, domestic animal water bowl, etc.	Drawing contains **pictures or words** depicting water sources **interacting by only touching** favorite animal. e.g. water source touching ground or bowl, etc	Drawing contains **pictures or words** depicting water sources **interacting** with favorite animal. e.g. water source drunk, "dog drinks the water", etc	Drawing contains **pictures and descriptions** (labels or arrows) depicting water sources with **deliberate emphasis** placed on the interaction with the favorite animal.	
Shelter	Drawing **does not contain pictures or words** depicting shelter sources for the favorite animal.	Drawing contains pictures **or** words depicting shelter sources **without any apparent interaction** with favorite animal. e.g. tree cavities, nest, forest, burrows, doghouse, etc	Drawing contains **pictures or words** depicting shelter sources **interacting by only touching** favorite animal. e.g. bird at nest, rabbit at burrow, dog at doghouse, etc	Drawing contains **pictures or words** depicting shelter sources **interacting** with favorite animal. e.g. bird in nest, "rabbit lives in the borrow", etc	Drawing contains **pictures and descriptions** (labels or arrows) depicting shelter sources with **deliberate emphasis** placed on the interaction with the favorite animal.	
					Total out of 16 points	

Table 4.3

Demographics of Survey Participants Among Experiment Groups from Sandy Creek Day Camp and Memorial Park Day Camp in Athens-Clarke County, GA.

		Control	EE Treatment	Art EE Treatment
Variable	**N**	**Frequency**	**Frequency**	**Frequency**
Gender				
Male	166	58.7%	60.0%	56.2%
Female	119	41.3%	40.0%	43.8%
Age				
6 to 7	90	44.0%	21.0%	33.3%
8 to 9	103	17.3%	42.9%	42.9%
10 to 12	92	38.7%	36.2%	23.8%
Ethnicity				
African American	82	68.0%	15.2%	14.3%
Asian	30	8.0%	11.4%	11.4%
Hispanic/Latino	19	2.7%	8.6%	7.6%
White	154	21.3%	64.8%	66.7%
Income Level*				
Low	120	73.3%	24.8%	37.1%
High	165	26.7%	75.2%	62.9%
School				
Private	37	4.0%	22.9%	12.4%
Public	245	96.0%	77.1%	87.6%
Total	**258**	**75**	**105**	**105**

*Income levels determined by scholarships awarded by Athens-Clarke County Leisure Services Department based on household size and annual income.

Table 4.4

Demographic Comparison between Survey Participants from Sandy Creek Day Camp and Memorial Park Day Camp and the Population from Athens-Clarke County, GA.

Variable	One-week Day-camp [a] (n=285) Frequency	Athens-Clarke County (N=116,714)[b] Frequency
Gender		
Male	58.2%	48.3%
Female	41.8%	51.7%
Ethnicity		
African American	28.8%	26.6%
Asian	10.5%	4.2%
Hispanic/Latino	6.7%	10.4%
White	54.0%	61.9%

a. All information obtained by permission from camp registration forms provided by parents of camp participants.

b. Based on the 2010 U.S. Census fact sheet on Athens-Clarke County, GA.

Table 4.5

Pre-test Mean (M) Scores and Standard Deviations (SD) for Likert-Type Items on the Children's Environmental Perceptions and Art Survey (CEPAS) Across Demographic Groups.

		Eco-Affinity		Eco-Awareness		Art-Appreciation	
Variable	**N**	**M**	**SD**	**M**	**SD**	**M**	**SD**
Gender							
Male	166	3.89	0.759	4.31	0.542	3.70	0.911
Female	119	3.99	0.736	4.34	0.516	4.10	.647
Age							
6 to 7	90	4.13	0.680	4.17	0.628	4.05	0.770
8 to 9	103	3.93	0.606	4.35	0.451	3.70	0.775
10 to 12	92	3.74	0.903	4.44	0.477	3.62	0.952
Ethnicity							
African American	82	3.66	0.850	4.08	0.537	3.71	0.910
Asian	30	3.85	0.640	4.31	0.503	3.85	0.803
Hispanic/Latino	19	4.30	0.515	4.41	0.589	3.89	0.756
White	154	4.05	0.695	4.44	0.486	3.79	0.846
Income Level							
Low	120	3.92	0.737	4.24	0.512	3.91	0.839
High	165	3.94	0.761	4.38	0.537	3.69	0.852
School							
Private	37	4.07	0.578	4.39	0.520	3.70	0.862
Public	245	3.91	0.771	4.31	0.533	3.79	0.852
Attended SCDC*							
Yes	96	3.99	0.677	4.40	0.516	3.73	0.868
No	189	3.90	0.784	4.28	0.535	3.81	0.845
Total	285	3.95	0.713	4.32	0.525	3.79	0.834

*Campers where asked if they had attended SCDC the previous year with responses: yes or no.

Table 4.6

Pre-test Mean (M) Scores and Standard Deviations (SD) for Draw-an-Ecosystem Test (DET) and Draw-an-Animal Test (DAT) Items Across Demographic Groups.

		DET-R		DAT-R		Habitat Type		Environmental Components	
Variable	**N**	**M**	**SD**	**M**	**SD**	**M**	**SD**	**M**	**SD**
Gender									
Male	166	4.07	2.524	4.21	2.591	2.03	0.770	6.43	2.981
Female	119	5.09	2.181	5.03	2.760	1.89	0.807	9.03	3.768
Age									
6 to 7	90	4.03	2.223	4.40	2.508	1.98	0.770	6.79	3.331
8 to 9	103	4.72	2.675	4.53	2.673	1.90	0.806	7.69	3.504
10 to 12	92	4.70	2.317	4.71	2.892	2.04	0.784	8.02	3.767
Ethnicity									
African American	82	3.89	2.219	4.32	2.751	1.78	0.818	6.31	3.192
Asian	30	4.20	2.441	4.57	2.921	2.07	0.944	8.20	3.934
Hispanic/Latino	19	5.21	2.859	4.63	3.240	2.29	0.561	8.47	3.960
White	154	4.79	2.440	4.66	2.602	2.01	2.046	7.89	3.499
Income Level									
Low	120	4.44	2.527	4.51	2.538	1.88	0.800	7.42	3.660
High	165	4.53	2.378	4.58	2.798	2.04	0.774	7.58	3.501
School									
Private	37	4.49	2.293	4.43	3.158	2.12	0.721	7.70	3.297
Public	245	4.50	2.462	4.57	2.618	1.95	0.796	7.48	3.606
Attended SCDC*									
Yes	96	4.68	2.565	4.47	3.920	2.06	0.732	7.51	2.982
No	189	4.40	2.370	4.59	2.680	1.93	0.813	7.51	3.835
Total	285	4.52	2.432	4.55	2.843	2.00	0.863	7.60	3.521

*Campers where asked if they had attended SCDC the previous year with responses: yes or no.

Table 4.7

Mean (M) Score Differences (Post – Pre) and Standard Deviations (SD) on the Children's Environmental Perceptions and Art Survey (CEPAS) Among Three Experiment Groups: Control, EE Treatment, and Art-based EE Treatment.

	Control (n=75)		**EE Treatment (n=105)**		**Art EE Treatment (n=105)**		
Variable	**M**	**SD**	**M**	**SD**	**M**	**SD**	**Sig. (p)**
Likert-type Items							
Eco-Affinity	0.07	0.00	0.01	0.02	0.04	0.08	0.376
Eco-Awareness	0.02	0.01	0.10	0.01	0.06	0.02	0.006
Art-Appreciation	0.00	-0.02	0.12	0.05	0.10	0.03	0.975
DET/DAT Items							
DET-R	-0.10	0.00	1.28	0.20	0.95	0.15	0.003
DAT-R	-0.50	0.23	1.56	0.28	0.97	-0.10	0.011
Habitat Type	0.09	0.00	0.00	-0.10	-0.10	-0.10	0.829
Env. Components	-0.60	-0.70	3.78	3.95	2.25	2.65	0.016

Table 4.8

Likert-Type Item Mean (M) Score Differences (Post - Pre) and Standard Deviations (SD) on the Children's Environmental Perceptions and Art Survey (CEPAS) Across Demographic Groups.

		Eco-Affinity		Eco-Awareness		Art-Appreciation	
Variable	**N**	**M**	**SD**	**M**	**SD**	**M**	**SD**
Gender							
Male	166	0.00	0.05	0.01	0.06	0.00	0.00
Female	119	-0.03	0.02	0.07	-0.02	0.09	0.02
Age							
6 to 7	90	0.01	0.05	0.02	0.06	0.08	-0.02
8 to 9	103	0.11	0.00	0.00	0.06	0.05	0.09
10 to 12	92	0.11	0.02	0.08	0.00	0.07	-0.01
Ethnicity							
African American	82	0.07	-0.01	0.08	0.02	0.08	-0.03
Asian	30	0.17	-0.06	0.07	-0.02	0.11	0.01
Hispanic/Latino	19	0.15	0.14	-0.12	0.10	0.04	0.05
White	154	0.07	0.02	0.02	0.06	0.06	0.04
Income Level							
Low	120	0.04	0.04	0.02	0.06	0.06	0.01
High	165	0.12	0.00	0.06	0.00	0.07	0.02
School							
Private	37	-0.03	-0.04	-0.16	0.15	0.10	0.02
Public	245	0.10	0.02	0.06	0.02	0.06	0.02
Attended SCDC*							
Yes	96	0.03	0.03	0.04	0.05	-0.06	0.03
No	189	0.11	0.00	0.03	0.02	0.20	0.01
Total	285	0.08	0.02	0.01	0.04	0.07	0.01

*Campers where asked if they had attended SCDC the previous year with responses: yes or no.

