Evaluation of the Environmental Education Program at the New Jersey School of Conservation

N. J. Smith-Sebasto and Heidi J. Semrau

ABSTRACT: The authors present the findings of an evaluation of the residential environmental education program offered by the New Jersey School of Conservation (NJSOC). Sixth-grade students (n = 419) from a large, central New Jersey school district participated in a 4-day/3-night experience. The Children's Attitudes Toward the Environment Scale (L. M. Musser & A. J. Malkus, 1994) was used to assess the effect of the NJSOC program on the students' attitudes toward the environment. A complementary phase of the research involved using qualitative methods of inquiry to evaluate the effectiveness of NJSOC programs experienced by the students in meeting selected missions of the NJSOC.

KEY WORDS: attitudes, children, evaluation, residential environmental education (EE) qualitative, quantitative

The New Jersey School of Conservation (NJSOC) is one of the oldest residential environmental education (EE) centers operated by a university in the United States. It was originally the site of a Civilian Conservation Corps camp that was built in the 1930s and was founded as the New Jersey State School of Conservation in 1949. Since 1972, when State was dropped from its name, it has been administered by Montclair State College, now University. Schierloh (1982) and McGarr (1990) have provided a detailed discussion of the history of the NJSOC. Since 1963, nearly 500,000 students and 50,000 teachers have participated in the residential EE programs that the school offers. Although the school has operated for many years, the present report is the first effort to assess the effects of the programs offered at the NJSOC on the affective, cognitive, or conative domain variables of the participants. In this report, we will describe the multimethod approach we used to assess the effect of selected NJSOC sessions on students' attitudes toward the environment and evaluate the sessions with respect to meeting the stated missions of the NJSOC.

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The primary contribution of this research to the EE literature is that it represents an evaluation of a residential EE program in changing students' attitude toward the environment. Iozzi (1989) pointed out that few studies have examined the effects of an intervention aimed at improving attitudes or behaviors, and those that have are weak because of poor design or because invalid or unreliable instruments were used. This study addresses those needs. In addition, the instrument we used, the Children's Attitudes Toward the Environment Scale (CATES), has high internal consistency reliability (Cronbach alpha = 0.70) and high test–retest reliability (0.68, $p < 0.001$; Musser & Malkus, 1994). We also used a large sample ($n = 419$), which Crompton and Sellar (1981) found to be lacking in their review of 28 quantitative studies concerning the impact of outdoor education programs on school children. Finally, our study also provides a template that other residential EE centers may wish to adopt as they evaluate their programs.

Background

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).

Most sessions at NJSOC are taught by a mix of the school's staff and teachers from visiting schools who have been trained by NJSOC's academic staff, which is not the case at other EE facilities. At NJSOC, visiting teachers are encouraged to continue providing and integrating EE in their classrooms after their visits. All NJSOC lesson plans are correlated to the New Jersey Core Curriculum Content Progress Indicators and Workplace Readiness Progress Indicators.

Glaser and Strauss introduced a new way of analyzing data with the release of their 1967 book titled *The Discovery of Grounded Theory: Strategies for Qualitative Research*. Grounded theory is an inductive process in which the researcher begins with an area of study from which data are collected and then formed into a theory, either substantive or formal (see also Backman & Kyngäs, 1999; Charmaz, 2000; Corbin & Strauss, 1990; and Merriam, 2000, for detailed descriptions of how to conduct a grounded theory investigation). Grounded theory concentrates on interpreting the given data and constantly applying them to the research and vice versa (Glaser & Strauss, 1967). A grounded theory should not, however, be confused with a scientific theory. The grounded theory applies to the given study and may or may not apply to other studies or under other conditions. A scientific theory has been rigorously tested and found to be unchanged in all situations tested. Grounded theory is relevant, though, because it describes exactly what is going on in the research setting, describing variations and allowing for modification of the study as new data are collected or as changes in conditions emerge. However, it does not verify theory; it creates theory (Charmaz, 2000).

Method

Participants

The population for this study consisted of 577 sixth-grade students from three middle schools (referred to hereinafter as Schools A, B, and C) in a large, central New Jersey school district who were eligible to attend the NJSOC in fall 2002. They participated in a 4-day/3-night program. The school

district consists of 23 public, suburban middle schools that serve almost 12,500 students. The middle schools are very diverse, with representation in many ethnic categories. They consist of an approximately equal student population in terms of gender, race and ethnicity, academic standing, and socioeconomic status.

