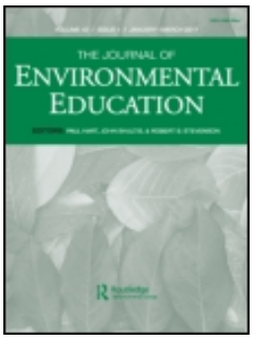

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Toward a Grounded Theory for Residential Environmental Education: A Case Study of the New Jersey School of Conservation

N. J. Smith-Sebasto and Lisa M. Walker

ABSTRACT: The authors present the findings of a study that explored student perceptions of the residential environmental education (EE) program at the New Jersey School of Conservation. The authors administered a 3-item instrument that was based on the minute paper/muddiest point techniques to 2,779 students from 31 schools. A qualitative methodology with a grounded theory approach was used to discover which areas of the program were most meaningful, most confusing, and most interesting to the students. The findings revealed that students found social, personal, and wilderness survival sessions to be very meaningful. They thought orienteering and environmental science sessions were confusing. They were interested in learning more about many subjects, but they were less interested in social topics than environmental science, safety, or recreation topics. A grounded theory for effective residential environmental education is offered.

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

Environmental education (EE) is one of the most rapidly expanding areas of education, yet the theory that guides it is often limited to findings obtained through quantitative methods of inquiry (Rickinson, 2001). Qualitative methods of inquiry, however, allow more complex and detailed information to be collected about a subject than do quantitative methods (Tilbury & Walford, 1996). This study used a qualitative method of inquiry with a grounded the-

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ory approach to data collection and analysis that will hopefully give the learner a voice concerning the quality of programming he or she received during a residential EE program.

The grounded theory methodology was proposed by Glaser and Strauss (1967). It is characterized by the formation of theories based on data that are collected during a study. It was formulated in an attempt to give systematic guidelines for collecting and analyzing qualitatively derived data, with the goal of building hypotheses that supported the data rather than collecting data that fit into a specific hypothesis (Strauss & Corbin, 1994). Unlike quantitative methods of inquiry, data collection is not based on a rigidly prescribed protocol, nor is data analysis performed after data collection is complete (Charmaz, 2001).

The use of grounded theory in EE research is limited, but its use in research in general education, sociology, and psychology is widespread. Grounded theory is, nonetheless, especially suited for EE because (a) narrative and rich descriptive data capture the complexity of EE that is often inaccessible in studies that use quantitative methods of inquiry; (b) its naturalistic methodology attempts to represent education as it occurs naturally; (c) it has a phenomenological view that social processes, like EE, have subjective elements; (d) it values the investigators' and participants' accounts as reliable; (e) it immerses the researcher in the data and relies on her or his interpretations; (f) multiple data-gathering methods allow formation and internal verification of complex theory; and (g) it uses generative and constructivist ways of building theory (Tilbury & Walford, 1996, p. 54). Further use of grounded theory in EE research, such as in this study and others (Smith-Sebasto & Semrau, 2004; Tilbury & Walford), may allow researchers to better characterize those areas of EE that have been previously overlooked by researchers who have employed quantitative methods of inquiry.

Current environmental issues have been attributed to a worldview that is fragmentary, reductionistic, and scientific. It is this attitude that is pervasive in EE research. Tilbury and Walford (1996) stated, "the dominant scientific paradigm and its narrow fragmented research focus can be blamed for the failure of researchers to ascertain why environmental education has not yet achieved its goals" (p. 52). Just as studies of individual components of an ecosystem may not help illuminate the nature of the ecosystem as a whole, research that seeks to quantify learning in EE disconnected from the circumstances of that learning may not contribute to the advancement of EE theory or practice.

The purpose of this study was to assess students' perceptions of the residential EE program at the New Jersey School of Conservation (NJSOC) and to develop a grounded theory for effective residential EE. Traditionally, visiting school coordinators and teachers have provided evaluations of the program, but these primarily address issues such as facilities, scheduling, and meals, rather than the quality of instruction. Students at the NJSOC have not, however, been systematically asked which sessions they thought were most meaningful, most confusing, or about which sessions they would like to learn more.