Table 4.9

Draw-an-Ecosystem Test (DET) and Draw-an-Animal Test (DAT) Item Mean (M) Score Differences (Post - Pre) and Standard Deviations (SD) Across Demographic Groups.

		DET-R		DAT-R		Habitat Type		Environmental Components	
Variable	**N**	**M**	**SD**	**M**	**SD**	**M**	**SD**	**M**	**SD**
Gender									
Male	166	4.71	2.639	6.03	3.072	2.03	0.760	8.18	5.115
Female	119	6.14	2.596	4.92	2.727	1.86	0.685	11.70	7.888
Age									
6 to 7	90	5.07	2.734	4.42	2.688	1.87	0.756	7.47	4.366
8 to 9	103	5.42	2.933	5.47	2.540	1.91	0.749	11.02	8.465
10 to 12	92	5.40	2.426	6.22	3.272	2.09	0.679	10.20	5.574
Ethnicity									
African American	82	4.48	2.627	4.43	2.850	1.90	0.748	7.44	4.998
Asian	30	5.97	3.011	6.03	2.684	1.83	0.844	11.58	7.547
Hispanic/Latino	19	5.32	3.400	5.26	3.070	2.08	0.786	10.03	5.415
White	154	5.61	2.519	5.77	2.890	1.00	0.696	10.49	7.235
Income Level									
Low	120	5.10	2.637	5.04	2.917	1.94	0.764	8.308	5.027
High	165	5.44	2.759	5.62	2.910	1.97	0.712	10.58	7.438
School									
Private	37	6.27	2.684	6.49	3.263	1.99	0.692	11.12	5.171
Public	245	5.16	2.689	5.21	2.836	1.95	0.740	9.41	6.805
Attended SCDC*									
Yes	96	5.63	2.547	5.94	2.824	2.11	0.618	11.51	8.345
No	189	5.13	2.782	5.09	2.937	1.88	0.775	8.67	5.318
Total	285	5.35	2.693	5.42	2.879	1.90	0.733	9.73	6.165

*Campers where asked if they had attended SCDC the previous year with responses: yes or no.

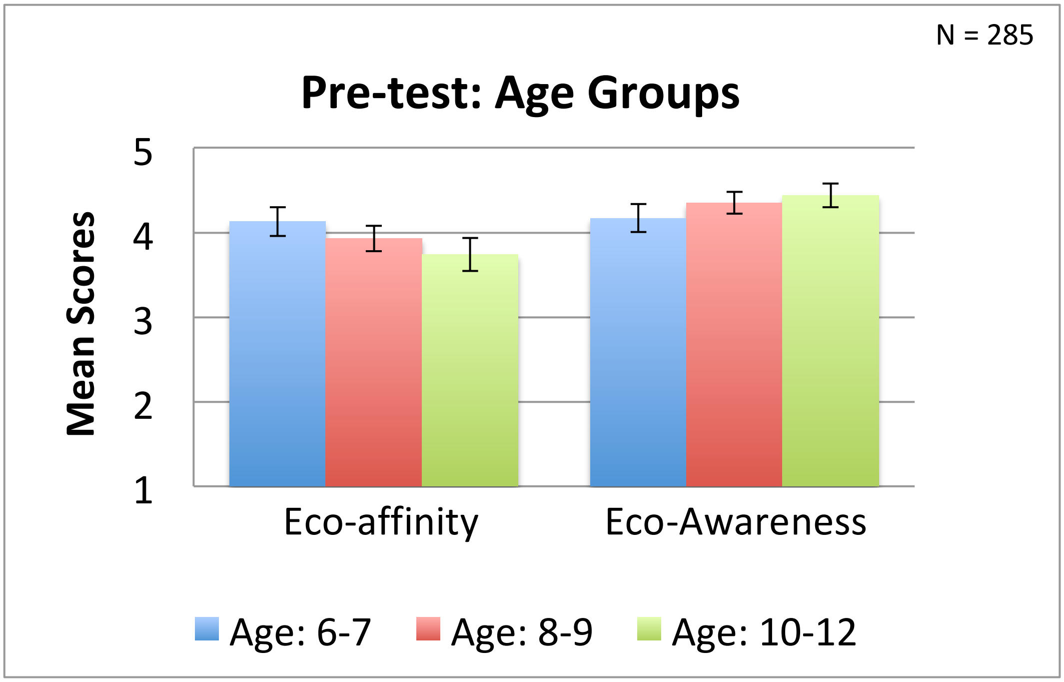
A.

B.

Figure 4.1

Examples of the Art Activity "Build-a-Bug" Completed by Campers Attending Sandy Creek Day Within Age Groups Eight to Nine (A) and Ten to Twelve (B).

A.



B.

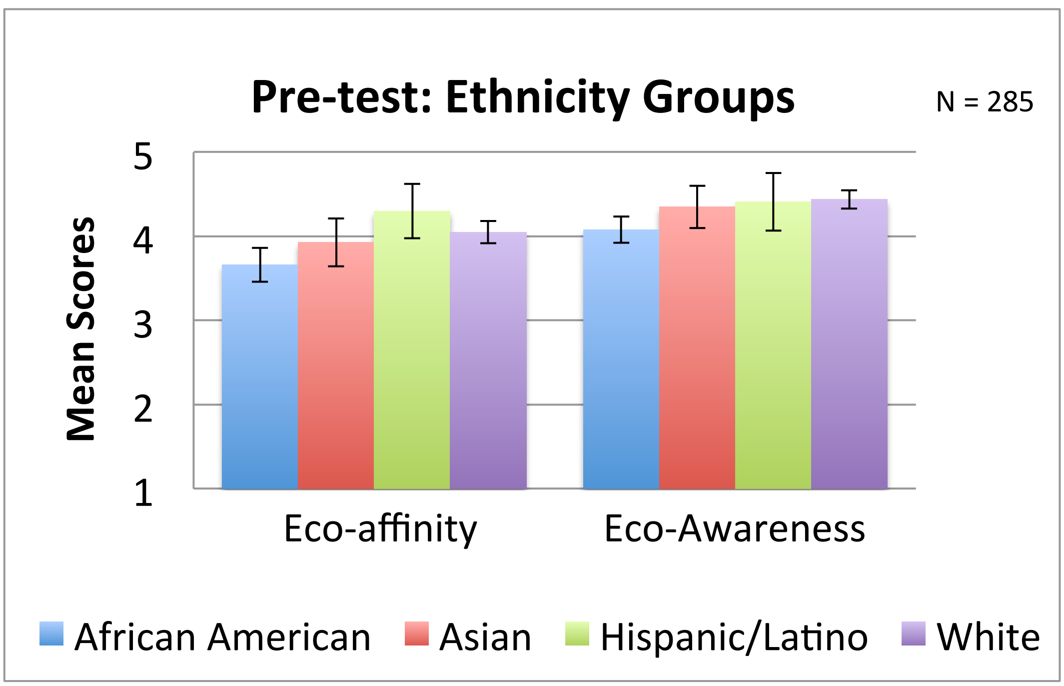


Figure 4.2

Pre-test Baseline Mean Scores for Eco-Affinity and Eco-Awareness Across Age Groups (A) and Ethnicity Groups (B) (one = strongly disagree to five = strongly agree).

A.

B.