We chose the school district for participation in this study for several reasons. Approximately 200 students from each middle school attended the NJSOC in the fall, which allowed for a large study group. We completed the testing in 1 month because of the short time between school trips. Most of the students (41%) attending the NJSOC were sixth graders coming from a public school, so this sample closely matched the population of students who participate in EE programs at the NJSOC. At the time of this study, only 13 schools participated in a 4-day/3-night program; the aforementioned district representing 3 of them. Another reason this sample was chosen was that the school district requires all their students to receive virtually the same NJSOC experience. So the students attended the same classes, which were taught expressly as the lesson plans outline. Finally, the seven selected lesson plans that were taught to these students represented all four NJSOC curricular areas (environmental sciences, humanities, outdoor pursuits, and social sciences) and were among the most popular classes taught at the NJSOC.

We submitted a human participant review to Montclair State University. The study was deemed to be exempt from Institutional Review Board action. The school district requires all students attending the NJSOC trip to have a parental permission slip signed.

Research Questions

The study focused on two research questions:

1. Do selected New Jersey School of Conservation programs change the attitudes of selected participants toward the environment? If so, what is the cause? If not, what is missing?
2. Are the three selected New Jersey School of Conservation mission objectives—(a) to develop in participants a sensitivity and awareness concerning the Earth and the problems that threaten life on the planet, (b) to facilitate participants' self-examination of the roles in contributing to environmental improvement, and (c) to use an active problem solving approach to provide students with the skills necessary to play productive roles in improving the quality of life—being met by its current programs based on selected lesson plans? If not, what are some suggestions for improvement based on the findings?

Intervention

The intervention was the students' participation in seven selected NJSOC lessons. The duration of the intervention was 4 days and 3 nights, the most extensive program offered by the NJSOC. School A attended the NJSOC from November 12–15, 2002; School C attended from November 19–22, 2002; and School B attended from December 3–6, 2002. As mentioned heretofore, the instructors used the same NJSOC lesson plans for all the students, and the lessons were taught expressly as each describes. The established treatment was, therefore, consistently applied to all students.

Research Methods

Sixth-grade students at the district's three middle schools are assigned to individual school "teams" that have the same five teachers for language arts, math, science, social studies, and reading. The students rotate through a schedule so that each team has a class period with each of the five teachers. For all three schools, the students to whom the pretest was administered were those who had their social studies class during the first four classes of the day.

The population of students at School A that was considered in this study was 160. Of these, we knew in advance that 36 students would not be participating in the NJSOC experience. (Guardian permission is required for students to participate in the NJSOC experience, and for a variety of reasons, some guardians did not grant permission for their child or children to participate in the experience. In addition, students who are discipline problems at school are not allowed to participate in the NJSOC experience). Thus, the eligible sample was 124 (77.5%). We administered 62 pretests the day before their NJSOC trip. The Children's Attitudes Toward the Environment Scale (CATES; Musser & Malkus, 1994) was used as the pretest and the posttest. A total of 59 (95.2%) usable instruments were returned. All of the students in the eligible sample attended the NJSOC. Within a week after their trip, we administered a posttest to all the students who had participated in the NJSOC experience during their science class. Because each of the schools' programs ended on a Friday, Monday was the soonest a posttest could be administered. However, the class schedule of the second author, who was a graduate student at the time this study was conducted, combined with the distance between the NJSOC and the three schools, which is slightly more than 100 miles and requires more than 2 hours commuting, required some flexibility concerning when the posttest was administered. We acknowledge, nevertheless, that the interval between the pretest and the posttest could have affected how the students responded. A total of 104 (83.9%) posttest instruments were usable.

The population of students at School B who were considered in the study was 176. Of these, we knew in advance that 29 students would not be participating in the NJSOC experience. The eligible sample was, therefore, 147 (83.5%). Seventy-three pretests were administered 1 day before their NJSOC trip. A total of 72 (98.6%) usable instruments were returned. All of the students in the eligible sample attended the NJSOC. Within 1 week following their trip, a posttest was administered during their Science class. A total of 129 (87.8%) posttest instruments were usable.

The population of students at School C who were considered in the study was 241. Of these, we knew of in advance that 22 students would not be participating in the NJSOC experience. The eligible sample was, therefore, 219 (90.9%). One hundred and nine pretests were administered 1 day prior to their NJSOC trip. A total of 88 (80.7%) usable instruments were returned. All of the students in the eligible sample attended the NJSOC. Within 1 week following their trip, a posttest was administered during their Science class. A total of 186 (84.9%) posttest instruments were usable.

Reliability and validity of the data gathered by the instrument have already been established (Musser & Malkus, 1994). Scores on the pretest and posttest were entered under each student's identification number in JMP Statistical Discovery Software (Version 3.1; Sall, Lehman, & Creighton, 2001). For the CATES, we gave an overall score to each student by summing across each of the three domains (affect, behavior, beliefs). We then determined if the pretest had any affect on the findings. We also determined the success of the intervention in changing students' attitudes toward the environment by analyzing the pretest and posttest mean scores collectively and for each school.

