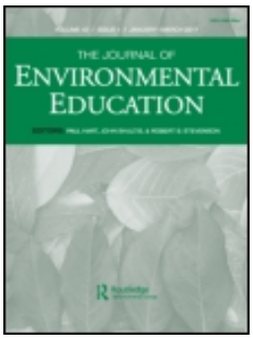

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# Effects of Pre- and Posttrip Activities Associated With a Residential Environmental Education Experience on Students' Attitudes Toward the Environment

*N. J. Smith-Sebasto and Lisa Cavern*

**ABSTRACT** : The authors measured the impact of adding pre- and posttrip in-class activities to the residential environmental education program at the New Jersey School of Conservation (NJSOC). Seventh-grade students ($N$ = 169) from a suburban, northern New Jersey school district participated in a 3-day, 2-night experience. The Environmental Adaptation, Environmental Trust, and Pastoralism subscales of the Children's Environmental Response Inventory developed by Bunting and Cousins (1983, 1985) were used to assess the impact of the NJSOC program and the supplemental activities on students' attitudes toward the environment. Statistically significant results were found only for students who received both the pre- and posttrip activity and only for the Environmental Adaptation subscale.

**KEY WORDS**: attitudes, children, evaluation, residential environmental education, pre/post activities

Environmental education (EE) researchers have suggested programs might increase in effectiveness if in-class activities were combined with field experiences (Bogner, 1998; Dettmann-Easler & Pease, 1999). In our review of published EE literature using the ERIC database for the years 1967–present, we found only two studies focusing on the effectiveness of using preparatory or follow-up activities in connection with a field learning experience. Gutierrez de White and Jacobson (1994) studied the effectiveness of a teacher training workshop in preparation for a zoo-based program. Farmer and Wott (1995) measured the effectiveness of a follow-up session related to an arboretum program. We found no reports in which the researchers investigated the use of in-class

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activities to reinforce learning related to a residential EE experience. Our study was designed to measure the effectiveness of in-class pre- and posttrip activities related to a residential EE program in improving students' attitudes toward the environment.

## Background

During the past 40 years, the EE research literature has grown as educators have sought the most effective methods for providing EE. Published studies vary in their findings of the effects of various EE interventions, but most researchers found some positive impact on participating students (Dresner & Gill, 1994; Gillett, Thomas, Skok, & McLaughlin, 1991; Jaus, 1982; Shepard & Speelman, 1985/86). Dettmann-Easler and Pease (1999) found that residential EE programs have stronger, more lasting effects on students than classroom-only instruction. Research also indicates that EE is most effective when it is provided as an integrated long-term curriculum (Ballantyne & Packer, 1996; Dettmann-Easler & Pease; Eagles & Demare, 1999). Evaluation of EE program types is essential to helping teachers and school administrators make informed decisions about how best to use their limited resources of time and funds to provide EE to students (Dettmann-Easler & Pease). Evaluation of individual EE programs is vital to learning what benefits are derived from the use of resources and strategies in these programs, but this evaluative process is often overlooked (Fien, Scott, & Tilbury, 2001).

Bogner (1998) concluded that EE programs should provide "a combination of first-hand experience, participatory interaction, adequate preparation and subsequent reinforcement" (p. 28). Dettmann-Easler and Pease (1999) suggested that to increase the impact of the residential EE experience, centers should supply pre- and postvisit classroom activities to reinforce concepts and to integrate their curricula into schools' education programs.

The New Jersey School of Conservation (NJSOC) is the EE field campus of Montclair State University. The 96-hectare campus is surrounded by the 6,400-hectare Stokes State Forest in Sussex County, New Jersey. Annually, nearly 9,000 students and 1,000 teachers from almost 100 schools participate in the residential EE program. The sessions offered include topics in the environmental sciences, humanities, outdoor pursuits, and social sciences. The mission of the NJSOC is

> "to develop in its program participants' knowledge of how Earth systems operate and how human actions affect these systems. It is intended that this knowledge will cultivate the prolonged performance of environmentally responsible behaviors and the development of self-confidence to support the development of attitudes, beliefs, and values that will aid individuals and groups alike in the resolution of current environmental problems, the avoidance of future environmental problems, and the quest for sustainable development." (http://csam.montclair.edu/njsoc.html)

## Research Questions

This study focused on four research questions:

1. What effect does participation in the residential EE program at the NJSOC have on students' attitudes toward the environment?
2. What effect, if any, does adding a pretrip activity have on the ability of the NJSOC program to improve students' attitudes toward the environment?

3. What effect, if any, does adding a posttrip activity have on the ability of the NJSOC program to improve students' attitudes toward the environment?
4. What effect, if any, does adding a pretrip and a posttrip activity have on the ability of the NJSOC program to improve students' attitudes toward the environment?