Method

Participants

Students from schools that participated in the NJSOC residential EE program between January and June 2004 constituted the study population. The participants of this study (N = 2,779) attended schools (N = 31) who participated in an overnight trip to the NJSOC and agreed to participate in this research. Most students attended public schools. Some were in special needs classes within those schools. We focused this study on the fifth to eighth-grade range because students in those grades constitute the majority of the NJSOC client base, and the age (10–14 years) of these students is representative for most NJSOC sessions. The study population comprised 687 (25%) fifth graders, 874

(31%) sixth graders, 887 (32%) seventh graders, and 331 (12%) eighth graders. We did not collect any data from schools whose students participated only in a day-trip program. We were interested only in the reported perceptions of students who experienced a residential program.

Research Questions

The study focused on three research questions posed directly to the participants:

1. What was the most useful or meaningful thing you learned during your time at the NJSOC?
2. What was the most confusing point of the trip? In other words, what do you still not understand?
3. Of all the things that you learned while at the NJSOC, about what would you like to learn more?

Instrument

A variation on the minute paper and muddiest point assessment techniques constituted the instrument in this study. Angelo and Cross (1993) described the minute paper as one of the most used and versatile feedback tools available for educators. The minute paper requires students to self-assess their knowledge and learning, making it both an assessment technique and a method of review. Minute papers are assigned at the end of a lecture or, as in this study, a school trip. Students are asked to describe the most important point of the class in just a sentence or two, taking no more than a few minutes to answer the question. The muddiest point assessment follows the same procedure but asks the students to recall the one or two most confusing or unclear points of the lesson (Angelo & Cross; Mosteller, 1989). This educational assessment is also a popular and effective way to quickly gauge learning in large groups (Chizmar & Ostrosky, 1998), making it ideal for this study.

Data Collection and Analysis

This study used a grounded theory approach to data collection and analysis to assess the content and presentation of the NJSOC residential EE program. The main benefit of using grounded theory is that the emergent theory is related to the perceived reality of the participants. This means the theory is based on what research participants perceive to be true rather than what the researcher assumes to be true prior to conducting the research. We also followed criteria for conducting and reporting EE research using qualitative methods of inquiry developed in a workshop sponsored by the North American Association for Environmental Education (NAAEE) (Smith-Sebasto, 2000).

At the conclusion of their residential EE program at the NJSOC, all students are routinely scheduled for a summation activity. At this time, the purpose of the study was explained to them and they were asked to provide answers to three open-ended questions about their experiences at the NJSOC.

The first step in a grounded theory methodology is data collection. Grounded theory specifies the way that data should be analyzed but not how it should be collected. Data may be collected by a variety of methods. This allows researchers to conduct a wide variety of research studies. Many grounded theorists rely on interview data, but any data collection method that generates accurate, rich, and descriptive data is appropriate (Charmaz, 2000).

As data collection is occurring, the researcher will undertake several steps (see Glaser & Strauss, 1967; also Charmaz, 2000, 2001; Dick, 2002; Strauss & Corbin, 1994) to sort the data into categories that form the basis for theory development later in the process. The researcher begins collecting and coding the data and analyzing them for dominant and recurring themes. These themes are fluid and often consist of notes and/or memos the researcher attaches to the datum. The heart of grounded theory is constant comparison (i.e., continuously looking at data and categories in order

to refine the areas to be studied and the ways data are grouped). Categories formed as memo themes are delineated or consolidated. The researcher may modify the interview procedure based on the data already collected and conduct further data collection to address additional questions generated during analysis (Strauss & Corbin, 1990). In this way, the researcher can narrow the field of research by collecting more data if themes or categories seem incomplete (Strauss & Corbin, 1994).

Data are then coded into several broad categories that are later refined as the researcher begins to make links between old and new data and between categories. There are three types of coding essential to grounded theory. Open coding is the first stage. It involves forming an impression of the main idea of each datum. During open coding, codes should emerge from the data and not from the literature. A literature review is conducted, however, as it becomes relevant to the emerging theory. Data are grouped and defined with preliminary labels. Category boundaries are defined during axial coding, the second step of coding in the grounded theory approach. Axial coding focuses on establishing relationships between groups of data and defining characteristics for each category. As part of this process, data categories are modified until each datum fits into a category. Selective coding, the third step of grounded theory coding, achieves a cohesive view of the data by defining a core category and an accompanying theory of how categories are related (Charmaz, 2000, 2001).

Once categories emerge, it is important for grounded theorists to ensure that any further data collected fit the evolving theory. This is done through theoretical sampling, further data collection aimed at exploring phenomena in the data, filling in gaps, or creating connections between categories (Strauss & Corbin, 1994). When the theory is complete and new data do not cause categories to be redefined, the theory has reached a state of saturation.