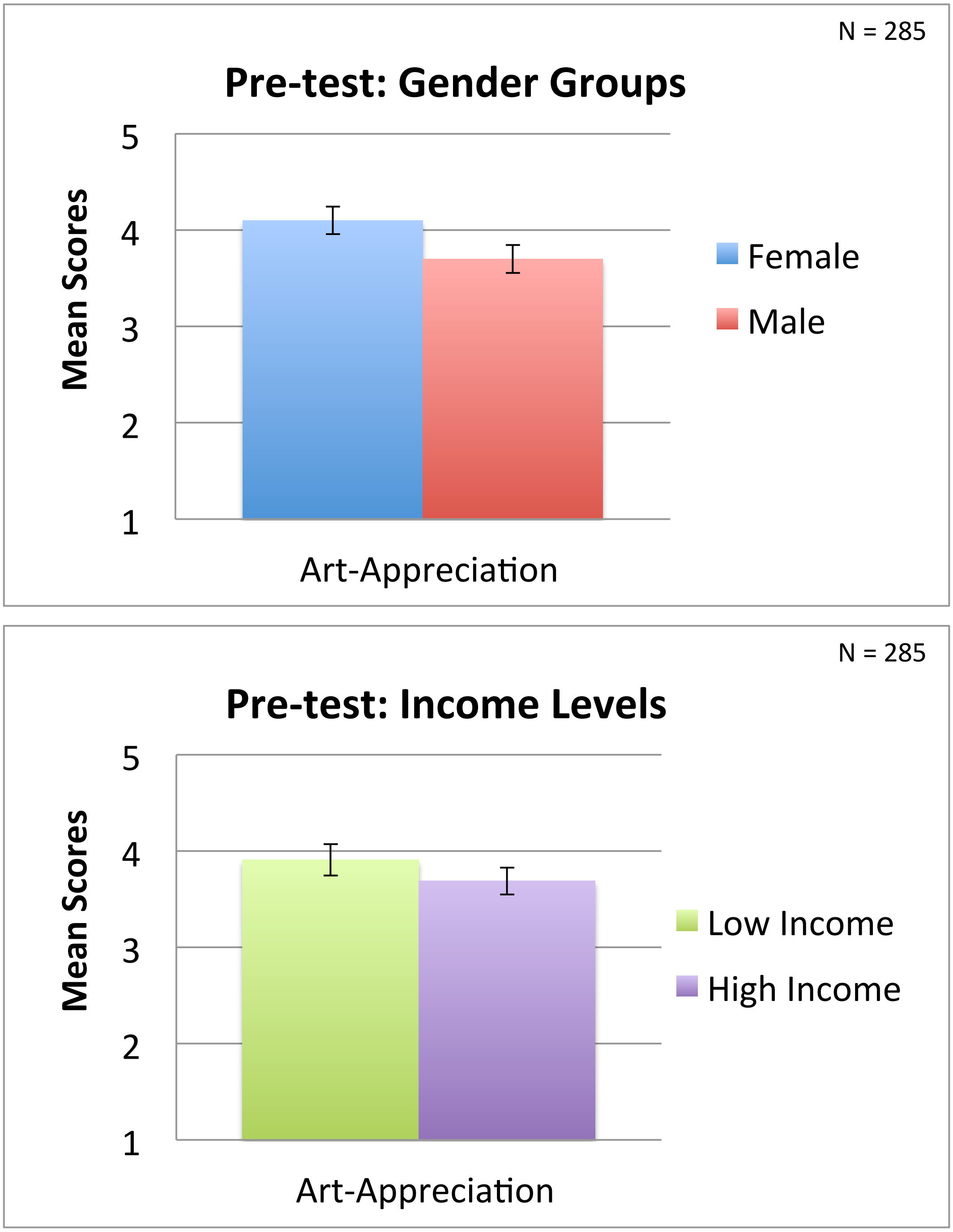
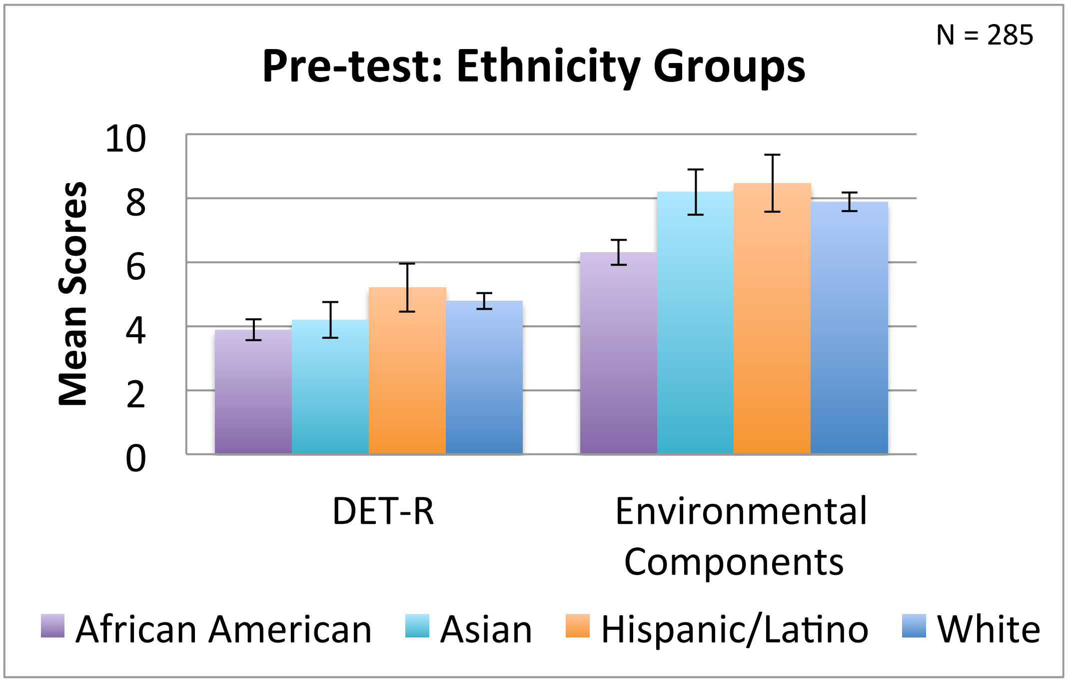


Figure 4.3

Pre-test Baseline Mean Scores for Art-Appreciation Across Gender Groups (A) and Income Levels (B) (one = strongly disagree to five = strongly agree).

A.



B.

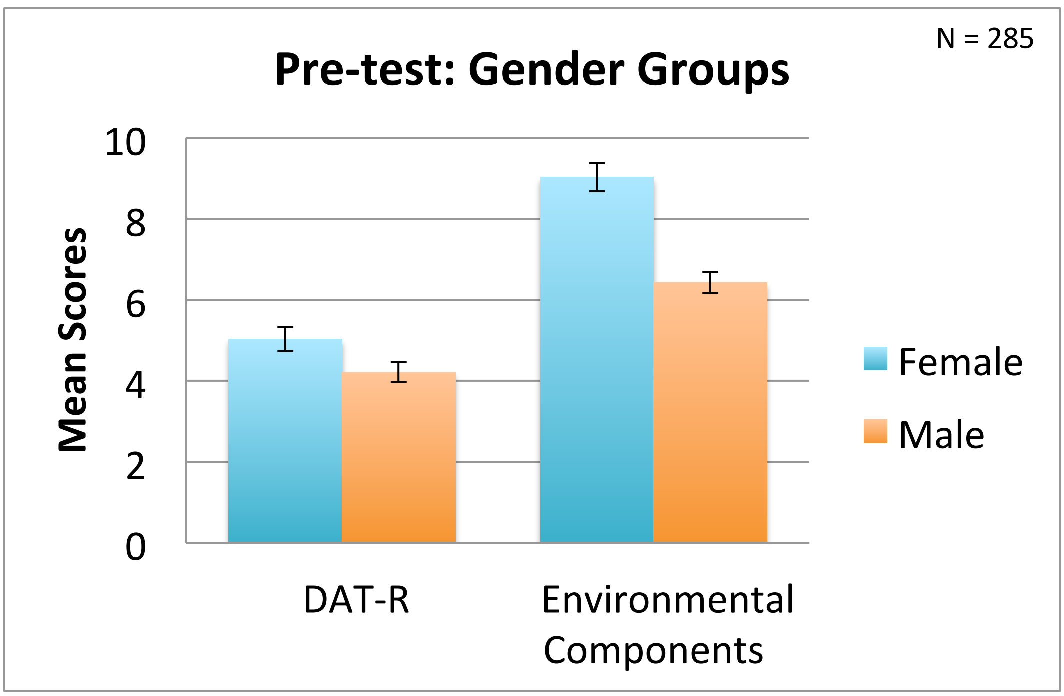


Figure 4.4

Pre-test Baseline Mean Scores for DET-R, DAT-R, and Environmental Components Across Gender Groups (A) and Ethnicity Groups (B) (zero = lowest to 16 = highest)

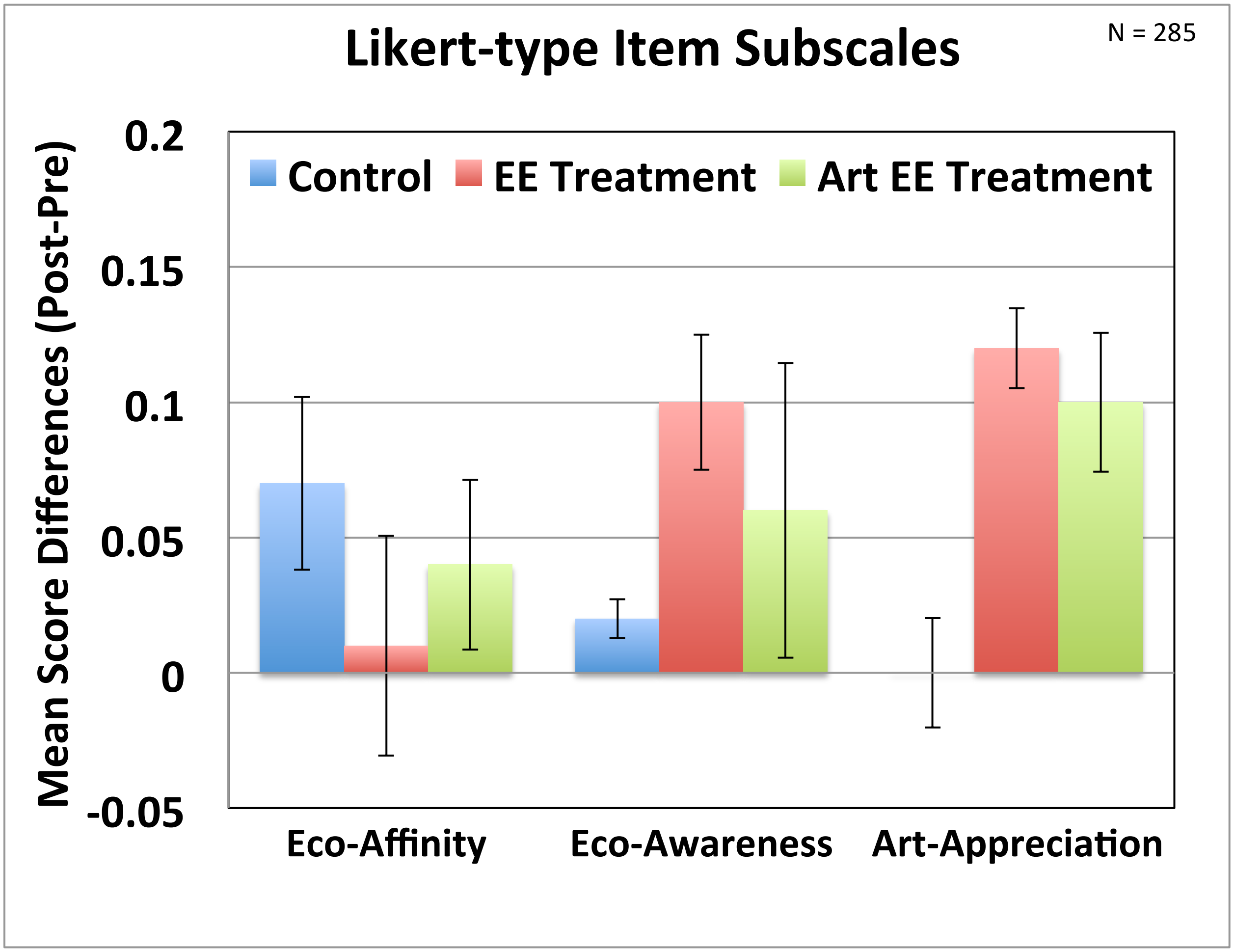


Figure 4.5

Mean Score Differences (Post-Pre) for Likert-type Item Subscales on the Children's Environmental Perceptions and Art Survey (CEPAS) Among Experiment Groups.