## Method

### Participants

Students who were scheduled to attend the NJSOC in the 2004–2005 academic year were the population for this study. They attended 69 (84%) public and 13 (16%) private schools, and were from 11 (13%) urban, 70 (86%) suburban, and 1 (1%) rural areas. They were 92 (1%) 4th graders, 1,449 (17%) 5th graders, 2,755 (34%) 6th graders, 1,697 (21%) 7th graders, 736 (9%) 8th graders, and 78 (1%) 9th–12th graders.

It was not feasible to select students randomly for participation in the NJSOC program, so we used an intact school group as the convenience sample. Participants for this study were the seventh grade classes at a suburban middle school in northwestern New Jersey (referred to in this article as NJMS) during the 2004–2005 academic year. In October of each year, all seventh graders at NJMS attend the NJSOC for 3 days and 2 nights.

The treatment groups were intact seventh grade classes during the autumn 2004 semester. Students at NJMS are not randomly assigned to classes, but they are assigned to one of three academic color groups: gold, white, or blue. Students in the color groups are assigned to four subgroups based on their academic classes (math, science, English, and social studies). Each color group is, therefore, comprised of students in four subgroups. Because of occupancy limitations at the NJSOC, each of the three-color groups attended at separate times. Students in the subgroups were randomly assigned to a level of the treatment.

Of the 277 NJMS students who attended the NJSOC, five were excluded from this study because of lack of signed consent forms. We excluded the responses of 32 students because they did not complete both the pre- and posttest, and excluded the responses of 71 more students who either left items blank or gave two responses for the same item. Thus, the responses from 169 students comprised the data sample.

Approval to conduct this research was provided by the Institutional Review Board (IRB) at Montclair State University. Students and their parents were informed of the study and signed an informed consent letter approved by the IRB. Because the potential for a difference in richness of the NJSOC experience did exist and the control group received only the NJSOC experience while the treatment groups received additional, related experiences, the teachers at NJMS were offered training on the pre- and posttrip activities so they could conduct them after the data collection for the study ended.

### Treatment

We designed pre- and posttrip activities to complement the experiences offered at the NJSOC by encouraging students to consider their role in the environment. We adapted these activities from those developed by Cohen (1995) who designed activities that would help participants consider their relationship with nature and encourage them to enhance their connectedness with it. The modified activities were designed to take no more than 45 min, which allowed them to be conducted within one regular class period. They were piloted during the spring 2004 semester with four classes of seventh grade students at NJMS. The pilot included conducting the activity with students and then col-

lecting their feedback. Piloting of the activities allowed an opportunity for adjustments prior to using the activities with the treatment groups.

The activity used for the pretrip activity was modified from Cohen's Activity 8: Separation from Nature. In this activity, we asked students to consider how their preset expectations might affect their understanding of situations. We selected this activity because it is designed to activate students' prior knowledge and expectations of spending time in the outdoors in nonhuman-dominated areas. The activity used for the posttrip activity was based on Cohen's Activity 6: Learning from Sensory Nature Connecting. In this activity, students considered their experiences and learning at the NJSOC and expressed how it has changed their beliefs and feelings about the environment. We selected this activity because it encourages metacognition and reflection on the students' experiences and feelings related to the environment.

Each color group consisted of four levels of the treatment: (a) participation in the NJSOC program with no additional activities; (b) pretrip activity one school day before participation in the NJSOC program; (c) participation in the NJSOC program and posttrip activity on the first school day after the trip; and (d) pretrip activity one day before participation in the NJSOC program plus posttrip activity on the first school day after the trip (see Table 1).

All students participated in seven sessions, including Action Socialization Experiences (ASEs); Sensory Awareness in Nature; Eco-Discovery; Web of Life; Climbing Wall or Confidence Course; one natural science session (Black Bear Ecology, Ornithology, or Stream Geo-Ecology); and one additional session (Archery, Art in Nature, Early American Woodworking, Orienteering, Stonewall Study, or Survival). Detailed descriptions of these sessions are available at the NJSOC Web site, found at http://www.csam.montclair.edu/njsoc/sessiondescriptions.htm.