We used a modified grounded theory approach to evaluate the second research question, which was to determine the effectiveness of the seven selected NJSOC lesson plans in meeting the three selected NJSOC mission objectives. The school district program consisted of seven NJSOC classes: Water Ecology, Mammalian Studies: Beaver Ecology, Wildlife Challenge, Back to the Future, Sensory Awareness in Nature, Orienteering, and Group Initiatives. The first four classes directly focus on some aspect of the environment. Sensory Awareness in Nature indirectly addresses the environment, and the last two classes lack an environmental focus.

Our analysis was addressed in three phases. During the first phase, identification and coding, we began by analyzing the eight NJSOC mission objectives. We selected one objective to represent each of the three domains being investigated: affective, cognitive, and conative. The affective mission objec-

tive was chosen because it addresses sensitivity; the cognitive mission objective, because it addresses problem-solving skills; and the conative mission objective, because it addresses actions for improving the environment. We then read the seven lesson plans and recorded the objectives, concepts, and outline of the activities covered in each lesson plan, and examples representing each domain. The lesson plans categorized as representing the affective domain addressed the students' feelings in general or their concern for the environment, organisms within the environment, or environmental problems. The lesson plans categorized into the cognitive domain addressed the students' knowledge in general or that concerning the environment, environmental issues, or environmental action strategies. The lesson plans categorized into the conative domain addressed the students' personal actions, especially those concerning the environment. We read the lesson plans a final time and recorded examples of how they addressed the instrument themes and of additional themes among them. We were finally able to code each lesson plan into one or more of the instrument's domains and themes.

The second phase consisted of an in-depth, comparative analysis of the selected NJSOC lesson plans and instrument items in the corresponding domain. The purpose of this analysis was to determine if the instrument items were addressed in one or more of the corresponding lesson plans for that domain. Instrument Item 2, for example, addressed using both sides of a piece of paper. This item represented the conative domain, so all lesson plans in the conative domain were analyzed for inclusion of this item. If the lesson plans did not directly address the item, then we analyzed the lesson plans for possible inclusion of the item. We conducted a second comparative analysis using the same procedure as the first comparative analysis on the instrument themes and the lesson plans. In a final analysis, we compared the selected NJSOC lesson plans with the selected mission objectives, again using the same procedure as the first comparative analysis.

The third phase of our grounded theory method was a refinement of the developing theory. This consisted of making a determination about whether or not NJSOC mission objectives were being met by the selected lesson plans based on the comparative analyses. We also provided suggestions for improvement for lesson plans that did not adequately meet the mission objectives and that did not directly focus on the environment.

Findings

Quantitative Analysis

The purpose of this analysis was to address the first research question: To determine if the students' attitude toward the environment changed as a result of the intervention. We began our analysis by coding each test item into one of three domains based on whether the item addressed personal preferences (affective domain), ideas (cognitive domain), or behavior (conative domain). Each test item was then coded into one of the five test themes: conservation, animal rights/animal protection, nature appreciation, pollution, or recycling (see Table 1).

We conducted a *t* test and one-way ANOVA on the mean posttest scores for all three schools combined and then for each individual school to determine if students who took a pretest were sensitized to the instrument. The alpha level for significance was established a priori at 0.05 (see Table 2). We found no significant difference for combined means or for School A, therefore, the pretest did not sensitize the students to the posttest, so any increase in attitude scores could be attributed to the treatment. It is interesting to note, however, that School C students who did not take the pretest (M = 2.87) scored significantly higher on the posttest than did those who took the pretest (M = 2.71). School B students who took the pretest (M = 2.80) scored significantly higher on the posttest than did those who did not take the pretest (M = 2.64), which suggests that sensitization

TABLE 1. Domain and Theme for Each Question

Question	Domain*			Theme**				
	A	Cog	Con	C	R	AR	NA	P
1			X	X				
2			X	X				
3		X			X			
4		X				X		
5	X						X	
6	X						X	
7		X		X				
8		X				X		
9	X			X				
10		X						X
11	X						X	
12	X					X		
13			X		X			
14		X						X
15			X					X
16			X		X			
17	X						X	
18			X			X		
19	X			X				
20	X			X				
21		X				X		
22	X						X	
23		X				X		
24			X	X				
25			X	X				

*Domain: A = Affective, Cog = Cognitive, and Con = Conative.
**Theme: C = Conservation, R = Recycling, AR = Animal Rights/Animal Protection, NA = Nature Appreciation, and P = Pollution.

occurred. Therefore, posttest analyses conducted on School B students may not reveal the effects of the treatment directly, so caution should be used when interpreting these data.

We analyzed a one-way ANOVA and *t* test of pretest scores for each school. The null hypothesis for all inferential tests was: H_o: $\mu_1 = \mu_2 = \mu_3$, where μ_n was the mean of each school. We conducted a Tukey–Kramer Honestly Significant Difference (HSD) test to compare the pretest means of each school pair. No significant difference was found between matched pairs of the schools. The null hypothesis was, therefore, accepted.