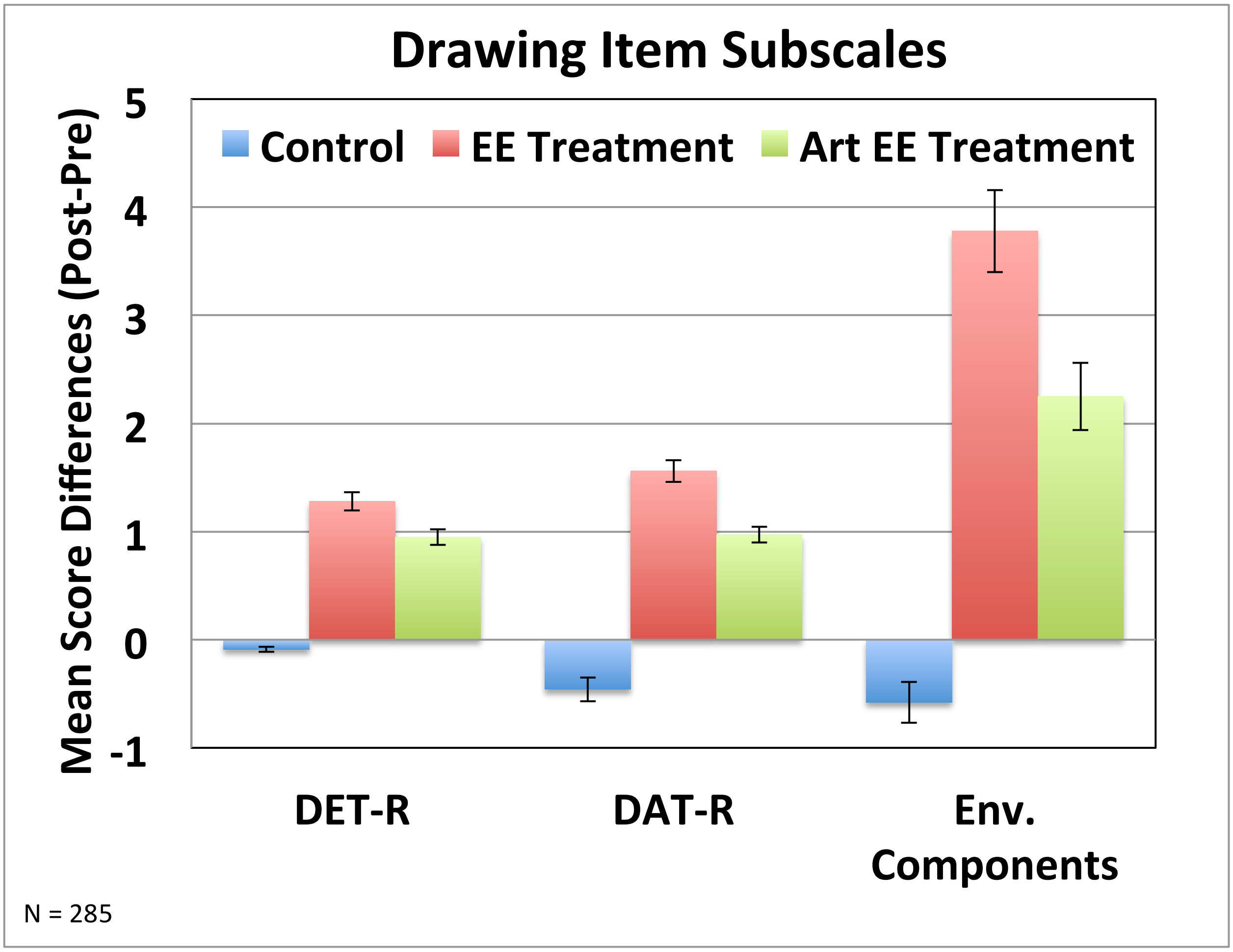


Figure 4.6

Draw-an-Ecosystem Test (DET) and Draw-an-Animal Test (DAT) Item Mean (M) Score Differences (Post - Pre) on the Children's Environmental Perceptions and Art Survey (CEPAS) Across Demographic Groups.

A.

Pre-test DET-R	Score
Human	2
Biotic	2
Abiotic	1
Human Built	2
Total Rubric Score	7
Habitat Type	1
Environmental Component	12
Total Drawing Score	20

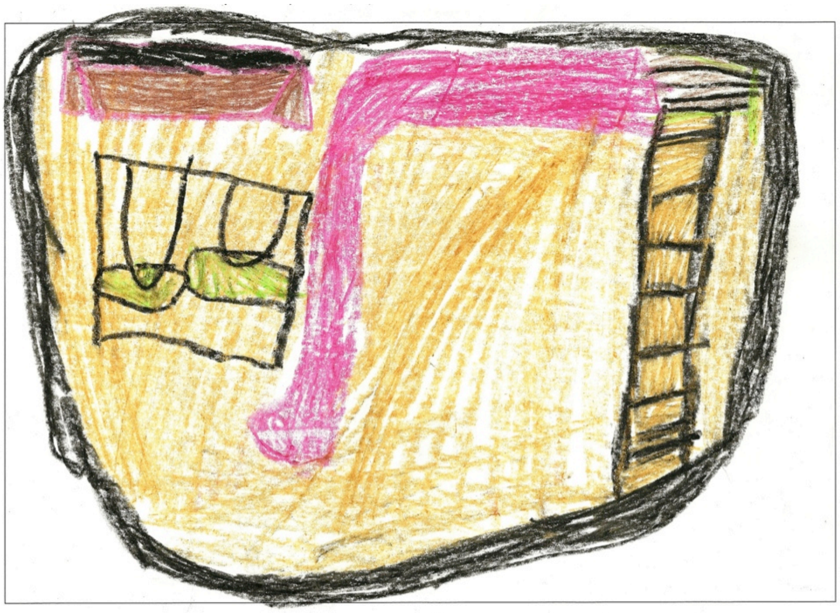
B

Post-test DET-R	Score
Human	2
Biotic	3
Abiotic	3
Human Built	2
Total Rubric Score	10
Habitat Type	1
Environmental Component	20
Total Drawing Score	31

Figure 4.7

Examples of Draw-an-Ecosystem-Test (DET) and Associated Scoring on the Children's Environmental Perceptions and Art Survey (CEPAS) from the Environmental Education Treatment Group: Pre-test (A) and Post-test (B) Drawings Completed by the Same Boy, Age 9.

A.



Pre-test DET-R	Score
Human	0
Biotic	0
Abiotic	2
Human Built	2
Total Rubric Score	4
Habitat Type	2
Environmental Component	5
Total Drawing Score	11

B.

Post-test DET-R	Score
Human	3
Biotic	3
Abiotic	3
Human Built	3
Total Rubric Score	12
Habitat Type	2
Environmental Component	15
Total Drawing Score	29

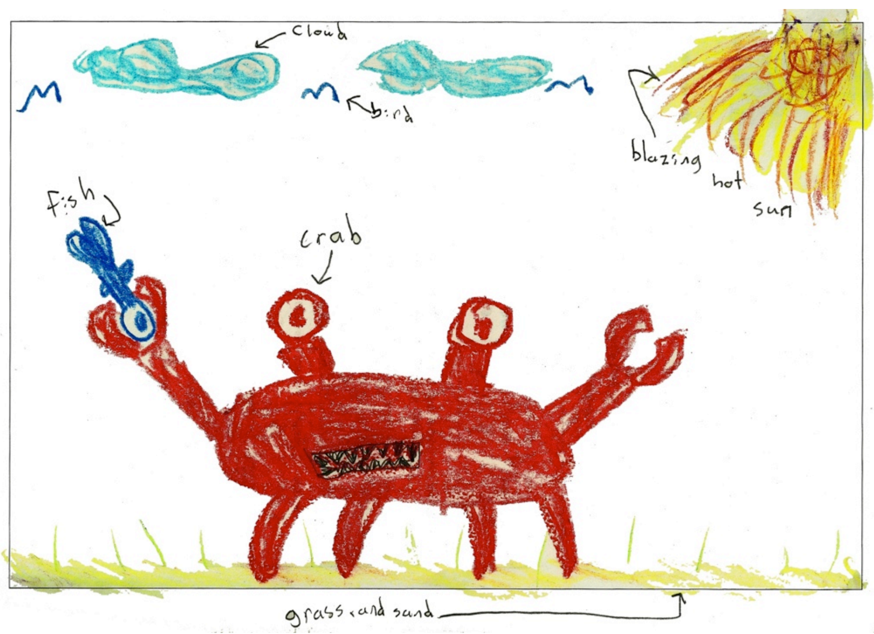
Figure 4.8

Examples of Draw-an-Ecosystem-Test (DET) and Associated Scoring on the Children's Environmental Perceptions and Art Survey (CEPAS) from the Art-based Environmental Education Treatment Group: Pre-test (A) and Post-test (B) Drawings Completed by the Same Girl, Age 7.