### Instrument

There are several measures of childrens' attitudes toward the environment (Bunting & Cousins, 1985; Leeming, Dwyer, & Bracken, 1995; Millward, 1973; Musser & Malkus, 1994). We chose the Childrens' Environmental Response Inventory (CERI) for the following reasons: (a) it is age-appropriate for students in this study; (b) it has established reliability and validity of the data for the subscales as reported by Bunting and Cousins (1983, 1985) and confirmed by Salmivalli (1998); and (c) it includes subscales that specifically target the attitude components that may be influenced by the NJSOC program. We used three CERI subscales: Environmental Adaptation, Environmental Trust, and Pastoralism. We selected these over the others to most closely match the study design and the

**TABLE 1. Treatment Group Interventions**

| Treatment group | Pretest CERI subscales | Pretrip activity | NJSOC trip | Posttrip activity | Posttest CERI subscales |
|---|---|---|---|---|---|
| A | X | | X | | X |
| B | X | X | X | | X |
| C | X | | X | X | X |
| D | X | X | X | X | X |

*Note.* CERI = Childrens' Environmental Response Inventory; NJSOC = New Jersey School of Conservation.

attitude components of interest: attraction to nature, humans' relationships with nature, and comfort level with being in different environments.

During the development of the CERI, teachers of students completing it were asked to rank their students on each of the eight CERI subscales. Convergent validity of the CERI was confirmed by the significant correlations of teacher ratings to actual student scores on the CERI (Bunting & Cousins, 1983). Convergent validity was also established by correlations between subscale scores of 10th grade students who took both the Environmental Response Inventory (McKechnie, 1974) and CERI. The Pearson Product-Moment Correlation Coefficients ranged from .37 to .85, with a median of .79; all were significantly related at $p < .05$, indicating that the CERI subscales measure the same constructs as the ERI subscales. Bunting and Cousins (1985) asserted that these statistics show that the two instruments were measuring the same domains and that the strong validation of the ERI may be generalizable to the CERI to some extent. Convergent validity was further shown through associations between scale scores and behaviors.

Bunting and Cousins (1985) reported reliability data for the CERI subscales. The Cronbach's alpha for the subscales range from .78 to .91, indicating very strong (Davis, 1971) levels of homogeneity among items of the same subscale. The median item-to-scale correlations range from .37 to .56, indicating that responses to items correlate moderately to substantially (Davis) to scores on the subscales. The Spearman-Brown split-half coefficients range from .87 to .94, indicating very strong (Davis) test-retest reliability.

Several published studies have employed the CERI both as an intact instrument and by modifying it. Bunting and Cousins (1983, 1985) used the CERI to find correlations between childrens' environmental dispositions and their interests and hobbies. They also found differences in scores related to age, gender, and place of residence. Feigin (2001) used the full CERI to measure the relationship between students' environmental dispositions and participation in a school ground naturalization program. Salmivalli (1998) administered the full CERI along with the Directing Traits Test (DTT) and found correlations between the instruments on two subscales: Stimulus Seeking (CERI) and Love of Adventure (DTT); and Environmental Trust (CERI) and Need for Security (DTT). As a part of the study, she confirmed the reliability of the CERI subscales, finding a range of alpha values from .67 to .89. Salmivalli also developed a shortened version of the CERI that consisted of only 81 items. She reported high correlations between the original CERI scores and the shortened CERI scores.

Two researchers used selected subscales of the CERI to target their areas of interest. Orren (2003) used the Environmental Adaptation, Environmental Trust, and Communality subscales with the Tennessee Self-Concept Survey to investigate a variety of outdoor programs, ranging from day programs to overnight trips. She reported reliability estimates for the CERI subscales as 0.91, 094, and 0.82, respectively. Zimmerman (1996) used the Environmental Adaptation, Pastoralism, and Urbanism subscales to create a short form with 31 items. This shortened version was created for use in subsequent studies involving parent–child investigations. Clearly, a precedent for using subscales of the CERI has been set in the published literature.

The Environmental Adaptation subscale consists of 22 items (16 scored positively, 6 scored negatively) related to human relationships with nature. Sample items are "People's activities don't really hurt nature" and "People have the right to change nature whenever they need to." Low scores on this subscale indicate a fundamental respect for the environment and were considered indicators of positive attitudes toward the environment.

The Environmental Trust subscale consists of 20 items (all scored negatively) related to trust in all types of environments. Sample items are "Blizzards are frightening" and "I don't feel really safe in places where I have never been before." High scores on this subscale indicate a general comfort and

trust in all types of environments, both human made and nonhuman made, and were considered indicators of positive attitudes toward the environment.

The Pastoralism subscale consists of 22 items (20 scored positively, 2 scored negatively) related to attraction to nonhuman-dominated environments. Sample items are "I enjoy watching the sky on summer nights" and "I feel good when I am close to nature." High scores on this subscale indicate a high affinity for nonhuman-dominated areas and the outdoors in general and were considered indicators of positive attitudes toward the environment.

All of the CERI subscales consist of 5-point Likert-type items, with responses ranging from 9 (*disagree very much*) to 5 (*agree very much*). Subscale scores for the CERI are calculated by adding the points for the positively scored items, subtracting the total of the negatively scored items, and adding a constant equal to six times the number of negatively-scored items in order to prevent a negative total subscale score. The subscale scores are not designed to be summated to a composite score (Bunting & Cousins, 1983).

