EXECUTIVE SUMMARY: Concerns regarding the profound physical, social, and psychological problems associated with childhood nature deprivation have catalyzed extensive growth in nature-based education programs. Recent environmental education (EE) initiatives and legislative measures, such as the proposed No Child Left Inside Act, have stressed the importance of EE in the formal education sector. However, out-of-school EE programs remain an appealing alternative to in-class science education. Non-formal programs provide children with a unique opportunity to experience substantial outdoor immersion and often influence affective development. These benefits suggest that an expansion of the depth and scope of non-formal outdoor programs is necessary to achieve the long-term goal of an environmentally literate population. Efforts to develop strategies for implementing and evaluating affective changes associated with EE programs could place a greater emphasis on the environmental orientations of children from different backgrounds. This exploratory study employed a new instrument, the Children’s Environmental Perceptions Scale, to investigate baseline differences in the environmental orientations of 133 six to thirteen-year-old children from different gender, age, and racial/ethnic groups in Athens-Clarke County, Georgia. This study used a mixed-method, pre-test, post-test approach to examine the effects of a one-week EE summer program sponsored by the State Botanical Garden of Georgia on children’s eco-affinity, eco-awareness, and environmental knowledge. Responses of EE program participants were compared to a control group of students enrolled in local after-school programs. Brief personal interviews and open-ended evaluations supplemented quantitative survey data. Results did not reveal gender differences in baseline environmental orientations. However, eco-affinity levels were significantly lower in participants age ten or older. African American children also displayed significantly lower eco-awareness and environmental knowledge scores than white children prior to the EE program. Interviews detailing children’s unique interactions with nature yielded several possible explanations for these discrepancies. The EE program
produced significantly higher adjusted mean eco-affinity and environmental knowledge post-test scores than the control group, regardless of gender, age, or race/ethnicity. The summer camp’s influence on eco-affinity, an affective component of environmental orientations that is difficult to alter, was especially encouraging. Fun and exciting concepts expressed through physical activity appeared to be a key component of effective EE programming. Overall, results suggested that non-formal EE programs in public parks and other recreation areas provide an ideal forum for stimulating positive environmental orientations in a diverse group of children and may generate future support for outreach efforts in underserved communities.

**KEYWORDS:** Children, eco-affinity, eco-awareness, environmental education, environmental orientations, ethnicity

**AUTHORS:** Lincoln R. Larson is with the D. B. Warnell School of Forestry & Natural Resources, University of Georgia, Athens, GA, 30602-2152, Phone: (919) 724-2443, Email: LarsonL@warnell.uga.edu. Steven B. Castleberry and Gary T. Green are also with the D. B. Warnell School of Forestry & Natural Resources, University of Georgia.

**ACKNOWLEDGMENT:** The authors wish to acknowledge the State Botanical Garden of Georgia, the Athens-Clarke County Leisure Services Department, and the Clarke County Public Schools for all of their support and assistance with this project. The authors are also grateful to the volunteers, teachers, and camp staff members who assisted throughout the research process.

Evidence suggests that a pervasive disconnect between youth and nature threatens children’s physical, social and psychological well-being (Coyle, 2005; Kahn & Kellert, 2002; Louv, 2005). Environmental education (EE) programs represent a potential antidote to this nature-deficit disorder. Growing support for EE initiatives, manifested by legislative measures such as the proposed No Child Left Inside Act (No Child Left Inside Coalition, 2009), has stressed the importance of EE in the formal education sector. However, out-of-school EE programs remain an appealing alternative to in-class science education because they provide children with a unique opportunity to experience substantial outdoor immersion and often have a more profound impact on affective development (Falk, 2001; Stone & Glascott, 1998). Young children benefit from educational approaches that use the natural environment as integrated context for learning, and a greater emphasis could be placed on programming that integrates ecological concepts into educational structures (Kellert, 2005; Lieberman & Hoody, 1998).

Considering the multiple benefits of EE, the general paucity of empirical work investigating youth program outcomes in non-formal settings has been criticized (Bocarro, Greenwood, & Henderson, 2008; Caldwell, 2000). Few studies have examined the role of EE programs on the development of children’s environmental orientations. Existing research often has featured qualitative assessments of community recreation programs for adolescents. Quantitative evaluations of nature-based camps and outdoor programs for younger audiences are rare, and mixed-method approaches are even less common (Bocarro et al., 2008). Recent efforts to develop age-appropriate strategies for measuring children’s environmental orientations have helped to address this gap (Evans, Brauchle, Haq, Stecker,
Wong, & Shapiro, 2007; Larson, Green, & Castleberry, 2008; Manoli, Johnson, & Dunlap, 2007), but an inadequate understanding of EE’s influence on the affective development of children from different gender, age, and ethnic backgrounds remains a major concern.