A.

Pre-test DAT-R	Score
Habitat Complexity	2
Food	3
Water	0
Shelter	1
Total Rubric Score	6
Habitat Type	3
Environmental Component	7
Total Drawing Score	16

B.

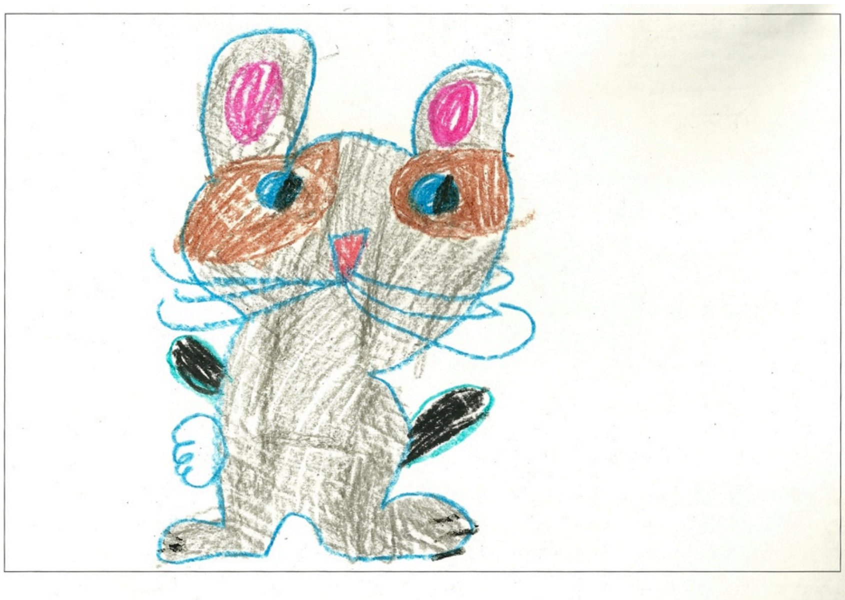


Post-test DAT-R	Score
Habitat Complexity	4
Food	3
Water	0
Shelter	2
Total Rubric Score	9
Habitat Type	3
Environmental Component	16
Total Drawing Score	28

Figure 4.9

Examples of Draw-an-Animal-Test (DAT) and Associated Scoring on the Children's Environmental Perceptions and Art Survey (CEPAS) from the Environmental Education Treatment Group: Pre-test (A) and Post-test (B) Drawings Completed by the Same Boy, Age 9.

A.



Pre-test DAT-R	Score
Habitat Complexity	1
Food	0
Water	0
Shelter	0
Total Rubric Score	1
Habitat Type	3
Environmental Component	5
Total Drawing Score	9

B.

Post-test DAT-R	Score
Habitat Complexity	3
Food	3
Water	0
Shelter	2
Total Rubric Score	8
Habitat Type	3
Environmental Component	16
Total Drawing Score	27

Figure 4.10

Examples of Draw-an-Animal-Test (DAT) and Associated Scoring on the Children's Environmental Perceptions and Art Survey (CEPAS) from the Art-based Environmental Education Treatment Group: Pre-test (A) and Post-test (B) Drawings Completed by the Same Girl, Age 7.

CHAPTER V

SUMMARY AND CONCLUSIONS

The purpose of this study was to construct a valid and reliable survey instrument for measuring children's environmental perceptions and then to measure the impact of an art-based environmental education program on children's environmental perceptions. The design and implementation of this study was based on four objectives:1) to develop a valid and reliable survey instrument for measuring children's environmental perceptions using both quantitative (Likert-type statements) and qualitative (drawings) assessment methods; 2) to develop a valid and reliable scoring rubric for assessing the qualitative (drawings) component of the survey instrument; 3) to establish a baseline measure of children's environmental perceptions across different gender (girls and boys), age (6-7, 8-9, 10-12 year olds), ethnic (African American, Asian, Hispanic/Latino, White), and income levels (low, high) using both quantitative (Likert-type statements) and qualitative (drawings) assessment methods; and 4) to evaluate the effects of two types of one-week environmental education programs (one using traditional approaches, one focused on art-based activities) compared to a general one-week summer camp program on children's environmental perceptions across different gender (girls and boys), age (6-7, 8-9, 10-12 year olds), ethnic (African American, Asian, Hispanic/Latino, White), and income levels (low, high) using both quantitative (Likert-type statements) and qualitative (drawings) assessment methods.

Summary

Children's environmental perceptions were measured using the Children's Environmental Perceptions and Art Survey (CEPAS), designed to evaluate the potential effects of an art-based

EE program on children's perceptions of the environment. Developed in multiple stages, CEPAS was based closely upon the Children's Environmental Perceptions Scale (CEPS) (Larson, Green, & Castleberry, 2011) and the Draw-An-Environment-Test (DAET) (Mosely, Desjean-Perrotta, & Utley, 2010). The CEPAS instrument was composed of two sections: section one contained 20 Likert-type statements evaluating children's affinity for and awareness of the environment; and section two contained two open-ended drawing questions evaluating children's environmental perceptions and knowledge of nature-related concepts. In section one, three subscales defined Likert-type statements: eco-affinity, eco-awareness, and art-appreciation. In section two, drawing questions were scored base on four subscales: two grading rubrics (DET-R, DAT-R), habitat type, and environmental components.

The CEPAS instrument was administered to eight groups attending one-week, summer day-camp programs in Athens-Clarke County, GA during June and July of 2010-2011. A total of 285 campers completed pre and post-camp surveys at Memorial Park Day Camp (MPDC) and Sandy Creek Day Camp (SCDC). Based on pre-determined camp enrollments, participants were randomly placed into three groups: no EE program (n=75), a traditional EE program with a moderate art component (n=105), and an EE program with a major emphasis on art (n=105). The control group was solely located at MPDC because it had a traditional summer camp program centered about sports and games with little to no formal EE curriculum. The EE treatment group and the art-based EE treatment group were located at SCDC. The SCDC was chosen as the treatment groups' site because it had the combination of an EE facility and program integrated with traditional summer camp sports activities. Variables pertaining to the campers considered during the data analysis were gender (girls vs. boys), age (6-7, 8-9, 10-12), ethnic group (African American, Asian, Hispanic/Latino, White), and income level (low vs. high).

Conclusion

Survey Instrument

The results of this study revealed the CEPAS instrument to be a valid and reliable tool for assessing children's environmental knowledge and perceptions within one-week summer day-camp programs. Exploratory factor analysis indicated three factors within CEPAS Likert-type statements: eco-affinity, eco-awareness, and art-appreciation. The first two subscales have been supported by previous research (Larson et al., 2011), and reflect elements of environmental attitudes and awareness: eco-affinity items suggest personal interest and engagement in nature and eco-awareness relates to cognitive grasp and intellectual thinking on environmental issues.

The eco-affinity pre- and post-test mean scores suggest that children generally agree that they have a personal interest in nature and enjoy participating in nature-based activities—reading, learning, caring, protecting, spending time, and spending money on nature. Similarly, the eco-awareness pre- and post-test mean scores suggest children generally agree to strongly agree that plants and animals are affected by human activity and nature is an important component to human survival (Leach et al., 1996; Meyers 2004).

The third subscale of Likert-type statements within CEPAS is art-appreciation, denoting preference for art activities within EE programming. Specifically, exploring children's enjoyment for participating in the activities of drawing, coloring, and creating crafts centered about plants, animals, and nature. The art-appreciation pre- and post-test mean scores show children generally agree that they enjoy participating in art activities and completing craft projects centered about plants, animals, and nature.

Environmental knowledge was assessed using the drawing section of CEPAS: the Draw-an-Ecosystem-Test (DET) and the Draw-an-Animal Test (DAT). These drawings were scored using the Draw-an-Ecosystem-Test Rubric (DET-R) and the Draw-an-Animal-Test Rubric (DAT-R), respectively. The main goal of the two scoring rubrics was that any reviewer could use the rubric and come to the same score for a single drawing. Also, the overall design of the rubric could be easily adapted to other subject matters and themes within EE programs. These objectives have been echoed in previous research, highlighting the instrument as user-friendly and easily adaptable (Cronin-Jones, 2005; Palmquist, 1997; Smith et al., 2003).

Results revealed a reasonable inter-rater reliability score for each grading rubric. Scoring rubrics rated drawings based on five scoring factors and associated degrees of presence and interaction for each of those factors. The use of scoring rubrics to evaluate drawings has been supported by previous research (Moseley et al, 2010), and was found to be a reliable and valid method for generating a quantitative score of a qualitative work (Cronin-Jones, 2005; Crook, 1985; Moseley et al., 2010; Thomas and Silk, 1990).

Children's Drawings

Within this study, the use of drawings (DET and DAT) sought to visually reflect the environmental knowledge children had prior to and after completing one-week day-camp summer programs. What children draw and how they think are closely connected (Vygotsky, 1971), reflecting a child's mental representations and conceptual knowledge about objects drawn. Recent trends in EE research support the use of drawings to evaluate environmental knowledge (Alerby, 2000; Aronsson & Andersson, 1996; Barraza,1999; Bowker, 2007; Guichard, 1995; Palmberg & Kuru, 1998; Tunnicliffe & Reiss, 1999).