We placed the items for these three subscales in random order and formatted them as an instrument. We revised some items slightly in order to remove gender-biased language. Otherwise, we did not change the items from the original CERI.

## Scale Administration and Analysis

This quasi-experimental research employed a pretest/posttest/control group design (Campbell & Stanley, 1963). We attempted to conform to guidelines for conducting quantitative EE research as outlined by Smith-Sebasto (2001). Two school days prior to each trip, a designated teacher at NJMS administered the CERI subscales to each of the four groups. On the school day immediately prior to each NJSOC trip, the pretrip activity was provided to treatment groups B and D (see Table 1). On the school day following the trip, the posttrip activity was provided to treatment groups C and D. On the school day following the posttrip activity, the designated teacher at NJMS administered the CERI to each of the four groups. The testing and activities were scheduled as close in time as possible to the NJSOC trip to minimize interference by other factors on the treatment.

We entered the student responses into Microsoft Excel 2002 and calculated scores for the subscales using macros. We then loaded the scores into the Statistical Package for the Social Sciences (SPSS) version 12.0 for analysis. The independent variable was the level of treatment received by students and the dependent variables were the three CERI subscale scores. The unit of analysis was the treatment group (cf. Leeming, Dwyer, Porter, & Cobern, 1993). We used paired samples *t* tests to measure whether changes in the subscale scores were statistically different from zero. An alpha level for statistical significance of .05 was established a priori.

## Results

To look for differences between the groups that attended on different dates, we examined the between-group differences of the mean pretest scores of the three color groups. The means and standard deviations for these groups are shown in Table 2, and the ANOVA results for between group differences are shown in Table 3. The *p* values for between-group differences were above .05 for all three CERI subscales, indicating that the groups attending the NJSOC at different times did not have statistically significantly different pretest scores.

To determine if uncontrolled factors may have differentially affected the groups that attended at different times, we examined the posttest scores for the three color groups. The means and standard deviations of the posttests are shown in Table 2, and the ANOVA results for between group differ-

**TABLE 2. Pre- and Posttest by Color Group for Groups That Attended the New Jersey School of Conservation on Different Days**

| Group | Environmental Adaptation | | Environmental Trust | | Pastoralism | |
|---|---|---|---|---|---|---|
| | *M* | *SD* | *M* | *SD* | *M* | *SD* |
| Gold | | | | | | |
| Trip 1 | 51.58 | 9.20 | 54.48 | 11.58 | 76.48 | 11.83 |
| Trip 2 | 49.96 | 11.30 | 52.85 | 10.90 | 76.63 | 15.70 |
| White | | | | | | |
| Trip 1 | 52.42 | 10.28 | 57.06 | 12.27 | 77.52 | 14.28 |
| Trip 2 | 52.21 | 10.62 | 57.58 | 12.07 | 76.69 | 15.06 |
| Blue | | | | | | |
| Trip 1 | 53.45 | 9.35 | 58.77 | 13.36 | 75.68 | 13.43 |
| Trip 2 | 54.03 | 11.23 | 60.62 | 12.86 | 73.46 | 14.98 |

ences are shown in Table 3. The *p* values for between-group differences were not statistically significant for the Environmental Adaptation or Pastoralism subscales. The between-group difference was statistically significant, $F(2) = 6.032$, $p = .003$, for the Environmental Trust subscale. To understand this difference, we looked at the pairwise comparisons. These showed that the only pair with a statistically significant difference was the white and blue groups $t(2) = 2.241$, $p = .002$. This difference could be related to a number of factors. There may have been some difference in the type or degree of preparation the students were given by their school teachers prior to the trip. This may have created a difference in the students' comfort level in visiting a new place. Also, the blue group attended the NJSOC during the last week of October and participated in pumpkin carving and a costumed dance party led by their school teachers. The other two teams did not have a pumpkin carving activity as part of their trip, and the dance they attended was not a costume event. These factors may be related to the difference in the Environmental Trust posttest scores.

We found a difference in posttest scores only between two color teams and only on one subscale. For purposes of this study, this single difference (the white and blue color groups on the Environmental Trust subscale) was not considered important enough to warrant dividing the data by color teams for the purpose of analysis. Therefore, we treated the data from the three color groups as equivalent and combined them in the subsequent analyses.

This study was designed to answer several questions related to students' attitudes toward the environment. To determine the change in attitudes toward the environment, we looked at the change in score on each of the subscales from the pre- to the posttest. Also, we used paired samples *t* tests to compare the group means of the pre- and posttest for each subscale.