We then analyzed a one-way ANOVA and *t* test of mean posttest scores for each school. We conducted a Tukey–Kramer HSD test to compare the posttest means of each school pair (see Table 3).

The results showed that the mean posttest scores differed significantly between School A and Schools B and C. There was no significant difference found between Schools B and C. The null hypothesis was, therefore, rejected.

We conducted a one-way ANOVA and *t* test on the difference between the pretest and posttest mean scores for all three schools combined. A Tukey–Kramer HSD test was conducted to determine if the difference between any two schools' means was statistically significant (see Table 4). We found no significant difference between School A and School B, School B and School C, or School C and School A. The null hypothesis was, therefore, accepted.

TABLE 2. Analysis of Variance of Mean Posttest Scores Between Those Students Who Completed the Pretest and Those Who Did Not Take the Pretest

School	*df*	*SS*	*MS*	*F*	*p*
A	1	0.1145	0.1145	0.8861	0.3488
	102	13.1796	0.129		
Total	103	13.2941			
B	1	0.7597	0.7597	4.6902	0.0322
	127	20.5714	0.1620		
Total	128	21.3311			
C	1	1.1886	1.1886	7.7163	0.0060
	184	28.3432	0.1540		
Total	185	29.5318			
Combined	1	0.1395	0.1395	0.8718	0.3510
	417	66.7310	0.1600		
Total	418	66.8705			

TABLE 3. Tukey-Kramer Results, Schools

School	School A	School B	School C
		Pretest	
A	–0.17	–0.02	–0.01
B	–0.02	–0.15	–0.14
C	–0.01	–0.14	–0.14
		Posttest	
A	–0.13	0.09	0.04
B	0.09	–0.12	–0.04
C	0.04	–0.04	–0.10

Note. Positive values show pairs of means that are significantly different.

A matched-pairs analysis was conducted to determine if posttest means for all three schools combined improved from pretest means (see Table 5). The difference between the means was not significantly different from zero; therefore, the intervention was not effective in changing students' attitudes toward the environment in all three schools as a whole. A second matched-pairs analysis was conducted across the schools to determine if any school had improved posttest scores to a statistically significant level, which would have suggested that the treatment was effective in improving the students' attitude toward the environment. None of the schools showed a significant difference between pretest and posttest scores; therefore, no improvement was evident. It remained unclear whether the intervention was effective in improving students' attitudes toward the environment, so we conducted further analysis on the test's domains and themes.

We conducted a matched-pairs test for each domain to address differences between mean pretest and mean posttest scores for all three schools combined and for each individual school. We used a one-way ANOVA, a *t* test, and a Tukey–Kramer HSD test to compare the domains to determine if any domains were significantly different between schools or combined (see Table 6). The matched-pairs test results showed a statistically significant increase in conative scores for all three schools com-

TABLE 4. Tukey-Kramer Results, Schools Using Mean Test Difference

School	School A	School B	School C
A	–0.11	–0.08	–0.01
B	–0.08	–0.10	–0.01
C	–0.04	–0.01	–0.09

Note. Positive values show pairs of means that are significantly different.

TABLE 5. Comparison of Mean Pretest and Posttest Scores

School Score	Cases	*M*	*SE*	*t* ratio	*df*	Two-tailed probability
A						
Pretest	59	2.88	0.03	1.08	58	0.29
Posttest	104	2.92				
B						
Pretest	72	2.75	0.03	1.74	71	0.09
Posttest	129	2.80				
C						
Pretest	88	2.74	0.03	–1.11	87	0.27
Posttest	186	2.71				
Combined						
Pretest	219	2.78	0.02	0.83	218	0.41
Posttest	419	2.80				

Note. The *t* test for paired samples was used for statistics reported in this table.

bined, but the remaining domains did not reach statistical significance. For School A, increases in the conative domain means were also significantly different; differences in the affective and cognitive domains were not statistically significant. For School B and School C, none of the domains were statistically significantly different after the treatment.

When we compared the domains for all three schools combined using the Tukey–Kramer HSD test, we found that the domains did not differ significantly nor did any pair of schools differ (see Table 7).

We also completed a matched pairs test for each theme, addressing mean differences between mean pretest and posttest scores for all three schools combined and for each individual school. We used a one-way ANOVA, a *t* test, and a Tukey–Kramer HSD test to compare the themes of each school and for all three schools combined to determine if any themes differed significantly (see Table 8). The matched-pairs test for all three schools combined showed a significant increase in the conservation theme and a significant decrease in the animal rights/animal protection theme. The remaining three themes were not statistically different. For School A and School B, an increase in conservation theme mean was also significantly different, but the other four themes were not different. None of the differences in theme means were statistically different for School C. We found a significant difference between the conservation theme means for School B and School C; however, no other school pairs achieved statistical significance for any other theme.