Findings within this research reveal a general knowledge of basic environmental concepts for both pre-test drawings. Overall mean scores improved on the post-test for both drawings related to levels of interaction, presence and drawing accuracy. These results are consistent with previous studies where children's drawings improved in accuracy and children's environmental knowledge increased after participating in EE programs (Bowker, 2007; Larson et al., 2010; Smith et al., 2003). Children scored higher on the pre-test DAT than the DET, but post-test scores improved more for the DET than the DAT. This finding may reflect children's underlining fascination with animals from an early age and thus greater knowledge of the subject matter (Meyers, 2004).

The Draw-an-Ecosystem Test (DET) addressed the question: what are children's perceptions of an ecosystem? Results suggest that children within this study see their local ecosystem as being comprised mainly of biotic factors (e.g., plants and animals), human built structures (e.g., houses, cars, and playgrounds), and generally in a backyard setting. This last result was to be expected since the majority of children in this study were from Athens-Clarke County, Georgia—a relatively urban to suburban environment. This result changed very little between the pre- and post-test. After EE program implementation, the presence of wild animals did improve slightly from pre- to post-test, however plants were drawn much more frequently than animals in both drawings.

The Draw-an-Animal Test (DAT) addressed the question: what do children perceive are survival needs for animals? Results showed that children generally understood the premise of the three basic animal needs in the order of shelter, food, and water. These animals were depicted in a natural outdoor habitat the majority of the time, which is consistent with the higher rate of wild animals drawn compared to domestic animals. This was an interesting result considering the majority of these children were from urban environments. The rate of plants drawn did decrease as compared to the DET, however this was to be expected since the drawing prompt was specific to animals and not plants.

Baseline Environmental Perceptions

Baseline mean scores for Likert-type items across demographics groups revealed younger children display higher levels of eco-affinity and lower levels of eco-awareness. Previous studies also support these findings, as younger children have a natural appreciation, interest, and concern for animals (Meyers, 2004; Owens, 2005). Children from Hispanic/Latino and White ethnicity groups generally scored higher on eco-affinity and eco-awareness. This may possibly be because of cultural appreciation for nature and/or preference for activities that generally take place outdoors. Along the same trend, females who were Hispanic/Latino or White generally scored higher on eco-affinity than boys who were African American or Asian. Overall, Hispanic/Latino ethnicity age groups scored higher on eco-affinity compared to all other ethnicity age groups.

Interestingly, females and lower income children displayed greater preference for art activities according to the Liket-type items. These findings were reflected in the drawing subscales as well. Both females and Hispanic/Latinos scored higher on DET/DAT items and environmental components when compared to males and the remaining three ethnic groups. Reasoning for higher art-appreciation scores in females maybe because of developmental maturity at a younger age and greater ability to focus on static art activities as compared to boys, whom generally prefer more energetic activities. Preference for art activities in Hispanic/Latinos may again be because of cultural influence and possibly related to income—cost of basic art supplies for entertainment versus the cost of electronic media and games.

Traditional EE and Art-based EE Treatment Effects

After implementation of the one-week day-camp programs, overall CEPAS mean score changes (pre – post) indicated that children in the traditional EE treatment and art-based EE treatment groups generally had larger improvements in scores than the control group. Within

Likert-type items, children in the traditional EE and art-based EE treatment groups scored higher on eco-awareness within the post-test as compared to the control group. The control group mean score did improve slightly for the eco-affinity and eco-awareness subscales, but the change in score was not statistically significant. This result is plausible since the control group lacked formal EE within its summer camp program, but did spend considerable time outdoors. Both the traditional EE and art-based EE program curriculum contained the same themes and thus children may have acquired a heightened awareness of environmental issues during the program.

Similarly, both the traditional EE and the art-based EE treatment groups scored higher on DET-R/DAT-R and environmental components of the post-test than the control group. These results suggest campers increased their knowledge of ecosystems and understanding of animal needs for survival. Again, this is likely due to the nature of the camp programs and prior research has revealed similar results with the use of EE programming within formal and non-formal education settings (Bartosh et al., 2009; Larson et al., Zoldosova, 2006). Surprisingly, the control group post-test mean scores declined across all subscales of DET/DAT items. Since DAT/DET items assess knowledge and understanding of environmental concepts, this result reflects the generally lack of formal EE curriculum within the control group day-camp program.

Overall, the traditional EE treatment group appeared to have higher post-test scores than both the art EE treatment group and the control group. One possible reason for this is because the EE treatment group contained a greater variety of activities for campers to participate within the program. Since children learn in varying ways (Gardner, 2000), the higher amount of art activities within the art-based EE treatment group may have been overwhelming for some campers. Hence, a general dislike for activities may have created a dis-interest in the subject matter, and thus campers within the art-based EE treatment group may have simply been tired of making art. The art-based EE programming might be more suitable for a particular audience that enjoys art or does not work well in social-group settings. The traditional EE treatment group provided a well–rounded program of activities that engaged campers in learning using a variety of methods. For EE programs to succeed, program diversity is key to reach increasingly diverse populations.

Implications and Future Research

In conclusion, this research study shows: 1) using both quantitative (Likert-type statements) and qualitative (drawings) assessment tools in a survey instrument are valid and reliable methods for measuring the effects of EE programs on children's environmental perceptions and knowledge; and 2) both traditional EE and art-based EE programs have a positive effect on children's environmental perceptions and knowledge. The drawing-based evaluation process and corresponding outcomes suggest that art could serve as an effective, learner-centered method for evaluating environmental awareness and the efficacy of EE programs. The art-based approach to EE could help educators better understand children's beliefs and ways of thinking, illuminating their cognitive grasp of complex environmental issues through creative expression.

Future research should continue to examine the potential use of art as an interdisciplinary teaching, learning, and assessment tool for EE programs. Future studies should explore the various mediums of art (e.g., music, theatre, writing, etc) within EE program activities—how they work in combination with one another and the affects they have on children from varying backgrounds (e.g., age groups, cultural upbringing, geographical location, learning abilities, etc). Future studies should also consider the long-term effects art-based EE programs have upon children and what would happen if children where continuously exposed to EE curriculum throughout the entirety of their academic careers (pre-K to twelfth grade)—not just during a one-week day-camp summer program.

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APPENDIX A

CHIDLREN'S ENVIRONMENTAL PERCEPTIONS AND ART SURVEY (CEPAS)

2010 Sandy Creek Day Camp
Camper Survey

My name is ____.

Have you ever attended Sandy Creek Day Camp before? Yes No

Instructions: We want to know how you feel about some things. There are no right or wrong answers, so just be honest. After I read each sentence, circle ONE of the five choices: Strongly Disagree (👎👎), Disagree (👎), Not Sure (?), Agree (👍) and Strongly Agree (👍👍) that best describes how you feel about that statement.

Let's try an example.

Example: Ice cream tastes great.	Strongly Disagree 👎👎	Disagre e 👎	Not Sure ?	Agree 👍	Strongly Agree 👍👍

Are there any questions? I'll read one sentence at a time and you decide how you feel about each one. Raise your hand if you need help (Remember to Circle just ONE choice).

1. I like to spend time drawing and coloring.	Strongly Disagree 👎👎	Disagree 👎	Not Sure ?	Agree 👍	Strongly Agree 👍👍
2. I like to draw and color plants and animals.	Strongly Disagree 👎👎	Disagree 👎	Not Sure ?	Agree 👍	Strongly Agree 👍👍
3. I like to make arts and crafts.	Strongly Disagree 👎👎	Disagree 👎	Not Sure ?	Agree 👍	Strongly Agree 👍👍
4. I like to make arts and crafts about nature.	Strongly Disagree 👎👎	Disagree 👎	Not Sure ?	Agree 👍	Strongly Agree 👍👍
5. I like to learn a lot about plants and animals	Strongly Disagree 👎👎	Disagree 👎	Not Sure ?	Agree 👍	Strongly Agree 👍👍

6. Plants and animals are very important to people.	**Strongly Disagree** 👎👎	**Disagree** 👎	**Not Sure** **?**	**Agree** 👍	**Strongly Agree** 👍👍
7. I like to read a lot about plants and animals.	**Strongly Disagree** 👎👎	**Disagree** 👎	**Not Sure** **?**	**Agree** 👍	**Strongly Agree** 👍👍
8. Plants and animals are very easily hurt by people.	**Strongly Disagree** 👎👎	**Disagree** 👎	**Not Sure** **?**	**Agree** 👍	**Strongly Agree** 👍👍
9. I want to learn ways to help protect plants and animals.	**Strongly Disagree** 👎👎	**Disagree** 👎	**Not Sure** **?**	**Agree** 👍	**Strongly Agree** 👍👍
10. People really need plants to survive.	**Strongly Disagree** 👎👎	**Disagree** 👎	**Not Sure** **?**	**Agree** 👍	**Strongly Agree** 👍👍
11. My life would change a lot if there were no trees.	**Strongly Disagree** 👎👎	**Disagree** 👎	**Not Sure** **?**	**Agree** 👍	**Strongly Agree** 👍👍
12. I would give a lot of my own money to help plants and animals.	**Strongly Disagree** 👎👎	**Disagree** 👎	**Not Sure** **?**	**Agree** 👍	**Strongly Agree** 👍👍
13. I would spend time after school working to fix problems in nature.	**Strongly Disagree** 👎👎	**Disagree** 👎	**Not Sure** **?**	**Agree** 👍	**Strongly Agree** 👍👍
14. People need to take much better care of nature.	**Strongly Disagree** 👎👎	**Disagree** 👎	**Not Sure** **?**	**Agree** 👍	**Strongly Agree** 👍👍