Literature Review

Gender and Environmental Orientations

Investigations of gender differences in environmental orientations typically have focused on adults. Results suggest that women are more inclined to support preservation of nature, often expressed as concern for environmental issues and intention to engage in pro-environmental behavior (Milfont & Duckitt, 2004; Vaske, Donnelly, Williams, & Jonker, 2001; Zelezny, 2000). Paradoxically, despite a female affinity for environmental preservation, many studies have also revealed an environmental “gender gap” that shows women are generally less knowledgeable about environmental issues and less interested in outdoor recreation than males (Busser, Hyams, & Carruthers, 1996; Coyle, 2005). Given these inconsistent findings and an absence of data regarding gender-based differences in children’s environmental orientations, the influence of EE on boys and girls remains uncertain.

Age and Environmental Orientations

The identification of an ideal age for EE delivery has also been a subject of considerable debate. For instance, pro-environment sentiments are historically more common in younger age groups (Jones & Dunlap, 1992; Van Liere & Dunlap, 1980), but this pattern may be changing. Whittaker, Segura, and Bowler (2005) observed a decline in the willingness of young adults to self-identify as environmentalists—a trend that could have negative repercussions for conservation efforts. Kellert (2005) provided a detailed outline of developmental shifts in environmental values beginning with a utilitarian and dominionistic view of nature in early childhood that progresses toward enhanced appreciation of nature for aesthetic, symbolic, or moralistic reasons as children get older (Kahn & Kellert, 2002). These transitions are supported by studies that identified an increase in overall environmental concern once children reached ten or eleven years of age (Eagles & Demare, 1999; Kahn, 1999). Though general measures of environmental concern and factual knowledge increase as children approach adolescence, specific indicators of environmental attitudes and behavioral intentions may be higher for younger individuals (Hines, Hungerford, & Tomera, 1986; Leeming, Dwyer, & Bracken, 1995). The implications of these conflicting results are difficult to determine, especially in the context of EE programming. An accurate and functional assessment strategy that separates distinct constructs (i.e., attitudes, awareness, knowledge, etc.) and provides an opportunity for age comparisons would help identify an optimal age range of emphasis for EE efforts.

Ethnicity and Environmental Orientations

The impact of ethnic and cultural differences on environmental attitudes and awareness may become more important as the U.S. population continues to diversify (Johnson, Bowker, & Cordell, 2004; Jones, 2002), but few studies have considered race or ethnicity as mediating variables when measuring children’s environmental orientations (Marouli, 2002). African American and Hispanic children are twice as likely as white children to live below the poverty level (U.S. Census Bureau, 2006). With few opportunities to safely access natural resources, minority children from low-income neighborhoods have little chance for positive reinforcement of ecological concepts and may be less inclined than whites to change their perspective on environmental issues (Bullard, 2006; Fisman, 2005;
In spite of this potential discrepancy, little empirical work has addressed the construction and solidification of environmental orientations in minority children (Flannery & Whiting, 2003; Kahn & Friedman, 1995). A well-designed EE program that crosses cultural borders and accounts for demographic diversity may confer unique benefits to minority children of low socioeconomic status (Gollnick & Chinn, 2002; Marouli, 2002; Wendling, Wuensch, & Christiano, 1989).

Statement of Purpose

With limited resources and budget constraints, future efforts to identify proven results and promising strategies for promoting EE will be critical (National Environmental Education Advisory Council, 2005). Research that examines the relationship between non-formal EE programming, environmental orientations, and children’s gender, age, and ethnicity will likely improve the efficacy of EE for most audiences. Therefore, the purposes of this exploratory study were to: (1) investigate baseline differences in the environmental orientations of children from different gender, age, and ethnic groups; and (2) examine the effects of a one-week EE program on the environmental orientations of children from different gender, age, and ethnic groups. A thorough understanding of children’s environmental orientations across diverse groups is necessary to devise an effective strategy for measuring and improving the quality of EE programs.

Methods

Participants

This study employed a mixed-method, quasi-experimental approach involving a purposive sample of 133 six to thirteen-year-old children in two counties surrounding Athens, Georgia. The EE treatment group consisted of children participating in six different five-day Eco-Explorer Camps sponsored by the State Botanical Garden of Georgia from June 18 through August 10 of 2007 (n = 64). Each program day lasted approximately six hours (9 a.m. to 3 p.m.) for a total of 30 instructional hours per session. The EE camps encompassed a range of costs ($0-$100 per child) and locations (Botanical Garden, Boys & Girls Club, 4-H Center, and local community centers), attracting participants across low-income urban and affluent suburban communities. The control group was comprised of 2nd, 3rd, 4th and 5th grade students enrolled in after-school programs (ASP) at two Athens-Clarke County elementary schools (n = 69). The ASP participants did not receive additional instruction or exposure to nature that might have influenced their environmental orientations immediately prior to or during participation in the study. Data from this group were collected during the first three months of school (August through October, 2007) to minimize the sampling time discrepancy. Control groups were selected from neighborhood schools near treatment group locations to reduce potential variation associated with socioeconomic factors (Bullard, 2006; Fisman, 2005).