Qualitative Analysis

Because we initially limited the examination of each mission objective to the lesson plan objectives, the focus became too narrow and few lesson plans met the mission objectives, so we performed an in-depth examination of each lesson plan in relation to a mission objective. We identified three additional themes within the lesson plans: (a) ecological relationships, meaning the relationship between organisms

TABLE 6. Comparison of Mean Pretest and Posttest Scores by Domain

Domain School	Cases	*M* Pre	 Post	*SE*	*t* ratio	*df*	Two-tailed probability
Affective							
A	59	2.99	2.97	0.04	–0.61	58	0.55
B	72	2.85	2.92	0.04	1.54	71	0.13
C	88	2.80	2.77	0.04	–0.86	87	0.39
Combined	219	2.87	2.87	0.02	0.07	218	0.95
Cognitive							
A	59	2.84	2.86	0.05	0.56	58	0.58
B	72	2.79	2.7	0.05	0.15	71	0.88
C	88	2.77	2.69	0.04	-1.73	87	0.09
Combined	219	2.79	2.77	0.03	-0.76	218	0.45
Conative							
A	59	2.80	2.91	0.05	2.09	58	0.04
B	72	2.58	2.67	0.05	1.63	71	0.11
C	88	2.65	2.66	0.04	0.29	87	0.77
Combined	219	2.67	2.73	0.03	2.27	218	0.02

Note. The *t* test for paired samples was used for statistics reported in this table.

TABLE 7. Tukey-Kramer Results, Domain

Domain School	School A	School B	School C
Affective			
A	–0.15	–0.05	–0.13
B	–0.05	–0.14	–0.03
C	–0.13	–0.03	–0.12
Cognitive			
A	–0.16	–0.14	–0.05
B	–0.14	–0.15	–0.06
C	–0.05	–0.06	–0.13
Conative			
A	–0.18	–0.15	–0.06
B	–0.15	–0.16	–0.08
C	–0.06	–0.08	–0.14

Note. Positive values show pairs of means that are significantly different.

and their environment; (b) adaptations; and (c) natural resource use (see Table 9). For convenience, the instrument item number is provided in parentheses when discussed in the following analysis.

The affective NJSOC mission objective is "to develop in participants a sensitivity and awareness concerning the Earth and the problems that threaten life on the planet" (http://csam.montclair.edu/njsoc/mission.html). The quantitative analysis found no significant difference between pretest and posttest scores among the nine affective domain test items (see Table 8), which means the treatment was ineffective in increasing pro-environmental feelings, except for School B students, who were sensitized to the instrument. It is uncertain, therefore, if this mission objective was met based on the present study.

A review of the seven selected lesson plans revealed six addressing the affective domain: Water Ecology, Mammalian Studies: Beaver Ecology, Wildlife Challenge, Back to the Future, Sensory Awareness in Nature, and Group Initiatives. Nine test items also fell under this domain. In Water Ecology, the students tested the water quality of a local stream through macroinvertebrate sampling, which increased sensitivity toward the specimens. After the macroinvertebrates had been identified, they were returned to the stream. All the nets were carefully checked to ensure that all specimens had been returned to the stream. This reinforced the idea that animals can be studied, but must be returned to their homes (Item 5).

Mammalian Studies: Beaver Ecology provided insight into the numerous environmental impacts humans have on plants and animals in relation to the impact the beaver has on the environment, thus increasing awareness of environmental problems. In Wildlife Challenge, students became different animals struggling to survive. In doing so, they gained an understanding of how animals balance their needs with what is available in their environment through adaptation. The students also learned about bioaccumulation and biomagnification by exploring pesticide use and its harmful effects on the environment. The topic of animal extinction often arose in Wildlife Challenge because few students survived through one game. By increasing awareness of the causes of death and sometimes extinction, the students should have gained a new appreciation and respect for wildlife (Item 12).

TABLE 8. Comparison of Mean Pretest and Posttest Scores by Theme

Theme School	Cases	*M* Pre	 Post	*SE*	*t* ratio	*df*	Two-tailed probability
Animal rights/ animal protection							
A	59	2.87	2.82	2.82	0.05	–1.00	0.32
B	72	2.90	2.82	0.06	–1.43	71	0.16
C	88	2.81	2.71	0.05	–1.90	87	0.06
Combined	219	2.85	2.78	0.03	–2.57	218	0.01
Conservation							
A	59	2.74	2.88	0.05	2.87	58	0.01
B	72	2.61	2.72	0.04	2.42	71	0.02
C	88	2.60	2.60	0.03	–0.17	87	0.87
Combined	219	2.64	2.71	0.02	2.92	218	0.004
Nature appreciation							
A	59	2.98	2.91	0.07	–1.11	58	0.27
B	72	2.78	2.87	0.08	1.15	71	0.25
C	88	2.83	2.82	0.05	–0.28	87	0.78
Combined	219	2.86	2.86	0.04	0.06	218	0.95
Pollution							
A	59	3.07	3.08	0.05	0.23	58	0.82
B	72	2.85	2.90	0.05	1.06	71	0.29
C	88	2.86	2.83	0.06	–0.51	87	0.61
Combined	219	2.91	2.92	0.03	0.32	218	0.75
Recycling							
A	59	2.91	3.00	0.08	1.10	58	0.28
B	72	2.63	2.75	0.07	1.67	71	0.10
C	88	2.70	2.71	0.06	0.12	87	0.91
Combined	219	2.73	2.80	0.04	1.64	218	0.10

Note. The *t* test for paired samples was used for statistics reported in this table.