15. I like to spend a lot of time in places that have plants and animals.	**Strongly Disagree** 👎👎	**Disagree** 👎	**Not Sure ?**	**Agree** 👍	**Strongly Agree** 👍👍
16. Building new homes and stores is bad for nature.	**Strongly Disagree** 👎👎	**Disagree** 👎	**Not Sure ?**	**Agree** 👍	**Strongly Agree** 👍👍
17. I like to learn a lot about nature.	**Strongly Disagree** 👎👎	**Disagree** 👎	**Not Sure ?**	**Agree** 👍	**Strongly Agree** 👍👍
18. I would help to protect plants and animals in my neighborhood.	**Strongly Disagree** 👎👎	**Disagree** 👎	**Not Sure ?**	**Agree** 👍	**Strongly Agree** 👍👍
19. Nature is very easily hurt by people.	**Strongly Disagree** 👎👎	**Disagree** 👎	**Not Sure ?**	**Agree** 👍	**Strongly Agree** 👍👍
20. My life would change a lot if there were no plants and animals.	**Strongly Disagree** 👎👎	**Disagree** 👎	**Not Sure ?**	**Agree** 👍	**Strongly Agree** 👍👍

21. Draw a habitat or ecosystem that you see or play in almost every day. Please write the names of everything you draw.

22. Draw your favorite animal, the habitat or ecosystem where it lives, and the things it needs to survive.
Please write the names of everything you draw.

APPENDIX B

MEMORIAL PARK DAY CAMP, CONTROL GROUP: GENERAL ACTIVITY SCHEDULE

Memorial Park Day Camp – Control Group
General Activity Schedule
A: Younger Groups (6-9 yrs)   B: Older Groups (10-12 years)

Time	Monday	Tuesday	Wednesday	Thursday	Friday
9:00-9:20	A & B - Opening Activity	A & B - Opening Activity	A & B - Opening Activity	A & B - Opening Activity	A & B - Opening Activity
9:20-10:00	A - Indoor Activities B - Outdoor Activities	A - Indoor Activities B - Outdoor Activities	A - Indoor Activities B - Outdoor Activities	A - Indoor Activities B - Outdoor Activities	A - Indoor Activities B - Outdoor Activities
10:00-11:00	A - Group Activity B - Arts & Crafts	A - Swim Time B - Educational Program	A - Swim Time B - Arts & Crafts	A - Swim Time B - Yoga Time	A - Swim Time B - Arts & Crafts
11:00-12:00	A - Arts & Crafts B - Group Activity	A - Educational Program B - Swim Time	A - Arts & Crafts B - Swim Time	A - Yoga Time B - Swim Time	A - Arts & Crafts B - Swim Time
12:00-12:45	Lunch	Lunch	Lunch	Lunch	Lunch
12:45-1:20	A - Nature Trail B - Bear Hollow Zoo	A - Indoor Activities B - Outdoor Activities		A - Indoor Activities B - Outdoor Activities	
1:30-2:15	A - Bear Hollow Zoo B- Natural Trail	A - Outdoor Activities B - Indoor Activities	A & B - Movie	A - Outdoor Activities B - Indoor Activities	A & B - Sandy Creek Park Activities
2:15-3:00	A & B - Team Building Activities	A & B - Team Building Activities		A & B - Team Building Activities	
3:00 - 3:15	Clean-up	Clean-up	Clean-up	Clean-up	Clean-up
3:15 - 3:30	Daily Wrap-up	Daily Wrap-up	Daily Wrap-up	Daily Wrap-up	Daily Wrap-up

a. Opening Activity: morning attendance, board games, etc.
b. Indoor Activity: music activity, kitchen time, game time, etc.
c. Outdoor Activity: sports (basketball, foursquare, soccer, etc), games, nature trail, etc.
d. Sandy Creek Park Activities: swimming, canoeing, fishing, archery, beach games, etc.

APPENDIX C

SANDY CREEK DAY CAMP, ART-BASED ENVIRONMENTAL EDUCATION

TREATMENT GROUP: GENERAL ACTIVITY SCHEDULE

Sandy Creek Day Camp – Art-based EE Treatment Group
General Activity Schedule
A: Younger Groups (6-8 yrs)   B: Older Groups (9-12 years)

Time	Monday	Tuesday	Wednesday	Thursday	Friday
9:00-9:45	A - Beach Games B - Educational Animal Program	A - Swim Time B - Creekwalk w/ Water Canaries Activity	A - Garden B - Nature Trail Hike w/ Bird Watching	A - Swim Time **B - Art: Build a Grasshopper**	A - Scavenger Hunt B - Movie
9:45-10:45	A - Swim Time **B - Art: Egg-carton Animals**	A - Sports B - Group Activity: MicroOdyssey	A - Fish **B - Art: Adaptive Artistry**	A - Sports B - Thicketwalk w/ Grasshopper Gravity Game	A - Swim Time B - Movie
10:45-12:00	A - Canoe B - Nature Trail Hike	A - Archery **B - Art: Fashion a Fish**	A - Swim Time B - Owl Pellet Dissection	A - Hike B - Group Activity: Every Tree for Itself	A - Beach Games **B - Art: Animal Masks**
12:00-1:00	Lunch	Lunch	Lunch	Lunch	Lunch
1:00-2:00	A - Educational Animal Program B - Beach Games	A - Creekwalk w/ Water Canaries Activity B - Swim Time	A - Nature Trail Hike w/ Bird Watching B - Garden	**A - Art: Build a Grasshopper** B -Swim Time	A - Movie B - Scavenger Hunt
2:00-3:00	**A - Art: Egg-carton Animals** B - Swim Time	A - Group Activity: MicroOdyssey B - Sports	**A - Art: Adaptive Artistry** B - Fish	A - Thicketwalk w/ Grasshopper Gravity Game B - Sports	A - Movie B - Swim Time
3:00 - 3:45	B - Nature Trail Hike A - Canoe	**A - Art: Fashion a Fish** B - Archery	A - Owl Pellet Dissection B - Swim Time	A - Group Activity: Every Tree for Itself B - Hike	**A - Art: Animal Masks** B - Beach Games
3:45 - 4:00	Clean-up	Clean-up	Clean-up	Clean-up	Clean-up

a. A: Younger Groups at Sandy Creek Park in A.M.; at Sandy Creek Nature Center in P.M.
b. B: Older Groups at Sandy Creek Nature Center in A.M.; at Sandy Creek Park in P.M.
c. Sports: soccer, wiffleball, dodgeball, water t-ball, etc.
d. Beach Games: frisbee, volleyball, sand castle building, etc.

APPENDIX D

SANDY CREEK DAY CAMP, ENVIRONMENTAL EDUCATION TREATMENT GROUP:

GENERAL ACTIVITY SCHEDULE

Sandy Creek Day Camp – Traditional EE Treatment Group
General Activity Schedule
A: Younger Groups (6-8 yrs)   B: Older Groups (9-12 years)

Time	Monday	Tuesday	Wednesday	Thursday	Friday
9:00-9:45	A - Beach Games B - Educational Animal Program	A - Swim Time B - Group Activity: MicroOdyssey	A - Garden B - Nature Trail Hike w/ Bird Watching	A - Swim Time B - Thicketwalk w/ Grasshopper Gravity Game	A - Scavenger Hunt B - Movie
9:45-10:45	A - Swim Time B - Nature Trail Hike	A - Sports B - Creekwalk w/ Water Canaries Activity	A - Fish B - Owl Pellet Dissection	A - Sports B - Group Activity: Every Tree for Itself	A - Swim Time B - Movie
10:45-12:00	A - Canoe B - Group Activity: Animal Charades	A - Archery **B - Art: Fashion a Fish**	A - Swim Time B - Group Activity: Migration Headache	A - Hike **B - Art: Build a Grasshopper**	A - Beach Games B - Group Activity: Adopt a Tree
12:00-1:00	Lunch	Lunch	Lunch	Lunch	Lunch
1:00-2:00	A - Educational Animal Program B - Beach Games	A - Group Activity: MicroOdyssey B - Swim Time	A - Nature Trail Hike w/ Bird Watching B - Garden	A - Thicketwalk w/ Grasshopper Gravity Game B - Swim Time	A - Movie B - Scavenger Hunt
2:00-3:00	A - Nature Trail Hike B - Swim Time	A - Creekwalk w/ Water Canaries Activity B - Sports	A - Owl Pellet Dissection B - Fish	A - Group Activity: Every Tree for Itself B - Sports	A - Movie B - Swim Time
3:00 - 3:45	B - Group Activity: Animal Charades A - Canoe	**A - Art: Fashion a Fish** B - Archery	A - Group Activity: Migration Headache B - Swim Time	**A - Art: Build a Grasshopper** B - Hike	A - Group Activity: Adopt a Tree B - Beach Games
3:45 - 4:00	Clean-up	Clean-up	Clean-up	Clean-up	Clean-up

a. A: Younger Groups at Sandy Creek Park in A.M.; at Sandy Creek Nature Center in P.M.
b. B: Older Groups at Sandy Creek Nature Center in A.M.; at Sandy Creek Park in P.M.
c. Sports: soccer, wiffleball, dodgeball, water t-ball, etc.
d. Beach Games: frisbee, volleyball, sand castle building, etc.

