Environmental Education & Children’s Environmental Orientations: Evaluating Program Effects by Gender, Age & Ethnicity

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Lincoln R. Larson
Gary T. Green
Steven B. Castleberry
University of Georgia
The Problem

- *Last Child in the Woods*
  - Nature-deficit Disorder
- No Child Left Inside Act
- Growing emphasis on EE…
  - Is it working?
  - How do we know?
Children’s Environmental Orientations

- Gender effect?
  - Boys know more? Girls care more?

- Age effect?
  - From anthropocentric to ecocentric?

- Ethnicity effect?
  - Interest/concern differ by race/ethnicity?
Objectives

1. Compare environmental orientations of children across gender, age & ethnic groups

2. Evaluate the effect of an EE program on children’s environmental orientations
Methods

- Quasi-experimental:
  - EE Treatment Group (Summer Camps)
  - Control Group (After-school Programs)

- Pre-test, post-test design:
  - Environmental orientations assessed using CEPS (Children’s Environmental Perceptions Scale)
CEPS (Children’s Environmental Perceptions Scale)

- Instrument reliable & valid across diverse audiences
- 3 Major Components:
  - Eco-Affinity
  - Eco-Awareness
  - Environmental Knowledge

<table>
<thead>
<tr>
<th>1. I like to learn about plants and animals.</th>
<th>Strongly Disagree</th>
<th>Disagree</th>
<th>Not Sure</th>
<th>Agree</th>
<th>Strongly Agree</th>
</tr>
</thead>
<tbody>
<tr>
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<td>🔵🔵</td>
</tr>
</tbody>
</table>
Participants (N = 190)

- Age:
  - 6 or 7: 8%
  - 8 or 9: 39%
  - 10 or 11: 48%
  - 12 or 13: 5%

- Ethnicity:
  - 51% African-American
  - 46% White
  - 3% Hispanic

- Gender:
  - 52.6% male
  - 47.4% female

Note: 147 children completed all items on the pre-test & post-test.
1. Compare environmental orientations of children across gender, age & ethnic groups.

**Statistical Analysis:**

- Mann-Whitney $U$ Test
- Kruskal-Wallis Test
**Gender Effect:** Mann-Whitney U test

<table>
<thead>
<tr>
<th>Scale</th>
<th>n</th>
<th>Z</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td>Eco-Affinity</td>
<td>180</td>
<td>-0.75</td>
<td>0.453</td>
</tr>
<tr>
<td>Eco-Awareness</td>
<td>182</td>
<td>0.00</td>
<td>1.000</td>
</tr>
<tr>
<td>Environmental Knowledge</td>
<td>185</td>
<td>-1.34</td>
<td>0.181</td>
</tr>
</tbody>
</table>

Environmental Orientations (± 95% CI) by Gender
**Age Effect:** Kruskal-Wallis Test

<table>
<thead>
<tr>
<th>Scale</th>
<th>n</th>
<th>$\chi^2$</th>
<th>p</th>
<th>$\eta^2$</th>
</tr>
</thead>
<tbody>
<tr>
<td>Eco-Affinity</td>
<td>180</td>
<td>24.67</td>
<td>&lt; 0.001</td>
<td>0.14</td>
</tr>
<tr>
<td>Eco-Awareness</td>
<td>182</td>
<td>1.94</td>
<td>0.586</td>
<td>0.01</td>
</tr>
<tr>
<td>Environmental Knowledge</td>
<td>185</td>
<td>11.24</td>
<td>0.010</td>
<td>0.06</td>
</tr>
</tbody>
</table>

The table above shows the results of the Kruskal-Wallis Test for different scales by age group. The test was conducted to determine if there are significant differences in baseline mean eco-affinity scores across different age groups.