Sensory Awareness in Nature engaged the five senses, allowing students to appreciate their senses as well as nature, because students had to touch, observe, and even hide in a nonhuman-dominated area. The goal was to help students feel comfortable in a nonhuman-dominated area, which might result in sensitivity toward Earth. Back to the Future involved educating students about how natural resources were used by humans throughout history, with the objective that the students would learn to appreciate natural resources. The final lesson plan in this domain was Group Initiatives. Here the focus was team building and cooperation, which required students to consider each other's feelings and abilities while they faced challenges; however, it failed to have an environmental focus, so it did not support the mission objective.

Just by attending the NJSOC, students see many species of wildlife, including charismatic megafuana such as black bears. Because all classes at the NJSOC consist of an outdoor component, students begin to feel comfortable outdoors. While hiking through the forest, students often encounter much wildlife or at least signs of wildlife (i.e., tracks, scat, nests), which usually piques their interest.

TABLE 9. Domain and Theme for the Seven Selected New Jersey School of Conservation Lesson Plans

Objective	WE	MS	WC	BF	SA	O	GI
Domain							
Affective	X	X	X	X	X		X
Cognitive	X	X	X	X		X	X
Conative		X	X	X			X
Theme							
Conservation	X	X	X	X			
Animal rights/animal protection	X	X	X				
Nature appreciation				X	X		
Recycling				X			
Pollution	X		X	X			
Ecological relationships	X	X	X	X			
Adaptations		X	X	X			
Natural resource use	X	X	X	X			

Note. NJSOC lesson plans: WE = Water Ecology, MS = Mammalian Studies: Beaver Ecology, WC = Wildlife Challenge, BF = Back to the Future, SA = Sensory Awareness in Nature, O = Orienteering, and GI = Group Initiatives.

This helps increase student preference for looking at plants and animals and may cause students to prefer living in a rural or suburban rather than an urban area (Items 5 and 17). Six of the test items are not covered in one of the seven selected lesson plans, but four of these items are covered in other NJSOC lesson plans. Ornithology might increase interest in making bird feeders and bird houses (Item 6); Alternative Energy addresses solar energy (Item 20); and Metalsmithing raises awareness of air pollution and promotes energy-saving practices such as carpooling (Items 19 and 22). The affective mission objective seemed to be met by participating in the NJSOC lessons, by being outside, and by studying organisms in their habitat.

The cognitive mission objective is "to facilitate participants' self-examination of the roles in contributing to environmental improvement" (http://csam.montclair.edu/njsoc/mission.html). This domain showed no significant improvement in posttest scores following the NJSOC treatment, which suggested that students did not learn more about the environment than they already knew before the treatment (see Table 6).

Six lesson plans fell into the cognitive domain: Water Ecology, Mammalian Studies: Beaver Ecology, Wildlife Challenge, Back to the Future, Orienteering, and Group Initiatives. In Water Ecology, students learned about water as a resource for humans, plants, and wildlife, and how water relates to them based on how they use water daily. Students also learned how to evaluate the quantity and quality of water. Mammalian Studies: Beaver Ecology introduced topics such as ecological relationships, the beaver's influence on the landscape and environment, beaver adaptations, and succession. Students learned the parts of a compass and practiced using one in Orienteering. Group Initiatives required students to think critically and to provide positive feedback on group dynamics. These four lesson plans failed to have students address or reflect on ways in which they could improve the environment, so they did not satisfy the mission objective.

In Wildlife Challenge, the students learned how to analyze and interpret data while making pre-

dictions about reality. The class also dealt with important concepts such as limiting factors, carrying capacity, competition, food webs, and bioaccumulation. The students learned about population dynamics, essential habitat components, predator–prey relationships, and the effects of environmental stressors on a stream ecosystem. The lesson was summarized by having the students think about ways in which they could help wildlife survive. Back to the Future focused on three cultures through time—Native Americans, the Colonials, and today's society. The students learned about the renewable and nonrenewable natural resources that were used in the technology of each period. The main focus was the impact that each culture had or is having on the environment, with a special emphasis on personal impact. So, only two of the selected NJSOC lesson plans actually met the mission objective.