APPENDIX E

SANDY CREEK DAY CAMP REGISTRATION FORM

This program sponsored by the Athens-Clarke County Department of Leisure Services

Sandy Creek Day Camp 2011

Camper's First Name: ______________________ **Camper's Last Name:** ____________________

Address: ______________________________ **City:** ________________ **State/Zip:** _____________

Birthdate: _____________ **Age (as of camp start date):**_________________ **Gender:** _________

Current School: ___________________________ **Current Grade:** _______

Parent/Guardian's Name: __________________**Phone(1):** _____________ **Phone(2):** _____________

Parent/Guardian E-mail Address: ____

Parent/Guardian's Name: __________________**Phone(1):** _____________ **Phone(2):** _____________

Other Emergency Contact: _________________ **Relationship to Child**____________________

Phone(1): _________________ **Phone(2):** ____________________

Summer Day Camp Fees	**Fee**	**100% Scholarship (You pay 0%)**	**80% Scholarship (You pay 20%)**	**60% Scholarship (You pay 40%)**	**40% Scholarship (You pay 60%)**	**20% Scholarship (You pay 80%)**
Camp Fee Per Week (7-12 years old)	ACC Fee **$61**	ACC $0	ACC $12.20	ACC $24.40	ACC $36.60	ACC $48.80
	Non ACC **$92**					
Camp Fee Per Week (Teens)	ACC Fee **$68**	ACC $0	ACC $13.60	ACC $27.20	ACC $40.80	ACC $54.40
	Non-ACC **$102**					
Early or Late Fee Per Week	ACC Fee **$15**	ACC $0	ACC $3	ACC $6	ACC $9	ACC $ 12
	Non-ACC **$23**					
Both Early AND Late Fee Per Week	ACC Fee **$25**	ACC $0	ACC $5	ACC $10	ACC $15	ACC $20
	Non-ACC **$38**					

PAYMENT CALCULATIONS

Please put appropriate fees with the week(s) for which you are registering		Camp Fee	Early Supervision (Time)	Late Supervision (Time)	Early & Late Supervision	TOTALS
Session 1	**June 6-10**					
Session 2	**June 13-17**					
Session 3	**June 20-24**					
Session 4	**June 27- July 1**					
Session 5	**July 5-8**					
Session 6	**July 11-15**					
Session 7	**July 18-22**					
SCNC Members receive a 10% discount on Sandy Creek Day Camp fees if there is no scholarship. Enter discount amount in column right. →						
Campers must be 7 years old by September 1		**TOTAL AMOUNT DUE:**				

Internal Office Use Only

Method of Payment: Credit Card Cash Check # __________ M.O. # ________ Amt.__________

Received by: ________________________ *Date:* __________ *Receipt #* ______________________

APPENDIX F

MEMORIAL PARK DAY CAMP REGISTRATION FORM

This program sponsored by the Athens-Clarke County Department of Leisure Services

2011 Memorial Park Day Camp

Camper's First Name: ______________________ **Camper's Last Name:** ____________________

Address: ______________________________ **City:** ______________ **State/Zip:** ____________

Birthdate: _______ **Age:** _____ **Sex:** ____ **T-Shirt Size: YOUTH: XS S M L XL**
ADULT: XS S M L XL XXL

Current School: __________________________ **Current Grade:** _______

Parent/Guardian's Name: __________________ **Phone(1):** ____________ **Phone(2):** _______

Parent/Guardian E-mail Address: ____

Parent/Guardian's Name: __________________ **Phone(1):** ____________ **Phone(2):** _______

Other Emergency Contact: _________________ **Relationship to Child**____________________

Phone(1): _________________ **Phone(2):** ____________________

Summer Day Camp Fees	**Fee**	**100% Scholarship (You pay 0%)**	**80% Scholarship (You pay 20%)**	**60% Scholarship (You pay 40%)**	**40% Scholarship (You pay 60%)**	**20% Scholarship (You pay 80%)**
Camp Fee Per Week (6-12 years old)	$35 ACC Fee/ $53 Non ACC Fee	ACC $0	ACC $7	ACC $14	ACC $21	ACC $28
Early or Late Fee Per Week	$15 ACC Fee/ $23 Non ACC Fee	ACC $0	ACC $3	ACC $6	ACC $9	ACC $12
Both Early AND Late Fee Per Week	F$25 ACC Fee/ $38 Non ACC Fee	ACC $0	ACC $5	ACC $10	ACC $15	ACC $20

PAYMENT CALCULATIONS

Indicate appropriate fees with the week(s) for which you are registering		Course Code	Camp Fee	Early Drop-Off	Late Pick-Up	Early & Late Supervision	TOTALS
Session 1	**June 6-10**	***2933***					
Session 2	**June 13-17**	***2934***					
Session 3	**June 20-24**	***2935***					
Session 4	**June 27-July 1**	***2936***					
Session 5	**July 5-8**	***2937***					
Session 6	**July 11-15**	***2938***					
Session 7	**July 18-22**	***2939***					
Session 8	**July 25-29**	***2940***					
Campers must be 6 years old by September 1				**TOTAL AMOUNT DUE:**			

Internal Office Use Only

Method of Payment: Credit Card Cash Check # __________ M.O. # ________ Amt. _________

Received by: ______________________ *Date:* __________ *Receipt #* ____________________

APPENDIX G

ATHENS-CLARKE COUNTY DEPARTMENT OF LEISURE SERVICES SCHOLARSHIP RATING

ATHENS-CLARKE COUNTY DEPARTMENT OF LEISURE SERVICES
For FY11 (July 1, 2010 to June 30, 2011)

Annual:

Household Size	Recipient Pays 0%		Recipient Pays 20%		Recipient Pays 40%		Recipient Pays 60%		Recipient Pays 80%	
	Annual Income		Annual Income		Annual Income		Annual Income		Annual Income	
	From	To	From	To	From	To	From	To	From	To
1	$0	$5,415	$5,416	$13,538	$13,539	$16,923	$16,924	$21,155	$21,156	$26,445
2	$0	$7,285	$7,286	$18,213	$18,214	$22,767	$22,768	$28,460	$28,461	$35,576
3	$0	$9,155	$9,156	$22,888	$22,889	$28,611	$28,612	$35,765	$35,766	$44,707
4	$0	$11,025	$11,026	$27,563	$27,564	$34,454	$34,455	$43,069	$43,070	$53,838
5	$0	$12,895	$12,896	$32,238	$32,239	$40,298	$40,299	$50,374	$50,375	$62,969
6	$0	$14,765	$14,766	$36,913	$36,914	$46,142	$46,143	$57,679	$57,680	$72,099
7	$0	$16,635	$16,636	$41,588	$41,589	$51,986	$51,987	$64,983	$64,984	$81,230
8	$0	$18,505	$18,506	$46,263	$46,264	$57,829	$57,830	$72,288	$72,289	$90,361
9	$0	$20,375	$20,376	$50,938	$50,939	$63,673	$63,674	$79,593	$79,594	$99,492
10	$0	$22,245	$22,246	$55,613	$55,614	$69,517	$69,518	$86,897	$86,898	$108,623

Monthly:

Household Size	Recipient Pays 0%		Recipient Pays 20%		Recipient Pays 40%		Recipient Pays 60%		Recipient Pays 80%	
	Monthly Income		Monthly Income		Monthly Income		Monthly Income		Monthly Income	
	From	To	From	To	From	To	From	To	From	To
1	$0	$451	$452	$1,064	$1,065	$1,331	$1,332	$1,665	$1,666	$2,082
2	$0	$759	$760	$1,426	$1,427	$1,784	$1,785	$2,231	$2,232	$2,790
3	$0	$954	$955	$1,789	$1,790	$2,237	$2,238	$2,797	$2,798	$3,498
4	$0	$1,148	$1,149	$2,151	$2,152	$2,690	$2,691	$3,364	$3,365	$4,206
5	$0	$1,343	$1,344	$2,514	$2,515	$3,143	$3,144	$3,930	$3,931	$4,914
6	$0	$1,538	$1,539	$2,876	$2,877	$3,596	$3,597	$4,497	$4,498	$5,622
7	$0	$1,733	$1,734	$3,239	$3,240	$4,049	$4,050	$5,063	$5,064	$6,330
8	$0	$1,801	$1,802	$3,601	$3,602	$4,503	$4,504	$5,629	$5,630	$7,038
9	$0	$1,982	$1,983	$3,964	$3,965	$4,956	$4,957	$6,196	$6,197	$7,746
10	$0	$2,163	$2,164	$4,326	$4,327	$5,409	$5,410	$6,762	$6,763	$8,454

Weekly:

Household Size	Recipient Pays 0%		Recipient Pays 20%		Recipient Pays 40%		Recipient Pays 60%		Recipient Pays 80%	
	Weekly Income		Weekly Income		Weekly Income		Weekly Income		Weekly Income	
	From	To	From	To	From	To	From	To	From	To
1	$0	$123	$124	$245	$246	$308	$309	$386	$387	$484
2	$0	$165	$166	$329	$330	$413	$414	$517	$518	$648
3	$0	$206	$207	$413	$414	$517	$518	$648	$649	$811
4	$0	$248	$249	$496	$497	$622	$623	$778	$779	$974
5	$0	$290	$291	$580	$581	$726	$727	$909	$910	$1,138
6	$0	$332	$333	$664	$665	$831	$832	$1,040	$1,041	$1,301
7	$0	$374	$375	$747	$748	$935	$936	$1,171	$1,172	$1,464
8	$0	$416	$417	$831	$832	$1,040	$1,041	$1,301	$1,302	$1,628
9	$0	$457	$458	$915	$916	$1,145	$1,146	$1,432	$1,433	$1,791
10	$0	$499	$500	$998	$999	$1,249	$1,250	$1,563	$1,564	$1,955

Based on information obtained from Department of Health and Human Services **7/1/2010**