Comparisons should be made of data pertaining to individuals, between answers from the same individual, between responses and categories, and between categories, as well as between any other factors that seem relevant to the researcher (Charmaz, 2000). Many researchers perceive grounded theory to be a linear progression, but the process is actually very circular (Peine, 2003). A theory evolves as relationships between categories do; the final theory illuminates the importance of each category. The theory generated in this way is based on the relationships between categories and circumstances. It can be either substantive, describing a specific phenomenon, or formal, describing a general or universal phenomenon (Merriam, 2002). The theory can then be verified through a variety of procedures, including validation by respondents, by coworkers of the researcher, or by the applicability of the theory to the greater population (Tilbury & Walford, 1996).

Findings

The grounded theory analysis in this study resulted in the emergence of five main categories of responses: recreational, safety, scientific, social, and trip.

The recreational category encompasses responses that focused on physical activities that are not explicitly related to knowledge about the environment or environmental issues and/or problems. This category consists of activities that emphasize enjoyment or exercise, such as archery, boating, or cross-country skiing.

The safety category encompasses responses that focused on skills or knowledge related to self-preservation in the outdoors. This category consists of topics such as survival, orienteering, wilderness safety, and preparedness.

The scientific category encompasses responses that focused on factual or conceptual knowledge of ecological processes, historical information, scientific processes, or creative skills. Social sciences and humanities fit into this category because of their focus on aspects of environmentally responsible

behaviors or awareness of nature. This category included more sessions than the other four categories and included diverse topics, such as wildlife ecology, colonial American history, conservation, water ecology, entomology, sensory awareness, and geology.

The social category encompasses responses that focused on personal and group skills generally unrelated to the environment. This category focuses on interpersonal aspects such as teamwork, friendship, cooperation, trust, respect, and communication, as well as character attributes such as self-confidence, courage, self-esteem, self-respect, perseverance, and independence.

The trip experience category encompasses responses that focused on phenomena that are related to the purpose or implementation of the NJSOC program or are related to unstructured time or nonsession topics, such as meals, scheduling, and layout. This category is the only category that was not described by frequency of answers relative to sessions offered because of the difficulty of establishing the relative impact of unstructured time.

Research Question Domains

Each question was analyzed separately after the central categories had emerged. Domains were defined based on the ways or reasons that the students responded to a specific question. Only answers that were sufficiently rich to give a coherent idea of the rationale behind a response were considered in this part of the analysis. Responses often focused on more than one domain; therefore, the analysis of these data focused on the content rather than the frequency of response. Domains for each question are summarized in Table 1.

The domains associated with question 1 focused on how students learned about the most important thing they reported learning during their trip. Responses were clustered into three domains that mirror methods of learning: (a) affective, (b) cognitive, and (c) kinetic (Williams, 1983). Domains reflected how the student learned about recreation, safety, scientific, social, and trip categories: (a) they related to the category in a personal, emotional way, such as enjoyment; (b) they learned an important fact or concept; or (c) they learned to physically perform a skill. Each of the five categories in Question 1 contained examples of the four domains, but some domains were more frequent in certain categories. Scientific responses, for instance, were more likely to contain cognitive attributes than were social responses; recreation responses were more likely to contain cognitive kinetic attributes than were scientific responses. It was also interesting that many students felt a session was meaningful because they had accomplished something or learned a new skill. In all categories, some responses focused on a learned skill, such as catching animals, rowing a boat, or building a shelter. These kinetic responses demonstrate that students may attach importance to sessions that have concrete objectives.

For Question 2, we asked what students felt was the most unclear aspect of their NJSOC experience. The domains of question 2 illuminated why students were confused about sessions or categories. Confusion was found to be generated by five domains of the experience: (a) affective issues, (b) the facts/skills, (c) the procedures of the trip in general, (d) the presentation of the material, and (e) the purpose. There were few affective responses to Question 2, but those that were provided focused on social and emotional issues that made students confused about certain topics, such as, "I still don't understand boating because the kids in my boat kept yelling at me." Question 2 also contained a large number of responses (n = 378; 12%) that expressed satisfaction with the program and indicated that nothing was confusing. Those responses were not included in the analysis, but presence of such data indicated that some students were generally satisfied with their NJSOC experience. For Question 2, students often did not distinguish cognitive facts and kinetic skills. We felt it was inappropriate to create separate domains, such as for Questions 1 and 3, because a complete and saturated domain was created when all such responses were grouped together as facts/skills.