In addition to the EE treatment, other independent variables of interest included gender (boy or girl), age (< 9 years old or > 10 years old), and race/ethnicity (African American or white). The survey population was characterized by a relatively equal gender ratio (See Table 1). Most of the survey participants were between the ages of eight and eleven (See Table 1). Age was converted into a dichotomous variable to adjust for unequal sample sizes. Ten was used as the dichotomous cutoff point because children’s expression of environmental orientations begins to differ significantly around that age (Larson, Green, & Castleberry, in press). The number of African American and white participants was approximately equal (See Table 1), and sample sites encompassed a range of socioeconomic conditions across the urban-rural gradient (U.S. Census Bureau, 2008). Each demographic
was approximately equally represented in both the treatment (50% boys, 53% age 9 or younger, 48% white) and control groups (54% boys, 51% age 9 or younger, 49% white). Although Hispanic children did not participate in the non-formal EE programs, a small number of Hispanic students enrolled in ASP took the survey as part of the control group. Because Hispanics were not included in the experimental group, these participants were omitted from the analysis.

**Environmental Education Treatment**

The EE treatment selected for this study was designed by educators at the State Botanical Garden of Georgia as part of the institution’s Garden Earth Naturalist (GEN) curriculum. The GEN program has been used in summer programs and after-school clubs and has received positive reviews from both teachers and students. The program helps children identify valuable ecological services provided by “Garden Earth” and understand the importance of these free services by studying, exploring, and enhancing natural habitats on their school sites and in surrounding communities. The GEN framework consists of eight curricular modules that address important ecological life support services. The program incorporates a variety of activities such as puppet shows, crafts, hikes, outdoor games, field trips, and animal encounters designed to teach children about ecological processes and environmental stewardship. Although the one-week timeframe did not allow for a full integration of all GEN themes and activities, the program was designed around the GEN curriculum’s guiding principles. The same instructor conducted each program session using the same materials to reduce variation associated with different teaching styles and techniques. Paid counselors and volunteers provided programming assistance. Though day-to-day activities varied slightly, each child was exposed to the same ideas and concepts throughout the course of the EE camps.

**Survey Instrument**

Children’s environmental orientations were measured using the 16-item Children’s Environmental Perceptions Scale (CEPS). Development of the scale within the context of this study is described in detail in an earlier article (Larson, Green, & Castleberry, 2009). The instrument, which is a psychometrically sound adaptation of earlier metrics (Leeming et al., 1995; Manoli et al., 2007), uses a five-point Likert-type scale (from one = strongly disagree to five = strongly agree) to measure two distinct components of children’s environmental orientations: eco-affinity and eco-awareness. Eight eco-affinity items reflected personal interest in nature and intentions to engage in pro-environmental behavior. Eight eco-awareness items reflected a cognitive grasp of environmental issues related to the general importance and sustainability of natural ecosystems. Four multiple-choice questions and one open-ended question were appended to evaluate children’s environmental knowledge and to provide a metric for comparing the cognitive and affective effects of EE on environmental orientations. One point was awarded for each correct multiple-choice answer. One-third of a point was awarded for each correct answer on the open-ended question, which asked children to list reasons plants are important to people. The fractional point value for correct answers on the open-ended question was determined by assigning the median number of correct responses (three) one full point. Overall, the 21-item version of CEPS proved to be an efficient and reliable method for accurately measuring the eco-affinity, eco-awareness and environmental knowledge of children across a demographic range (Larson et al., 2009).

All EE camp participants completed an identical pre-test and post-test at the beginning and end of a one-week camp session. Camp surveys were conducted by trained volunteers.
in small groups of six to ten individuals. If a child in the treatment group was absent for more than one day of the program, his/her post-test scores were not included in the analysis. Participants in the ASP control group completed identical surveys at the beginning and end of a one-week period without an intervention. After-school surveys were conducted in slightly larger groups (8-25 individuals) to comply with rigid time constraints. Based on previous research and potential comprehension issues, each item was read out loud twice (Musser & Malkus, 1994). Children were given ample time to respond to each item (20-30 seconds) and clarification was provided if necessary. Approximately 15 minutes was needed to complete CEPS. Precautions were taken to minimize potential disturbances associated with survey sessions, such as lunch and parent pick-ups and drop-offs. Parental consent was obtained before children were allowed to participate in the study. After listwise deletion of incomplete data and missing cases, 133 of the original 190 participants completed both the pre-test and post-test and were included in the statistical analyses.

Qualitative Data

Additional data regarding summer camp activity preferences and program-related changes in environmental attitudes and awareness were obtained through one-page evaluations and short personal interviews. The qualitative supplements were incorporated to provide a more holistic picture of children’s thoughts and ideas associated with the EE treatment (Patton, 1990; Waliczek, Logan, & Zajicek, 2003).

The program evaluation form was attached to the post-test of students in the treatment group. Semi-structured interviews of children in the treatment group (n = 64) were conducted by the principal investigator and trained volunteers at the beginning and end of the one-week summer program. Interviews lasted approximately five minutes each (minimum = 2:26, maximum = 9:54). Participants were asked eight questions designed to provide a more detailed look at individual’s interactions with nature. Children in the control groups were not interviewed because of time constraints associated with the after-school program setting.