The graph below illustrates the baseline mean eco-affinity scores by age group, along with 95% confidence intervals (CI). The scores decrease as age increases, indicating a significant age effect on eco-affinity.
Ethnicity Effect: Kruskal-Wallis Test

<table>
<thead>
<tr>
<th>Scale</th>
<th>n</th>
<th>$\chi^2$</th>
<th>p</th>
<th>$\eta^2$</th>
</tr>
</thead>
<tbody>
<tr>
<td>Eco-Affinity</td>
<td>180</td>
<td>1.14</td>
<td>0.566</td>
<td>0.01</td>
</tr>
<tr>
<td>Eco-Awareness</td>
<td>182</td>
<td>16.88</td>
<td>&lt; 0.001</td>
<td>0.09</td>
</tr>
<tr>
<td>Environmental Knowledge</td>
<td>185</td>
<td>43.22</td>
<td>&lt; 0.001</td>
<td>0.24</td>
</tr>
</tbody>
</table>

Eco-Awareness (± 95% CI) by Ethnicity

Environmental Knowledge (± 95% CI) by Ethnicity
Baseline Environmental Orientations: Conclusions

- No evidence of gender differences
- Eco-affinity lower in older children than younger children
- Eco-awareness/content knowledge lower in African-American children than white children
2. Evaluate the effect of an EE program on children’s environmental orientations.

Statistical Analysis:
- ANCOVA
EE Treatment

- 5 day Eco-Camp (9 am to 3 pm)
- Based on State Botanical Garden’s Garden Earth Naturalist (GEN) Curriculum
- **Activities:** hikes, games, animal encounters, field trips, crafts, puppet shows
## Main Effects: ANCOVA

<table>
<thead>
<tr>
<th>Scale</th>
<th>$\text{df}_{\text{num}}$</th>
<th>$\text{df}_{\text{den}}$</th>
<th>$F$</th>
<th>$p$</th>
<th>$\eta^2$</th>
</tr>
</thead>
<tbody>
<tr>
<td>Eco-Affinity</td>
<td>1</td>
<td>126</td>
<td>7.20</td>
<td>0.008</td>
<td>0.03</td>
</tr>
<tr>
<td>Eco-Awareness</td>
<td>1</td>
<td>130</td>
<td>0.63</td>
<td>0.037</td>
<td>0.02</td>
</tr>
<tr>
<td>Environmental Knowledge</td>
<td>1</td>
<td>134</td>
<td>10.92</td>
<td>0.001</td>
<td>0.05</td>
</tr>
</tbody>
</table>

**Adjusted Mean Difference Scores (± 95% CI) for Each Scale**

- Eco-Affinity: -0.5 ± 0.0
- Eco-Awareness: 0.0 ± 0.0
- Environmental Knowledge: 0.5 ± 0.0

**Dependent variable:** adjusted mean post-test score

**Independent variable:** treatment or control

**Covariate:** mean pre-test score
Interactions: ANCOVA

- **Treatment * Age**
  - Eco-Affinity:
    - $F(3, 126) = 1.47$, $p = 0.226$, $\eta^2 = 0.02$
    - Adjusted Mean Differences: 6 & 7 year-olds = 0.30, 8 & 9 year-olds = 0.08, 10 & 11 year-olds = 0.25, 12 & 13 year-olds = 1.29

- **Treatment * Gender**
  - Eco-Awareness:
    - $F(1, 130) = 2.09$, $p = 0.151$, $\eta^2 = 0.01$
    - Adjusted Mean Differences: Boys = 0.37, Girls = 0.18

- **Treatment * Ethnicity**
  - Environmental Knowledge:
    - $F(1, 134) = 1.18$, $p = 0.280$, $\eta^2 = 0.01$
    - Adjusted Mean Differences: African-Americans = 1.35, Whites = 0.98
Conclusions

- EE program had positive effect on eco-affinity, eco-awareness, & environmental knowledge
- Interactions (EE*demographic variables) warrant further investigation
Implications

- Evaluate non-formal EE programs to:
  - Address age-related decline in eco-affinity
  - Confront eco-awareness & environmental knowledge gaps in minority populations
  - Identify specific program elements that are most effective

- Extend analysis to formal EE curricula
Special Thanks To...

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Oconee County 4-H

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