Students were confused by the specifics of sessions, such as the facts and skills, which was expected. Unexpectedly, however, students were quite concerned with the purpose of specific sessions and the rules of the trip. We interpreted this to reflect the growing independence of fifth to eighth-grade students. The responses to purpose expressed two issues: students wanted to know why they were scheduled for one session instead of another and why sessions should be important to them. The former is easily remedied with better communication, but the latter may indicate that students need to be better informed of the learning objectives for specific sessions.

The procedures domain in Question 2 included many responses that concerned scheduling and rules. These responses, such as "The [confusing] fact was that we are not allowed to bring watches but we had to be on time" and "The most confusing part was knowing where to go next, like when to go to my activity or cabin," were mostly clustered in the trip category. Only a few students were confused about the procedures of the sessions. The recreation and safety categories contained no procedural responses.

The domains in Question 3 focused on what attributes of a session inspired students to name it as something about which they would like to learn more. This question elicited a large number of responses that only named a session or experience, making the specific domains harder to create than for the other two questions. Responses were primarily coded into domains similar to Question 1: affective, cognitive, enjoyment, and kinetic, but these domains were less strongly supported given the large number of nonspecific responses to Question 3. Again, the ratio of domains in each category varied, with affective responses being clustered in the social category, cognitive responses clustered in the scientific category, and kinetic responses associated with all categories.

In education, enjoyment and interest are closely linked with students more willing and able to learn topics they enjoy. The enjoyment domain contained responses that included key words or phrases, such as "fun," "cool," "awesome," and "great." These responses were not clustered in any one category, which demonstrates that students responded positively to fun activities and perceived many sessions at the NJSOC as enjoyable. Responses indicating enjoyment and fun were rare in Question 2, indicating that students did not necessarily attribute fun to sessions that were confusing. It is important to note that a response without specific mention of enjoyment indicated that the student's reason was not primarily based on fun, but did not indicate the student did not enjoy the session.

TABLE 1. Domains for Questions 1–3

Question	Domain
1: Most important	Affective
	Cognitive
	Kinetic
2: Most confusing	Affective
	Facts/skills
	Presentation
	Procedures
	Purpose of activity
3: Learn more	Affective
	Cognitive
	Enjoyment
	Kinetic

Attributing Sessions to Categories

After categories and domains were defined, NJSOC sessions were assigned, or attributed, to a category based on the content of student responses in reference to a session and on analysis of the objectives and content of the session. We assigned each session to a category in order to categorize responses that named only a session. When referring directly to wildlife ecology sessions, for example, most students replied that they would like to learn more about wildlife. These were characterized as scientific responses; therefore, a response such as "I would like to learn more about wildlife ecology" was also put in the scientific category. Only sessions with content found in the data were included in this analysis. Journaling, for example, was an activity assigned to all groups at three schools (42 groups), but no responses mentioned journaling, writing, or reflection, so the journaling activity was not included in this analysis.

Detailed responses were not attributed to a category based on the session mentioned but by the content of the response. A response stating it was important to learn about X in Y session, for example, would be attributed to a category based on X regardless of Y. The majority of rich responses concerning a session did fall into the indicated category, but some did not. A few students mentioned that they learned the importance of teamwork, for example, from a boating session. These responses were categorized as social rather than recreation. The vast majority of responses that referred to boating made no mention of teamwork, choosing instead to mention the athletic aspects. For that reason, boating was put into the recreation category rather than the social category. Many responses did not specifically refer to the rationale behind naming a certain session or topic, such as "The most useful thing I learned was orienteering" or "Water ecology was the most useful class at NJSOC." These responses were then attributed to the category into which the session was grouped.

Responses were attributed to a session by comparing the responses from a school with that school's schedule. We then tallied the session results of all schools (*sr*) and the number of groups that could have had each session (offered) during the study period. Responses thought to be inspired by a specific session were analyzed for relative frequency. To obtain this, we multiplied the number of responses by 100, for reporting ease, then divided by the number of groups experiencing a session ([*sr* × 100]/offered). It is clear that for each question, certain sessions were more influential than others.