Data Analysis

All statistical tests were conducted using SPSS Version 17.0 (SPSS, Inc., 2008). Reliability estimates of internal consistency were measured across subgroups using Cronbach’s alpha. Baseline (i.e., pre-test) eco-affinity, eco-awareness, and environmental knowledge scores among the demographic groups and distinct program sites were compared using independent samples t-tests and analysis of variance (ANOVA). Preliminary checks were conducted to ensure that the assumptions of normality and equal variances were not violated. For comparisons where the within-group homogeneity of variances assumption was violated, the Welch’s correction for unequal variances was applied and adjusted degrees of freedom are reported. The Eta-squared effect size statistic ($\eta^2$), which represents the proportion of the variability in the ranked dependent variable accounted for by the different factor levels, was calculated for each test using the following formulas: (1) for t-tests: $\eta^2 = \frac{t^2}{t^2 + df}$; and (2) for F-tests: $\eta^2 = \frac{SS_{between groups}}{SS_{total}}$.

A 2x2x2x2 factorial analysis of covariance (ANCOVA) with one covariate was used to evaluate program-mediated effects on mean post-test scores for each of the different subscales (eco-affinity, eco-awareness, and environmental knowledge). Independent variables were the EE treatment (EE program or no EE program) and the dichotomous demographic variables gender, age, and race/ethnicity. Interactions between each demographic variable and the EE treatment were also included in the model. Pre-test scores on respective subscales served as the covariate. Preliminary checks were conducted to ensure that the assumptions of reliable covariate measurement, normality, linearity,
homoscedasticity, and homogeneity of regression slopes were not violated. A statistical significance threshold of $\alpha = .05$ was set for all analyses.

Qualitative data were assessed using an inductive analysis with the constant comparative method to identify emerging patterns and classify responses into a set of ordered categories that supported emerging trends (Dey, 1993). The inclusion of these components also helped to independently validate the EE program elements and activities that were most effective and enjoyable for all participants.

Study Limitations

Causal inferences based on this research design are limited by several factors. The relatively small and purposively selected sample may not fully represent actual demographic variation in children’s environmental orientations across the general population. Random allocation of subjects to the treatment and control group was not possible because both camp and ASP enrollment was pre-determined. The sample size of 190 was also reduced because of unexpected absences at the time of data collection (e.g., early pick-up, family obligations and vacations, sick days, etc.).

Additionally, statistical comparisons of treatment and control group data may be somewhat confounded because the treatment effect could not be directly isolated. Although the EE program was standardized, site-specific variation may have influenced post-camp scores across the six camp locations. The school partnership that supported the research precluded control group data collection during the summer, and the resulting differences in sampling timeframes also could have introduced intervening factors such as external motivation, maturation, or indirect instruction that were not explicitly considered in the analysis. Fortunately, the use of ANCOVA with the pre-test covariate helped to control for some of these unknown factors.

Because many EE camp surveys were conducted by the camp director, experimenter expectancy effects were also a concern. These confounding effects are common when an instrument is administered immediately following an intervention by the same person who directed the intervention (Leeming, Dwyer, Porter, & Cobern, 1993). Children who completed post-camp surveys administered by EE camp personnel could therefore potentially select more pro-environmental responses in an effort to please their instructors. This possible bias was examined through a comparison of scores from post-test surveys administered by different people. Despite these limitations, the results of this exploratory study yielded important insight into the potential effects of a non-formal EE program on the environmental orientations of children from different backgrounds.

Results

The reliability of the aggregated 16-item CEPS was high on both the pre-test (Cronbach’s alpha = 0.843) and post-test (Cronbach’s alpha = 0.862) and within the distinct eco-affinity (pre-test Cronbach’s alpha = 0.865, post-test Cronbach’s alpha = 0.876) and eco-awareness (pre-test Cronbach’s alpha = 0.739, post-test Cronbach’s alpha = 0.742) constructs. The internal consistency of program-specific environmental knowledge items, which were added to CEPS to provide a more cognitive metric, were relatively low on the pre-test (Cronbach’s alpha = 0.442) and post-test (Cronbach’s alpha = 0.325). The construct validity of CEPS in the context of this study has already been examined and verified by previously published research (Larson et al., 2009).
Baseline Environmental Orientations

Skewness (< |-1.25|) and kurtosis (< |1.10|) statistics for the data distribution on the pre-test and post-test subscales indicated that scores were approximately normally distributed. Because non-homogenous within-group variances were evident in several cases, Welch’s correction was applied to the corresponding mean comparison tests. Pre-test means and standard deviations for CEPS scores on each subscale are presented in Table 1. Prior to the EE treatment, t-tests revealed no significant gender differences in scores across subscales. Eco-affinity \[ t(113.7) = 1.11, p = 0.269 \], eco-awareness \[ t(131) = -0.13, p = 0.898 \], and environmental knowledge \[ t(131) = 1.23, p = 0.196 \] scores were approximately equal for boys and girls (See Figure 1).

Figure 1. Combined mean baseline eco-affinity, eco-awareness, and environmental knowledge scores with 95% CI for boys (n = 64) and girls (n = 69) in the treatment and control groups. Differences between subscale means were not statistically significant.