The eight test items in this domain, dealing with individual ideas, should have been exceptional in determining if this mission objective was being met effectively because all the items dealt with improving the environment and most addressed ways in which humans could do this. For Water Ecology, Mammalian Studies: Beaver Ecology, and Wildlife Challenge, animals were at the center of the lesson, and the focus was on the habitat of each and the challenges that each face. Three of the four test items concerned animal rights, protection, and equality, which were closely related to the three lesson plans (Items 8, 21, and 23). The fourth test item addressed the harmful effects of dams on plants and animals (Item 4), but this topic was not discussed in the selected lesson plans. Because Back to the Future focused on human environmental impacts, the test items concerning recycling and turning off lights could have been covered in this class (Items 3 and 7). The last two test items, concerning the use of landfills and pesticides, were not addressed in the selected lesson plans, but could easily have been incorporated into Water Ecology or Back to the Future (Items 10 and 14). Overall, the test items seemed to adequately relate to the mission objective, and therefore, it should have been possible to accurately determine if the selected lesson plans met this mission objective. Unfortunately, the lesson plans failed to meet the mission objective because reflection on ways to improve the environment was overlooked.

The conative mission objective of the NJSOC is "to utilize an active problem solving approach to provide students with the skills necessary to play productive roles in improving the quality of life" (http://csam.montclair.edu/njsoc/mission.html). This was the only domain to show a statistically significant increase in posttest scores (see Table 6).

Eight test items and four lesson plans were encompassed in this domain. Back to the Future had a human-centered focus with a concentration on the wise use of natural resources. A goal of this lesson was to have the students realize how their actions have an impact on the quality of the environment. For example, they learned that Native Americans used every part of an animal they killed, wasting nothing. This might have influenced students to use both sides of paper and to turn off the water when brushing their teeth so as not to waste these natural resources (Items 1 and 2). The students also learned that in Colonial times, people had only two outfits, which were passed down to younger siblings until they could no longer be worn, in which case they were torn apart and used to make rugs. Knowing this, students might have come to understand the importance of reusing items or giving them to someone else (Item 13). The lesson was concluded with a discussion of today's society and our dependence on environmentally degrading fossil fuels. Students should be encouraged to be environmentally responsible by simply turning off lights when leaving a room and by walking or riding a bike, whenever possible, rather than getting a car ride (Items 24 and 25).

Mammalian Studies: Beaver Ecology stressed the importance of environmentally responsible behavior and encouraged students to set aside areas for wildlife. Students learned how the beaver makes its lodge and dams by using trees, sticks, and mud, all recyclable materials. This should have promoted an understanding of recycling (Item 16). Wildlife Challenge focused on habitat conser-

vation and challenged students to commit themselves to helping wildlife survive. This lesson allowed the students to experience the importance to wildlife of having a habitat that provides ample food, water, and shelter with minimal competition and pollution. The students were encouraged to protect and conserve wildlife habitat, which may in turn have influenced them to pick up and throw away trash because it pollutes wildlife habitat (Item 15). Group Initiatives required students to balance leading and following, but was not environmentally focused. Only one test item—touching or catching wild animals—was not covered by one of the four activities in this domain (Item 18); however, in Water Ecology students touched macroinvertebrates. In addition, the NJSOC offers a variety of lessons that allow students to touch wild animals, such as Herpetology, Fish Ecology, and Wildlife Ecology. In summary, the test items covered several common conservation practices, which were easy for children to accomplish. The majority of the lesson plans in this domain also addressed conservation practices, though specific practices mentioned in a lesson varied with each class. Hence, the conative mission objective was supported by the selected lesson plans.

Discussion

Results for all three schools combined showed no sensitization to the instrument, but the intervention was assessed by the instrument as ineffective in improving students' attitudes toward the environment. A significant increase was found in the conative domain mean scores. So, in terms of the first research question, the intervention was assessed by the instrument as ineffective in altering students' overall attitudes, but was assessed by the instrument as effective in increasing environmentally responsible behaviors (ERBs), as measured by the instrument.

The results from the three schools showed that no instrument sensitization occurred in School A or School C students, but that School B students were sensitized. One suggestion for this sensitization by School B students, and for the significant decrease in School C students' posttest scores for those who took a pretest, is that students did not take the test seriously and arbitrarily marked boxes; one student admitted to doing this because the test was not for a grade. Several students also commented that they would put the same answers on the posttest as they put on their pretest. These students probably did not read the items carefully and simply checked the box they thought they checked on the pretest. This could be problematic because several items address the same topic but fall into different domains.

Pretest means were not significantly different between any school pair, but posttest means differed significantly between School A and School C and between School A and School B. The difference between the pretest and posttest means was not significant for any school, so the intervention was assessed by this instrument as ineffective in changing the attitudes of the students. School A students showed a significant increase in the conative domain. School B and School C students did not show a significant increase in any domain. None of the school pairs differed significantly by domain. The conservation theme for all three schools combined increased significantly, whereas the animal rights/animal protection theme significantly decreased. The conservation theme was also significant among students from School A and School B.