Some responses were not attributable to a specific session either due to overlap in session content in the schedule or because responses addressed broad concepts rather than specific subjects. If, for example, a student participated in the wildlife challenge, beaver ecology, and saw white-tailed deer (*Odocoileus virginianus*) outside her/his cabin, and then responded, "I would like to learn more about wildlife," there was no way to tell which experience influenced her or his answer. A surprisingly large number of responses were not clearly attributable to any one session. For Questions 1, 2, and 3, out of over 2,000 responses to each question, 32%, 25%, and 23%, respectively, were nonspecific. This may reflect the wording of the questions or may suggest that students have synthesized individual sessions into their perceptions of the NJSOC experience.

Research Questions

Of the relevant sessions taught at the NJSOC, 1,069 (51%) were categorized as scientific, 447 (21%) were categorized as social, 337 (16%) were categorized as recreation, and 246 (12%) were categorized as safety. It was necessary to find relative frequency to control for the disproportionate influence of scientific sessions. We determined, from responses to Questions 1, 2, and 3, respectively, the relative importance of level of, confusion about, and interest in each cat-

egory by obtaining the relative frequency of responses (Figure 1). For the four major categories (scientific, recreation, social, and safety), we obtained relative frequency distributions for each category. When relating information about the trip experience, we could not compare frequency of answers to the other categories because the source was the whole experience. Trip responses were more prevalent, however, in responses to Question 2 than Questions 1 or 3, comprising 20% of all answers compared to 1% in Questions 1 and 3.

Question 1: Most Meaningful or Important

Students responded that the most meaningful aspect of their residential EE experience at the NJSOC was safety. This category had the highest relative frequency (352.44), followed by social (174.05), scientific (66.14), and recreation (44.87).

The safety category encompassed only three sessions: survival, orienteering, and a mountain-man night program. The responses to this category usually mentioned emergency situations and the need to survive alone in a hostile area or the ability to use a compass when lost in the woods. This indicates that students found the potential negative impact of wilderness to be more important than other aspects of wilderness.

This strong reaction to safety sessions is an important facet of the psychology of the student when attending a residential EE program because nervousness related to getting lost could over-

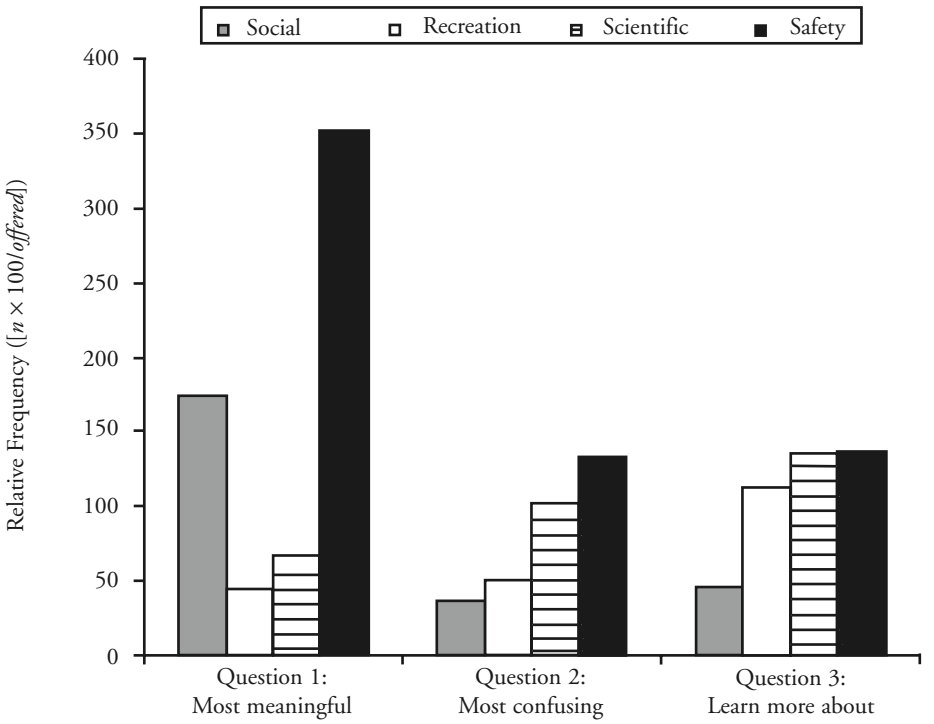

FIGURE 1. Relative frequency of responses in the four categories. Trip responses are not included because of the difficulty in determining the relative impact of unstructured time.

whelm her or him and hinder learning. EE studies highlight that fears in a natural setting are very real for students, and this affects their educational experience (Bixler, Carlisle, Hammitt, & Floyd, 1994; Simmons, 1994; Wals, 1994). Many students are not familiar with being in a forest and feel they need to protect themselves from the elements and animals. This makes safety sessions more relevant than academic or recreational sessions because the student perceives herself or himself to be immersed in an unfamiliar, and potentially dangerous, environment.