Children in distinct age groups exhibited significant pre-treatment differences in eco-affinity \[ t(115.5) = 3.59, p < 0.001, \eta^2 = 0.10 \] prior to the EE treatment. In general, eco-affinity was lower in older children (See Figure 2). Significant differences among age groups were not observed in eco-awareness scores \[ t(131) = -0.63, p = 0.528 \]. Although statistically significant differences in environmental knowledge between the different age groups did not exist \[ t(125.2) = -1.73, p = 0.082, \eta^2 = 0.02 \], the mean knowledge score of older children was higher than the mean knowledge score of younger children (See Figure 2).
Race/ethnicity appeared to have a significant effect on eco-awareness \( [t(116.1) = 5.11, p < 0.001, \eta^2 = 0.18] \) and environmental knowledge \( [t(131) = 6.69, p < 0.001, \eta^2 = 0.25] \) scores. The eco-awareness of white children was significantly higher than African American children (See Figure 3). Environmental content knowledge score ranks also were higher for white children than African American children (See Figure 3). Significant differences between African American and white children were not observed in eco-affinity scores \( [t(131) = 0.18, p = 0.861] \).

An ANOVA did not reveal significant differences in pre-test eco-affinity scores among the different EE camp sites \( [F(5,58) = 0.91, p = 0.345] \). However, baseline eco-awareness \( [F(5,58) = 3.18, p = 0.013] \) and environmental knowledge \( [F(5,58) = 7.19, p < 0.001] \) scores did vary across EE program locations. Because most of these differences appeared to be an artifact of the ethnic composition of program attendees (some camps were exclusively white or African American) and not other unknown factors, all EE program sites were combined into a single treatment group.

**Environmental Education Program Effects**

The assumptions of ANCOVA were tested before EE program effects and potential interactions between the treatment and demographic variables could be assessed. The use...
of ANCOVA with intact, nonrandomized groups can interfere with statistical inferences (Pallant, 2007; Tabachnick & Fidell, 2001), but a t-test comparing treatment and control groups confirmed that pre-test scores on the eco-affinity \( t(127.6) = 1.89, p = 0.061 \), eco-awareness \( t(131) = 0.13, p = 0.898 \), and content knowledge \( t(131) = 1.10, p = 0.272 \) subscales were approximately equal and independent of assigned treatments prior to the intervention (See Table 1). Although post-test score distributions for different gender and ethnic groups displayed unequal variances, ANCOVA is reasonably robust to violations of this assumption when group size is sufficiently large and approximately equal (Pallant, 2007). The within-group relationship between the pre-test and the post-test scores was linear for each level of the independent factors \( R^2 > 0.446 \). Analyses of the homogeneity-of-slopes assumption revealed that the relationship between the covariate and the dependent variable did not differ significantly as a function of the independent variables for eco-affinity \( F(15,112) = 0.87, p = 0.598 \), eco-awareness \( F(15,112) = 0.65, p = 0.831 \), or environmental knowledge \( F(15,112) = 0.67, p = 0.811 \). An examination of the normal probability plot and scatterplot of the standardized residuals showed the data also satisfied the requirements of linearity, normality and homoscedasticity. The case to variable ratio of 26.6 was above the 20-to-1 ratio recommended for most regression procedures (Tabachnick). A post hoc power analysis using G*Power (G*Power, 2008) showed that, given the inputs (moderate effect size of \( \eta^2 = 0.05 \) or \( f = 0.23 \), \( \alpha = 0.05 \), \( N = 133 \), numerator \( df = 1 \), denominator \( df = 124 \)), the ANCOVA would likely detect existing treatment effects (power = 0.75).
Adjusted post-test means and standard errors for scores (controlling for individual pre-test scores) on each construct are presented in Table 2. Controlling for demographic variables, ANCOVA revealed a significant treatment effect on the mean adjusted post-test scores for eco-affinity \[F(1,124) = 6.44, p = 0.012, \eta^2 = 0.05\], and environmental knowledge \[F(1,124) = 27.11, p < 0.001, \eta^2 = 0.18\](See Table 3 for a sample output). Despite an overall score increase, the EE treatment did not have a statistically significant effect on eco-awareness \[F(1,124) = 0.95, p = 0.331, \eta^2 = 0.01\]. Comparison of adjusted mean difference scores between the treatment and control groups showed the EE program had the strongest effect on environmental knowledge (See Figure 4). Statistically significant interactions between the EE treatment and gender, age, or ethnicity were not evident on any subscale. However, African American children displayed a slightly larger gap between treatment and control group adjusted post-test environmental knowledge scores (treatment group scored 1.15 points higher than control) than white children (treatment group scored 0.71 points higher than control).

### Qualitative Data

Interview data revealed several interesting patterns with respect to ethnicity and children’s environmental orientations. About half of African American children indicated that they talked to their parents about nature compared with 74% of white children. Two out of every three children who claimed to spend a majority of outdoor time in their own private backyard were white. The children who said they went somewhere to play outside, such as a friend’s or relative’s house, were predominantly African American (83%).