#### Effect of NJSOC Participation on Attitudes Toward the Environment

Because we used three subscales to measure students' attitudes toward the environment, there were three hypotheses associated with each question.

$H_o$ Environmental Adaptation: posttest – pretest = 0
$H_o$ Environmental Trust: posttest – pretest = 0
$H_o$ Pastoralism: posttest – pretest = 0

$H_a$ Environmental Adaptation: posttest – pretest < 0
$H_a$ Environmental Trust: posttest – pretest > 0
$H_a$ Pastoralism: posttest – pretest > 0

**TABLE 3. Analyses of Variance (ANOVA) of Between-Color Group Differences on Pre- and Posttest CERI Subscales**

| Test condition | Source | *SS* | *MS* | *F*(2, 166) | *p* |
|---|---|---|---|---|---|
| | | *Environmental Adaptation* | | | |
| Pretest | | | | 0.555 | .575 |
| | Between | 102.27 | 51.135 | | |
| | Within | 15299.446 | | | |
| | Total | 15401.716 | | | |
| Posttest | | | | 1.953 | .145 |
| | Between | 478.365 | 239.182 | | |
| | Within | 20334.535 | 122.497 | | |
| | Total | 20812.899 | | | |
| | | *Environmental Trust* | | | |
| Pretest | | | | 1.704 | .185 |
| | Between | 535.654 | 266.327 | | |
| | Within | 25939.346 | 156.261 | | |
| | Total | 26472 | | | |
| Posttest | | | | 6.032 | .003 |
| | Between | 1749.947 | 874.973 | | |
| | Within | 24078.846 | 145.053 | | |
| | Total | 25828.793 | | | |
| | | *Pastoralism* | | | |
| Pretest | | | | 0.28 | .756 |
| | Between | 98.06 | 46.03 | | |
| | Within | 29098.177 | 175.29 | | |
| | Total | 29196.237 | | | |
| Posttest | | | | 0.884 | .415 |
| | Between | 410.179 | 205.089 | | |
| | Within | 38505.288 | 231.960 | | |
| | Total | 38915.467 | | | |

We expected that if the Environmental Trust and Pastoralism scores changed, they would increase from the pre- to the posttest. If the Environmental Adaptation score changed, we thought it would decrease from the pre- to the posttest. Because the alternate hypotheses were directional, we used single-tailed *p* values. The two-tailed *p* values generated by SPSS were transformed into one-tailed *p* values. To do this, we divided each two-tailed *p* value by two (Moore & McCabe, 2003).

The mean group score on the Environmental Adaptation subscale increased by 0.50 points between the pre- and the posttest (see Table 4). The one-tailed *p* value for the paired samples *t* test was .747 (see Table 5), indicating that this change was not statistically significant; therefore, we retained the null hypothesis. The mean group score on the Environmental Trust subscale increased by 0.24 points between the pre- and the posttest (see Table 4). The one-tailed *p* value for the paired samples *t* test was .425 (see Table 5), indicating that this change was not statistically significant; there-

**TABLE 4. Childrens' Environmental Response Inventory (CERI) Subscale Scores for Testing Conditions**

| | Pretest | | Posttest | | |
|---|---|---|---|---|---|
| CERI Subscale | *M* | *SD* | *M* | *SD* | Δ *M* |
| | | *NJSOC trip only* | | | |
| Environmental adaptation | 52.37 | 10.03 | 52.87 | 10.04 | 0.50 |
| Environmental trust | 54.18 | 14.59 | 54.42 | 13.53 | 0.24 |
| Pastoralism | 76.05 | 14.43 | 74.00 | 15.29 | –2.05 |
| | | *Pretrip activity and NJSOC trip* | | | |
| Environmental adaptation | 52.98 | 9.75 | 53.44 | 12.46 | 0.47 |
| Environmental trust | 57.63 | 13.07 | 57.30 | 11.59 | –0.33 |
| Pastoralism | 76.91 | 15.39 | 74.02 | 17.74 | –2.89 |
| | | *NJSOC trip and posttrip activity* | | | |
| Environmental adaptation | 52.93 | 10.78 | 52.53 | 11.94 | –0.40 |
| Environmental trust | 56.30 | 11.48 | 57.05 | 12.83 | 0.75 |
| Pastoralism | 74.43 | 12.25 | 73.28 | 15.71 | –1.15 |
| | | *NJSOC trip with pretrip and posttrip activities* | | | |
| Environmental adaptation | 52.02 | 8.16 | 50.35 | 10.05 | –1.67 |
| Environmental trust | 58.98 | 11.07 | 59.75 | 11.66 | 0.77 |
| Pastoralism | 78.19 | 10.69 | 79.63 | 11.51 | 1.44 |

*Note.* NJSOC = New Jersey School of Conservation.

fore, we retained the null hypothesis. The mean score on the Pastoralism subscale decreased by 2.05 points between the pre- and the posttest (see Table 4). The one-tailed *p* value for the paired samples *t* test was .948 (see Table 5), indicating that this change was not statistically significant; therefore, we again retained the null hypothesis.