The grounded theory analysis revealed the conservation theme was adequately covered in the lesson plans. The significant decrease in the animal rights/animal protection theme for all three schools combined was probably caused by a misunderstanding of the item addressing the impacts of dams on plants and animals. In Mammalian Studies: Beaver Ecology, students learn the benefits of a beaver dam, through the creation of a pond ecosystem that supports a variety of plants and animals that

could not survive in that area without the new habitat. This probably caused students to choose the least proenvironmental responses, which state that dams are good. On the basis of this statistical analysis, the intervention was assessed by this instrument as ineffective in changing the students' attitudes toward the environment; however, the intervention did result in increased ERBs, as measured by the conative domain test items.

The findings also showed that the affective and conative mission objectives are being met by the selected NJSOC lesson plans, but the cognitive mission objective is not being met sufficiently by the selected lesson plans. After we had completed the grounded theory analysis, we identified four lesson plans for improvement—Water Ecology, Sensory Awareness in Nature, Group Initiatives, and Orienteering. In each case, the lesson plan either did not address environmentally responsible behavior, or it did not include an environmental focus even though to do so would not require substantial effort or deviation from the intended focus of the lesson.

Limitations and Relevance

This study focused only on the effects of the intervention on sixth-grade students attending a middle school in a large, central New Jersey district who attended the NJSOC in fall 2002, so it was limited by grade level, time of year, and intervention. As is the case with most, if not all, educational research that relies on personological variables and psychometric techniques, this study is also limited by the reliability and validity of the data obtained via the research instrument and the chosen research methods. The results and findings of this study should not, therefore, be generalized to any other population. The effects of attending the NJSOC may be different for each grade level. The study is also limited in that it failed to include a variety of school locations—that is, urban, suburban, rural—and only consisted of public school children and not children from private schools. The study was limited to a few of the classes offered at the NJSOC and addressed only selected mission statements, so the findings are only preliminary and by no means conclusive. Also, the study was limited to reported ERB, rather than observation of such behaviors.

Nevertheless, the findings of this study support those of Jordan, Hungerford, and Tomera (1986) that knowledge of action strategies is needed to promote ERB and that knowledge about the environment is not enough. Hwang, Kim, and Jeng (2000) recommended that environmental centers switch their teaching focus from knowledge about an issue to knowledge about action strategies. This study showed an increase in the conative domain as a result of the treatment. The qualitative analysis revealed that sufficient lesson plans address action strategies, and the lack of lesson plans supporting the cognitive mission objective helps show that knowledge did not lead to the reported behaviors. The NJSOC was successful, therefore, in increasing ERB, with a focus on action strategies.

Evans and Gill (1996) studied the role that school children play in the reversal of their parents' attitudes toward the environment and their parents' lack of ERBs, such as recycling. They found that students who participated in an EE program at school influenced their parents to act more environmentally responsibly. Ballantyne, Fien, and Packer (2001) focused on six EE programs and their effects on participants' (and their family's) environmental knowledge, attitudes, and practices following visitation to one of the six facilities. Their goal was to determine if children were able to communicate and ultimately to educate their parents and other adults in their community about environmentally responsible behaviors and knowledge. Their findings revealed that participants not only gained knowledge about environmental issues by attending a program, but they also gained skills in how to monitor and solve environmental problems. Parents reported changes in environmental attitude, behavior, interest, and awareness. These studies are relevant to the activities of the NJSOC since programs are primarily provided for children of middle school age. By educating them, their parents

may indirectly be educated. This may result in communities considering the environment an important and worthwhile topic when planning for the future.

Further Research

This research effort provides a foundation for further research into the effectiveness of the NJSOC in meeting its mission objectives with its current lesson plans and ultimately changing students' attitudes toward the environment. The example set here may also provide guidance for other residential EE centers wishing to evaluate their programs. The NJSOC educates children in Grades 3–12, with an occasional college group. This study focused on children in sixth grade, so further research needs to be conducted to determine the effectiveness of the program in changing children's attitudes at different grade levels (and hence different age levels). We considered only three public schools, so further research should focus on public and private schools, as well as schools in rural and urban areas. Some schools come to the NJSOC for a 1-day program, whereas others stay for 4 days and 3 nights. The duration of stay also needs to be analyzed to determine if the NJSOC is effective in changing attitudes in students who attend the NJSOC for a short time verses a long time. Further research also needs to be conducted on different lesson plans and mission objectives because we addressed only three mission objectives and seven lesson plans in this study. Finally, we made recommendations on ways to improve lesson plans in the light of the findings of this study. If those changes are made, then further research will be needed to evaluate the effectiveness of the new lesson plans.

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