<table>
<thead>
<tr>
<th>Variable</th>
<th>N</th>
<th>M</th>
<th>SD</th>
<th>M</th>
<th>SD</th>
<th>M</th>
<th>SD</th>
</tr>
</thead>
<tbody>
<tr>
<td>Eco-Affinity</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Gender</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Boy</td>
<td>64</td>
<td>3.91</td>
<td>0.908</td>
<td>4.25</td>
<td>0.619</td>
<td>3.29</td>
<td>1.510</td>
</tr>
<tr>
<td>Girl</td>
<td>69</td>
<td>4.06</td>
<td>0.653</td>
<td>4.24</td>
<td>0.659</td>
<td>3.63</td>
<td>1.476</td>
</tr>
<tr>
<td>Age</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>≤9 years old</td>
<td>69</td>
<td>4.22</td>
<td>0.636</td>
<td>4.21</td>
<td>0.620</td>
<td>3.25</td>
<td>1.676</td>
</tr>
<tr>
<td>≥10 years old</td>
<td>64</td>
<td>3.74</td>
<td>0.861</td>
<td>4.28</td>
<td>0.660</td>
<td>3.70</td>
<td>1.247</td>
</tr>
<tr>
<td>Ethnicity</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>White</td>
<td>65</td>
<td>4.00</td>
<td>0.698</td>
<td>4.51</td>
<td>0.452</td>
<td>4.24</td>
<td>1.341</td>
</tr>
<tr>
<td>African American</td>
<td>68</td>
<td>3.98</td>
<td>0.868</td>
<td>4.00</td>
<td>0.690</td>
<td>2.73</td>
<td>1.253</td>
</tr>
<tr>
<td>Treatment</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>EE program</td>
<td>64</td>
<td>4.12</td>
<td>0.677</td>
<td>4.25</td>
<td>0.630</td>
<td>3.61</td>
<td>1.532</td>
</tr>
<tr>
<td>Control</td>
<td>69</td>
<td>3.87</td>
<td>0.863</td>
<td>4.24</td>
<td>0.650</td>
<td>3.33</td>
<td>1.460</td>
</tr>
<tr>
<td>Total</td>
<td>133</td>
<td>3.99</td>
<td>0.786</td>
<td>4.25</td>
<td>0.638</td>
<td>3.47</td>
<td>1.496</td>
</tr>
</tbody>
</table>

Table 1. Children’s Mean Baseline Eco-affinity, Eco-awareness, and Environmental Knowledge Scores (with Standard Deviations) for each Dichotomous Independent Variable (N = 133).
children were more likely to engage in solitary nature-based activities (58%) than African Americans (21%), who preferred a social outdoor experience. One ten year-old African American boy summed up his exposure to nature with the following statement:

“I don’t go outside at my house because it’s like a bad, you know, environment to go out in. So my mom takes me to the park and we go play basketball, go on the swings, slide down the slide, and sometimes we walk.”

Many of the white children clearly had a different perspective. “I go in my backyard woods,” one 10-year-old girl said. “I have trails back there. It goes back to this field thingy. I have lots of places to explore.” An 11-year-old boy was in a similar situation:

---

Table 2. Children’s Adjusted Mean Post-test Scores (with Standard Errors) on the Eco-affinity, Eco-awareness, and Environmental Knowledge Subscales for the Treatment (n = 64) and Control (n = 69) Groups After Controlling for the Covariate Pre-test.

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>EE Treatment</td>
<td>64</td>
<td>4.16</td>
<td>0.063</td>
<td>4.40</td>
<td>0.043</td>
<td>4.66</td>
<td>0.128</td>
</tr>
<tr>
<td>No EE Treatment</td>
<td>69</td>
<td>3.93</td>
<td>0.061</td>
<td>4.38</td>
<td>0.041</td>
<td>3.73</td>
<td>0.123</td>
</tr>
</tbody>
</table>

Table 3. Factorial ANCOVA Examining Main Effects and Interactions of EE Treatment (TREAT) and Demographic Variables on Children’s Eco-Affinity Scores After Controlling for the Covariate (PRETEST) (N=133).

<table>
<thead>
<tr>
<th>Source</th>
<th>df</th>
<th>Type III SS</th>
<th>F</th>
<th>p</th>
<th>η²</th>
</tr>
</thead>
<tbody>
<tr>
<td>Intercept</td>
<td>1</td>
<td>5.54</td>
<td>22.22</td>
<td>0.000</td>
<td></td>
</tr>
<tr>
<td>TREAT</td>
<td>1</td>
<td>1.60</td>
<td>6.44</td>
<td>0.012</td>
<td>0.049</td>
</tr>
<tr>
<td>Gender</td>
<td>1</td>
<td>0.09</td>
<td>0.37</td>
<td>0.545</td>
<td></td>
</tr>
<tr>
<td>Age</td>
<td>1</td>
<td>0.06</td>
<td>0.23</td>
<td>0.634</td>
<td></td>
</tr>
<tr>
<td>Ethnicity</td>
<td>1</td>
<td>0.07</td>
<td>0.27</td>
<td>0.606</td>
<td></td>
</tr>
<tr>
<td>TREAT*Gender</td>
<td>1</td>
<td>0.01</td>
<td>0.02</td>
<td>0.880</td>
<td></td>
</tr>
<tr>
<td>TREAT*Age</td>
<td>1</td>
<td>0.30</td>
<td>1.21</td>
<td>0.273</td>
<td></td>
</tr>
<tr>
<td>TREAT*Ethnicity</td>
<td>1</td>
<td>0.01</td>
<td>0.04</td>
<td>0.850</td>
<td></td>
</tr>
<tr>
<td>PRETEST</td>
<td>1</td>
<td>37.62</td>
<td>150.99</td>
<td>0.000</td>
<td>0.549</td>
</tr>
<tr>
<td>Error</td>
<td>124</td>
<td>30.89</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
“I like to invite people over and go down in the woods and work on a fort that we have. It’s actually bigger than this room. It has a treehouse, tunnel, fireplace, and seats. We haven’t finished it yet. There are spiders and leaves in there. We’re going to add another layer to the treehouse and we’ll probably add a zipline.”