Students recognized that teamwork and confidence are important aspects of survival in the wilderness, making it initially difficult to separate safety from the social category. The social category was the second most meaningful category, according to the students' responses. These two categories were separated after much deliberation because we felt that the cognitive and hands-on aspects of survival and orienteering made them distinct from the primarily affective social category. The social category reflects a strong sense of team building skills and personal growth that is consistent both with the goals of the program at the NJSOC and the psychology of adolescent students. Team-building skills are an important aspect of the NJSOC residential EE program, as reflected by the frequency with which sessions involving these skills are taught. All students in this study, for example, took part in some form of the Action Socialization Experience (ASE) session. The stated objective of an ASE activity, as described on the NJSOC Web site, is a

> . . . problem-solving situation that stimulates immediate participation in the activity. These experiences encourage small groups of students to cooperatively decide on a solution to a carefully designed problem and then carry out their plan of action as quickly and efficiently as possible. Students have approximately 15 minutes at each station. As a result, the students realize that through communication and cooperation they are able to solve numerous challenges. (Montclair State University, n.d.)

Most schools' coordinators chose to include at least one climbing wall or confidence course session in a trip as well. Both sessions offer students the chance to challenge themselves, develop confidence, and learn to trust others. This social category also emphasizes the developing social nature of adolescents and the need for acceptance into a group that defines this age group (Slavin, 2003).

It is surprising that the scientific category was least relatively meaningful of the categories because the majority of sessions provided at the NJSOC are focused on ecological concepts or local history. The responses that identified scientific content were, however, generally richer in detail than the responses from the other categories. This may indicate that students perceived scientific sessions to be focused on specific knowledge. It is likely that the primarily cognitive aspects of these sessions were overwhelming to students or that they were unable to synthesize an answer that was short enough to meet our needs.

The more abstract concepts of conservation and natural processes are arguably less relevant to the students than sessions that focus on their immediate physical or emotional well-being. Maslow (1970) theorized that all humans have basic physical and emotional needs that must be met. The five basic needs are (a) physiological, (b) safety, (c) belongingness and love, (d) esteem, and (e) self-actualization. The preconditions for the basic need satisfactions are desires to know and to understand and aesthetic needs. Although, in common usage, Maslow's hierarchy is generally described in terms of his first five needs, he actually listed seven basic needs. It is clear that students at the NJSOC find it important to fulfill the five basic needs before concerning themselves with desires to know and to understand a cognitive need. In light of the relative importance of social and personal interactions reflected in these data, fulfilling

Maslow's three needs (i.e., belongingness and love, esteem, and self-actualization) may also be useful to create an atmosphere of teamwork and encouragement in more traditionally didactic sessions during, which the instructor is the primary source of information and students are given individual projects.

The relative frequency to Question 1 regarding the role of recreation activities in creating a meaningful experience was low (44.87). It is generally accepted, however, that when students enjoy themselves, they are more willing to learn. Recreation activities add enjoyment to the residential EE experience but were not shown in this study to be very important to students relative to the other categories. Recreation activities were also not shown to contribute any significant knowledge related to the environment that would correspond with the NJSOC mission statement.

The number of responses in the trip category of this question was extremely small (n = 28, 1%), demonstrating that some aspects of the trip, such as housing and hikes, were not deemed important. This demonstrates that the students were generally able to distinguish important learning events from the everyday details of the trip, such as housing or meals. The few trip responses to Question 1 focused mainly on the importance of hiking in the woods or participating in the NJSOC experience in general.