### Effect of Pretrip Activity on Attitude Change

The hypotheses and their null that guided this research were:

$H_{o}$ Environmental Adaptation: posttest – pretest = 0
$H_{o}$ Environmental Trust: posttest – pretest = 0
$H_{o}$ Pastoralism: posttest – pretest = 0

$H_{a}$ Environmental Adaptation: posttest – pretest < 0
$H_{a}$ Environmental Trust: posttest – pretest > 0
$H_{a}$ Pastoralism: posttest – pretest > 0

The mean group score on the Environmental Adaptation subscale increased by 0.47 points between the pre- and the posttest (see Table 4). The one-tailed *p* value for the paired samples *t* test was .644 (see Table 5), indicating that this change was not statistically significant; therefore, we

retained the null hypothesis. The mean group score on the Environmental Trust subscale increased by .33 points between the pre- and the posttest (see Table 4). The one-tailed *p* value for the paired samples *t* test was .639 (see Table 5), indicating that this change was not statistically significant; therefore, we retained the null hypothesis. The mean group score on the Pastoralism subscale decreased by 2.89 points between the pre- and the posttest (see Table 4). The one-tailed *p* value for the paired samples *t* test was .962 (see Table 5), indicating that this change was not statistically significant; therefore, we again retained the null hypothesis.

### Effect of Posttrip Activity on Attitude Change

The hypotheses and their null that guided this research were:

$H_o$ Environmental Adaptation: posttest – pretest = 0
$H_o$ Environmental Trust: posttest – pretest = 0
$H_o$ Pastoralism: posttest – pretest = 0

$H_a$ Environmental Adaptation: posttest – pretest < 0
$H_a$ Environmental Trust: posttest – pretest > 0
$H_a$ Pastoralism: posttest – pretest > 0

The mean group score on the Environmental Adaptation subscale decreased by 0.40 points between the pre- and the posttest (see Table 4). The one-tailed *p* value for the paired samples *t* test was .398 (see Table 5), indicating that this change was not statistically significant; therefore, we

**TABLE 5. Paired Samples *t* test for Each Test Condition**

| CERI Subscale | *M* | *SD* | *t* | *df* | *p* |
|---|---|---|---|---|---|
| | | *NJSOC trip only* | | | |
| Environmental adaptation | .500 | 4.596 | .671 | 37 | .747 |
| Environmental trust | .237 | 7.653 | .191 | 37 | .425 |
| Pastoralism | –2.053 | 7.601 | –1.665 | 37 | .948 |
| | | *Pretrip activity and NJSOC trip* | | | |
| Environmental adaptation | .465 | 8.195 | .372 | 42 | .644 |
| Environmental trust | –.326 | 5.971 | –.358 | 42 | .639 |
| Pastoralism | –2.884 | 10.427 | –1.814 | 42 | .962 |
| | | *NJSOC trip and posttrip activity* | | | |
| Environmental adaptation | –.400 | 9.684 | .261 | 39 | .398 |
| Environmental trust | .750 | 7.821 | –.607 | 39 | .274 |
| Pastoralism | –1.150 | 11.657 | .624 | 39 | .732 |
| | | *NJSOC trip with pretrip and posttrip activities* | | | |
| Environmental adaptation | –1.667 | 4.857 | –2.377 | 47 | .011 |
| Environmental trust | .771 | 6.040 | .884 | 47 | .191 |
| Pastoralism | 1.438 | 6.776 | 1.470 | 47 | .074 |

*Note.* CERI = Childrens' Environmental Response Inventory. NJSOC = New Jersey School of Conservation.

retained the null hypothesis. The mean group score on the Environmental Trust subscale increased by 0.75 points between the pre- and the posttest (see Table 4). The one-tailed *p* value for the paired samples *t* test was .274 (see Table 5), indicating that this change was not statistically significant; therefore, we retained the null hypothesis. The mean score on the Pastoralism subscale decreased by 1.15 points between the pre- and the posttest (see Table 4). The one-tailed *p* value for the paired samples *t* test was .732 (see Table 5), indicating that this change was not statistically significant; therefore, we retained the null hypothesis.