The quotes highlight some major differences in the outdoor experiences of children prior to the EE program. Following the EE treatment, children expressed an overwhelming preference for activities that involved at least some degree of activity. A majority of the children who attended the EE camp said they would definitely return (79%). When asked “Why would you like to go this program again?,” most responses involved some variation of “having fun” (73%). Both white and African-American children claimed the EE program changed the way they felt about nature to some degree (78%). A seven-year-old white boy admitted, “At first I don’t often go outside. Now I want to go out there, because it is more fun than I thought it would be.” A 10-year-old black boy echoed those sentiments, stating, “At first I wasn’t really interested in nature, but when I started coming to Eco-Camp, I started liking nature a lot more than I used too.”

Figure 4. EE treatment (n = 64) effects relative to control group (n = 69) for eco-affinity, eco-awareness, and environmental knowledge subscales depicted as adjusted mean post-test difference scores with 95% CI. Differences between the treatment and control groups are significant where confidence intervals do not include zero (eco-affinity and environmental knowledge).
Discussion and Implications

The use of standardized, age-appropriate, psychometrically sound scales for accurately measuring children’s environmental orientations will be a critical component of future EE research efforts (Leeming et al., 2005, Manoli et al., 2007, Larson et al., 2009). This exploratory study used one such instrument, the Children’s Environmental Perceptions Scale, to investigate baseline differences in the environmental orientations of children from diverse gender, age, and ethnic groups and examine the effects of a non-formal EE summer program on eco-affinity, eco-awareness, and environmental knowledge. Although the internal consistency and validity of the eco-affinity and eco-awareness scales were adequate and comparable to previous studies (Larson), the reliability of the environmental knowledge items was low. The environmental knowledge items were also program-specific, limiting applications on a broader scale. However, the five knowledge items that accompanied CEPS in this study provided a useful cognitive supplement to the affective measures of affinity and awareness.

Survey results did not appear to be confounded by experimenter expectancy effects. Although more children responded to all of the 21 items in the instructor-administered surveys (94.7%) than those administered by the trained volunteers (78.9%), Cronbach’s alpha coefficients for the instructor-administered surveys (alpha = 0.858, n = 25) and the volunteer-administered surveys (alpha = 0.764, n = 39) were similar. Post-test scores on survey administered by the camp director were equal to or lower than post-test scores on surveys administered by trained volunteers across all subscales. Pre-test scores for children participating in the EE programs were slightly higher across all subscales, but these initial score differences were not statistically significantly different. The potential eco-friendly predisposition of children in the EE programs did not appear to have a major impact on this study. However, site-specific differences in pre-test eco-awareness and environmental knowledge scores represent a potential source of confounding variation and program setting characteristics that influence these aspects of environmental orientations should be explicitly considered in future research.

Contrary to research has revealed distinct views of wildlife and nature among boys and girls (Flannery & Whiting, 2003), this study did not reveal a significant relationship between gender and environmental orientations. Results supported other studies that question the presumed impact of gender on environmental orientations and pro-environmental behaviors (Hines et al., 1986; Schultz et al., 1995). Environmental knowledge was generally higher in the older age group, but the cognitive gains in older children were not associated with increased levels of eco-affinity or eco-awareness. Although these results appear to contradict previous observations of heightened environmental concern in older children (Eagles & Demare, 1999; Kellert, 2002), high levels of specific indicators related to eco-affinity have been documented in younger age groups (Leeming et al., 1995). Increased affinity for nature among young children may be a residual effect of “biophilia,” an inherent passion for the natural world that all humans possess at an early age (Kellert & Wilson, 1993). However, lacking positive reinforcement, this innate eco-affinity may diminish as time progresses.