As a final commentary concerning Question 1, there is one session that we feel spans the scientific and safety categories and provides an interesting link between the two. Over the course of the semester, only one bear presentation was offered to students, yet almost every school group displayed knowledge and interest in black bears (*Ursus americanus*). How to be safe in bear country is mentioned in the opening orientation for all schools, and signs are posted around campus warning that black bears are present and potentially dangerous. Yet, students demonstrated more knowledge than these sources usually provide. One possible explanation for this may be that students ask teachers for more information about black bears, which are perhaps the most charismatic megafauna in the state. We hypothesize that this may also be because of the potential safety issues associated with bears. Many students responded that they learned or wanted to learn information about bear safety as well as about the habitat, behavior, and physiology of bears, indicating relevance to both the scientific and safety categories.

Question 2: Most Confusing or Unclear

The findings from Question 2, which focused on what the students perceived as the most confusing or unclear part of the NJSOC experience, revealed that safety topics were considered the most confusing. These sessions had the highest relative frequency (132.57), followed by scientific (101.87), recreation (50.15), and social (36.47). It is not surprising that scientific and safety sessions were most confusing because the content of those sessions is more detailed and cognitive than the content of sessions in the other programming areas. Orienteering, for example, specifically requires students to perform complex tasks involving spatial abilities and reasoning skills. Scientific sessions require students to think abstractly and scientifically about ecological processes.

Students between the ages of 10 and 14 years are in various developmental stages, with a clear physical difference between those students entering adolescence and those who are not. Developmental differences between individual adolescents are also present mentally and emotionally. According to Piaget's theory of development, most students between the ages of 11 and 14 are at the cusp of the formal operational stage (Slavin, 2003). This stage is characterized by the ability to think abstractly and to apply scientific findings to cognitive tasks. Students entering the formal operational stage are learning to apply logic to abstract concepts, to understand sarcasm, and to think metacognitively, meaning they are able to start thinking about the process of thinking.

This is in marked contrast to the concrete operational stage, during which students between the ages of 7 and 11 years are only able to apply logic to events they experience directly and are unable

to methodically solve problems or formulate solutions. These developmental stages are important to understanding research at the NJSOC because most students are between the ages of 11 and 14 years and are in various stages of development. It has been shown that there is a great range of individual differences in adolescents regarding the extent to which they develop formal operational skills. Many adults do not achieve proficiency with formal operations at any time in their lives. For this reason, students may not be cognitively ready to grasp some concepts that are taught in safety and scientific sessions.

In the safety category of Question 2, some students responded that they did not know how to do a task; for example, "The thing I didn't understand was how to make fire when you are trying to survive." Others were confused about the details of a session, such as how long a person can live without food or why a compass works. Safety responses focused mainly on orienteering, specifically on the use of the compass. It is interesting that many students felt they were unclear about the proper use of the compass, responding that "The most confusing point of the trip was orienteering because I didn't understand how to use a compass" or "The most confusing part was using the compass because I still don't know how to find my way back if I was lost." Some students were confused about specific aspects of this skill, such as setting or reading a bearing, but others expressed general confusion.

It is possible that students felt the skill is too complex to be grasped in a 2-hour session and, therefore, that they lacked sufficient proficiency to navigate in the woods. Yet, orienteering was found to be meaningful in many Question 1 responses. Some students, in fact, found orienteering to be meaningful but also responded that it was confusing because they weren't sure if they were doing it correctly. In this case, better communication from instructors regarding the goals of this introductory session may improve students' attitudes toward orienteering and their understanding of the session content. Further instruction, such as optional activities using a compass or incorporating some compass activities into other sessions, would allow students to gain greater proficiency and feel less confused.

Analysis of responses to Question 2 in the scientific category also revealed that students were confused by complex concepts, such as the interactions between people, the forest, and wildlife—concepts that are also not easily explained in a 2-hour session. It is interesting to note that, much more so than for other categories, some responses within the scientific category revealed curiosity about and knowledge of a subject. In fact, many responses gave examples of retained information from a session before stating a confusing point, such as "I do not understand why beavers get kicked out of the lodge when the mother is nursing the kit" or "How can salamanders lay such big egg sacks? They are about seven times bigger than the salamander. I saw the egg sack in herpetology." These responses illustrate that the student had retained specific concepts from the session, such as that beavers nurse kits in lodges or that salamanders lay large egg sacks. The students in these cases seem to be actively pursuing further knowledge based on those concepts they learned in the NJSOC session. In this regard, the frequency of scientific responses to Question 2 does not necessarily imply negative perceptions of a session or reflect critically on the content of a session.