#### Effect of Both Pretrip and Posttrip Activities on Attitude Change

The hypotheses and their null that guided this research were:

$H_{o\ \text{Environmental Adaptation}}$: posttest – pretest = 0
$H_{o\ \text{Environmental Trust}}$: posttest – pretest = 0
$H_{o\ \text{Pastoralism}}$: posttest – pretest = 0

$H_{a\ \text{Environmental Adaptation}}$: posttest – pretest < 0
$H_{a\ \text{Environmental Trust}}$: posttest – pretest > 0
$H_{a\ \text{Pastoralism}}$: posttest – pretest > 0

The mean group score on the Environmental Adaptation subscale decreased by 1.67 points between the pre- and the posttest (see Table 4). The one-tailed *p* value for the paired samples *t* test was .011 (see Table 5), indicating that this change was statistically significant; therefore, we rejected the null hypothesis. This indicates that the combination of the pre- and posttrip activities in addition to the NJSOC program did have an effect on students' attitudes toward the environment. The mean group score on the Environmental Trust subscale increased by 0.77 points between the pre- and the posttest (see Table 4). The one-tailed *p* value for the paired samples *t* test was .191 (see Table 5), indicating that this change was not statistically significant; therefore, we retained the null hypothesis. The mean group score on the Pastoralism subscale increased by 1.44 points between the pre- and the posttest (see Table 4). The one-tailed *p* value for the paired samples *t* test was .074 (see Table 5), indicating that this change was not statistically significant; therefore, we retained the null hypothesis.

## Discussion

In this article, we explored and described the effects of a residential environmental education experience on students' attitudes toward the environment and determined if the addition of in-class activities before or after the experience would result in a change in attitudes. For all hypotheses in this study, we expected the directional change in score for the three subscales to be in the direction of greater concern for the environment. We expected the Pastoralism score to increase, indicating a higher affinity for nonhuman-dominated environments and the outdoors; the Environmental Adaptation score to decrease, indicating a greater concern for the impact of human influence on the environment and a reduced belief in the right of humans to use technology to dominate nature; and the Environmental Trust score to increase, indicating an improved confidence and trust in all types of environments.

For the group whose level of treatment was the NJSOC experience only, the change in the Environmental Trust score was very small, but was in the expected direction. Perhaps the experience in a previously unfamiliar setting gave students the opportunity to increase their confidence in that type of environment. The change in Environmental Adaptation score was also small, but not in the expected direction. Perhaps the program sessions at the NJSOC did not clearly communicate to the students the need for humans to minimize their negative impact on the environment. Neither change was statistically significant, indicating the change may be due to random fluctuation in scores.

The change in Pastoralism score was over 2 points in the opposite direction of what we expected. Though this result was also not statistically significant, and the direction of the change was not as expected, there is a possible explanation for it. The literature on misconceptions in science shows that both children and adults hold ideas of their own for concepts about which they have little experience or knowledge (Ballantyne & Packer, 1996; Brody, 1996; Cross & Pitekethly, 1988; Hellden, 1998; Hills, 1989; Hulland, 1990; National Environmental Education and Training Foundation, 1999; Vosniadou & Brewer, 1989; Winer & Cottrell, 1996). Multiple studies have shown that classroom instruction is often not sufficient to induce students to change their naïve ideas about a subject (e.g., Brody; Hewson & Beeth, 1993; Mahadeva, 1989; Smith, 1983). However, when allowed to explore the phenomenon for themselves in hands-on experiences, students often accept and assimilate new knowledge and experience into their conception of it (Cross & Pitekethly; Hellden; Narode, 1987; Ogunsola-Bandele & Oyedokun, 1998).

The students participating in the NJSOC trip may have created a naïvely positive impression of what it is like to spend time in the outdoors, perhaps only considering those aspects of the outdoors that they find attractive or comfortable, such as playing in their backyards. When these students attended the NJSOC, they may have discovered that being in the outdoors means being exposed to aspects that are not so appealing to them. Students in the NJSOC programs spent at least 7 hr per day outdoors. If students were not properly attired for the weather, they may have been uncomfortable. Also, the physical demands of hiking as far as three miles over uneven terrain may have made students tired, leading them to a less positive perception of the outdoors. Finally, the students in this study attended the NJSOC early in the fall, when mosquitoes and other insects are abundant. Students' experiences with these insects, commonly considered pests, may also have affected their attitudes toward spending time in the outdoors. Because the Pastoralism subscale measures affinity for spending time in nonhuman-dominated areas, these eye-opening experiences may have had a negative effect on students' attitudes toward the environment.

For the students who participated in the pretrip activity before participating in the NJSOC program, the results indicate that they did not have a significant change in attitudes on any of the three subscales.

Again, as with the group that only participated in the NJSOC, the Pastoralism score decreased by over 2 points. It is possible that the immersion experience in the outdoors had a negative effect on the students' affinity for the outdoors and nonhuman-dominated areas.