Results suggest that significant declines in eco-affinity emerged between the ages of nine and ten. Multiple factors likely contribute to this diminishing eco-affinity. Older children often have fewer opportunities to interact with nature as their daily schedules become packed with school and family-related activities. Children approaching adolescence might be more inclined to participate in social activities, interacting with peers instead of interacting directly with nature. The distinction between interaction with nature and interaction within nature can have a significant impact on environmental orientations.
(Vadala, Bixler, & James, 2007). The observed attitudinal shift could also be related to a growing emphasis on standardized testing and prioritization of core subjects in the formal education sector. The North American Association for Environmental Education and the Environmental Literacy Council stated that although 61% of public school teachers claim to include environmental topics in their curricula, most devote fewer than 50 hours to it throughout the course of an entire year (Coyle, 2005). Without opportunities to learn about environmental issues and engage in direct experiences with nature, a child’s eco-affinity may be less likely to persist as he/she gets older. Investigation of links between eco-affinity and environmental literacy also may help educators develop strategies to mitigate the declining interest in the natural world that is characteristic of many older children. Research that tracks eco-affinity and similar measures as children transition from upper elementary to middle school might illuminate strategies for preserving pro-environmental orientations.

Ethnicity also seemed to play a role in the development of certain environmental orientations. Eco-affinity levels in this study were almost identical for both African American and white children—a result consistent with recent research regarding race and concern for the environment (Jones & Rainey, 2006; Kahn, 1999). However, significant differences were observed in the baseline eco-awareness and environmental knowledge scores of white and minority students. Although African Americans were passionate about nature, they were less aware of ecological issues and specific nature facts than white children. Interview responses suggested that the persistence of an awareness/knowledge gap, similar to the black-white achievement gap in natural science education (Norman, Ault, Bentz, & Meskimen, 2001), may be largely due to societal disparities affecting the way children from different ethnic and socioeconomic backgrounds are exposed to nature. In this study, both the treatment and control groups featured sharp within-group ethnic and socioeconomic contrasts. Most of the white participants attended either an EE camp with a substantial weekly cost or a high-performing local school, and most of the minority participants attended either an EE camp with little to no weekly cost or a low-performing local school. Whether or not observed differences were caused by race, ethnicity, SES, or an interaction of the three remained unclear, but there appeared to be a relationship between direct contact with nature, free play, and eco-awareness. Thus, an absence of free exploration opportunities and authentic natural experiences in poor areas should be a major concern, and could be a reason for lower eco-awareness and content knowledge scores associated with minority students and children of lower SES in the Athens, GA, area (Chawla, 2006; Louv, 2005). Links between environmental orientations, race/ethnicity, and socioeconomic variables warrant further investigation.

Children in the treatment group displayed higher adjusted mean post-test scores than children in the control group across all subscales. The EE program appeared to be a particularly valuable tool for promoting eco-affinity and environmental knowledge across all demographic groups. The effects of EE on knowledge and ecological awareness are well documented (American Institutes for Research, 2005; Bogner, 1998; Laing, 2004;), but few studies have reported significant changes in environmental attitudes following an EE treatment (Dimopoulos, Paraskevopoulos, & Pantis, 2008; Keen, 1991; Shepard & Speelman, 1985). Attitude and value changes often mediate pro-environmental behaviors and represent an important facet of effective EE programming. Therefore, the EE camp’s influence on eco-affinity revealed by this study was especially encouraging. A short intervention, such as a one-week EE program, could help 10 to 13-year-olds rekindle and even build upon a previous pro-environmental orientation. Although the immediate positive influence of education on the environmental attitudes of diverse children is promising long-
lasting effects of the EE treatment could not be measured because the study was limited to a one-week period. A delayed post, longitudinal-type study would provide insight into the long-term effects of EE on children’s eco-affinity, eco-awareness, and environmental knowledge.

The significant effect of the EE treatment on children’s eco-affinity was likely tied to the nature of the summer camp activities. Though the day-to-day programming featured a mix of activities ranging from inactive (sedentary observation games, writing, arts and crafts, etc.) to very active (ecosystem tag games, relay races, etc.), the children showed an overwhelming preference for activities that involved at least some degree of physical activity. Learning interesting facts about plants and animals may have been an added bonus, but most children who participated in the summer EE program remembered one thing about their experience—it was fun! A heavy emphasis on information content and cognitive gains may overshadow more exciting aspects of EE that have a stronger influence on environmental attitudes. A major value of effective EE may lie in entertaining and exciting programming, a delivery style that is not always applicable in a formal school setting. Out-of-school experiences can catalyze an interest in nature and have a profound impact on affective development (Uitto et al., 2006). Thus, non-formal EE programs may play an important role in the movement to create and evaluate EE curricula that help children reconnect with nature. Parks and recreation professionals could capitalize on non-formal programming opportunities that augment positive outdoor experiences as children approach adolescence. Comparative studies examining the effects of formal and informal approaches to EE on children’s environmental orientations would help to direct EE efforts and refine these implementation strategies.

The benefits of the EE treatment enjoyed by African American children reinforces other studies refuting the basic assumption that environmentalism is a strictly white phenomenon (Johnson et al., 2004; Whittaker et al., 2005). Even without exposure to EE, African American and white children display comparable levels of eco-affinity. Given a forum to interact with nature, such as an EE summer camp, African American children may be able to improve eco-awareness and environmental knowledge as well. Results present hope for EE outreach programs in underserved communities. Future research that focuses on the environmental attitudes and awareness of Hispanic children would help educators redesign and reevaluate EE programs to benefit minority students from other backgrounds, bridging existing eco-awareness and content knowledge gaps to create a more environmentally-literate society.

References