Students who participated in the NJSOC program followed by the posttrip activity showed a small increase in their Environmental Trust scores and a small decrease in their Environmental Adaptation scores. Though neither of these changes was statistically significant, they were both in the predicted direction. It is possible that the combination of the NJSOC experience and the posttrip activity had some effect on students' attitudes as measured on these subscales.

The Pastoralism score, as in the previous two groups, decreased rather than increased, but the decrease for this group was much smaller than that for the previous two groups. Some aspect of the posttrip activity may have tempered the students' negative response on the Pastoralism subscale questions. The activity asked students to reflect on their time at the NJSOC and how it may have changed their level of respect for the environment. Also, students went outdoors to their school yard and interacted with the plants growing there during the posttrip activity. Perhaps this outdoor experience in a more familiar area also served to temper or re-orient the students' perception of the outdoors.

The students who participated in both the pretrip and posttrip activities showed a statistically significant change of almost 2 points on the Environmental Adaptation subscale. The combination of both the pretrip and posttrip activities with the NJSOC program resulted in a change in students' fundamental respect for the environment. The posttrip activity asked students to reflect on their

experience at the NJSOC and their relationship with the environment. Though there was a change in the Environmental Adaptation mean group score for the students who had the posttrip activity only, the difference was less than half a point. Given this result, it seems that the combination of the pretrip and posttrip activities may have produced a more dramatic effect on students' attitudes toward the environment as measured on this subscale.

The changes in scores on the other two subscales, Pastoralism and Environmental Trust, are also of interest. Although these changes were not statistically significant, they were in the expected direction of more positive attitudes toward the environment. In fact, the group that participated in both the pre- and posttrip activities was the only one of the four groups whose scores on all three subscales changed in the expected direction of more positive attitudes toward the environment. Again, the combination of both additional activities in addition to the NJSOC experience was needed to produce the expected change in attitudes toward the environment.

## Limitations

We studied only the effect of the interventions on students in one grade at one school. Effects of attending the NJSOC and the additional activities may be different for different grade levels. Also, students from different areas (urban, rural, and suburban) may likewise respond differently. Consequently, the results of this study may not be representative of those found with other populations. The generalizability of the results is, therefore, limited.

The administration of the instruments also may have confounded the results. The instruments were administered to students by teachers from their school. When the answer sheets were collected from the school, it was discovered that many students skipped items. Their responses could not, therefore, be included in the analyses. Given the number of incomplete instruments, the students may not have taken the research seriously, and their responses also may not reflect their true attitudes. If this is the case, the results may not be a valid representation of the students' change in attitudes.

Another limitation of this study is the statistical procedure used to answer the research questions. We needed several *t* tests to answer all of the research questions. The use of many statistical tests increases the chances of a Type I error, rejecting the null hypothesis when it is, in fact, true (Moore & McCabe, 2003). Thus, it is possible that the one null hypothesis that was rejected was true. Replication of this study may confirm the results found here.

## Recommendations for Further Research

First, further research on the effectiveness of the NJSOC program is needed to understand why the program alone did not result in a change in students' attitudes toward the environment. Semrau (2003) conducted a preliminary qualitative assessment of some of the program sessions offered at the NJSOC. She found five sessions that have some affective component, but concluded that these sessions needed modifications to affect students' attitudes more directly. She made recommendations for improvements to some lesson plans. Further investigation of the rest of the NJSOC lesson plans would potentially illuminate areas of improvement for the program in this area. Also, this study only included students from one school in one town in New Jersey. Studies of this kind with other populations are needed to determine if these results would be found with other groups as well.

The additional activities used in this study were modified from those developed by Cohen (1995) as part of a larger unit of activities intended to help people reconnect with nature and reflect on their relationship with nature. Perhaps using only one or two of these activities has minimal effect on the

students' attitudes toward the environment. Future researchers could investigate whether multiple activities are more effective.

Also, further research is needed to determine if other types of activities would produce different results. The two additional activities used in this study were different in approach. The pretrip activity was designed to give students an opportunity to consider what they expect of the NJSOC trip, and the posttrip activity was designed to have students directly consider their relationship with plants and other natural resources and the value of those natural resources to life on Earth (both human and other). This study suggests that the combination of activities was most effective in increasing students' positive attitudes to the environment. Further research using different types of activities may produce different results. This additional research would help in determining the most effective type of activities to provide.

## Conclusion

Though the results of this study are preliminary, they offer some insights into the effects of using classroom activities before and after a residential environmental education experience to reinforce or alter students' attitudes toward the environment. Additional activities conducted at the students' schools may be effective in causing students to consider their relationship with the environment and in increasing positive attitudes toward it. However, the conclusions of this study should be regarded with caution until further researchers study the use of these activities.

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