Some responses did, however, indicate that students were genuinely confused by the amount of material and/or the complexity of it. It is clear from the data that a large number of students were confused by tree identification, for example, a conceptual skill generally taught in the forest ecology session. Identifying trees often involves using a dichotomous key, which has been observed by NJSOC staff to cause confusion for some students. We believe the skills needed to use the key, such as reading an outline, identifying distinguishing features, and visual comparison, are too advanced or complicated for some groups of students.

The social and recreation categories had low frequencies of responses to Question 2 relative to the times they were offered. We interpreted this finding to indicate that these sessions were not very confusing to students compared to safety and scientific sessions. Most responses in the recreation category expressed confusion about one specific aspect of a skill, such as how to row a canoe in a straight line or how to improve aim in archery. A few students were critical of the presentation of recreation activities, for example, stating, "The most confusing part of the trip was learning how to canoe. They just put us in the boats and sent us on our way. I would like to know different strokes and maybe do some canoe challenges, games or races." Other responses recommended that boating orientations and archery be more detailed and that the instructors should teach more techniques. NJSOC boating orientations are frequently short and focus on rules rather than skills in order to maximize recreation time. Confusion about the physical skills needed to participate in recreational activities could also be a result of the students being introduced to a new skill and not being given the time to practice to proficiency.

Social responses to Question 2 were primarily concerned with how to accomplish a goal of a session. Some students stated that some of the teamwork tasks were difficult and confusing because their team did not work together well. Many students wanted to know how to complete an ASE problem that they were unable to solve, responding, "I don't understand how the volcano challenge was to be accomplished" or "The most confusing point of the trip is how to get to the other side of the rope by pushing against each other on the confidence course." It is the opinion of NJSOC educators that students should not be told how to solve the problem, so that they continue to think about it after they have left the session. Some responses in this category also focused on the purpose of activities as they relate to nature and the environment.

Students gave many responses to Question 2 that asked specifically about topics that are not attributable to a specific session or activity but rather to the details of their trip to the NJSOC (n = 451, 21%). These trip responses were focused on scheduling, housing, trails around the NJSOC, the rules of the facility, and those of the visiting school. During the initial coding phase of data analysis, this category was most fully expressed in Question 2, with few responses in either of the other questions. We felt we needed to include responses such as "Why we couldn't pick our own activities to do. It would [motivate] you to learn more if, like, you have wall climbing but you really wanted to do ecology" or "I still don't understand why so many people abused their opportunity to enjoy the environment around them" in order to represent all participants' views of the experience.

The trip category mostly revealed that students wanted to know why they were in a session, participating in the trip, or doing a non-session activity. There were also many responses that asked why cabins were so far apart, why the showers were not in the cabins, and/or the procedure for getting food in the dining halls. Most of these responses, such as "I don't understand how come you can't do the wall and cable bridge" or "I still don't understand why we can't bring cell phones," indicated that students were confused about the reasons for activities, procedures, and rules. These can likely be remedied through better communication between the visiting schools' staff and students.

Students also expressed confusion about the layout of the NJSOC in Question 2. Responses such as "I still don't understand how to get to different parts of the [NJSOC], it [was] confusing" or "The most confusing thing is to find your dorm at night" indicated that students thought it was confusing to find their way around in the forest and/or on the NJSOC campus. The NJSOC sessions-description Web page for coordinators lists eco discovery as a session that allows students to purposefully explore the campus upon arrival. The description for this session states that students learn better when they feel comfortable in a place, yet few schools choose this activity as part of their program. Judging from the number of responses (n = 91,

20% of trip Question 2) that indicated students were confused about the layout of the campus, stressing the importance of this session to coordinators could alleviate some of the anxiety students feel about not knowing where they are.

A number of these trip responses questioned the purpose of the trip to the NJSOC, which indicates that some students are not being adequately prepared regarding the rationale behind their participation in residential EE. Responses, such as "I still do not understand why you took us on this trip and what the other activities teach you" or "Why it was so important that we went on the nature hike," revealed that students had questions about the overall importance or purpose of participating in the residential EE program at the NJSOC. Other students were confused about the purpose of specific sessions, but these responses are included in their respective categories. It is vitally important that a student be an active and informed participant in the learning process. These responses indicate that this may not be happening for all students who participate in residential EE at the NJSOC.

Question 3: Learn More About

The responses to Question 3 were more evenly distributed across categories than either of the other two questions (Figure 1). Two of the four categories, scientific (136.99) and safety (135.55), were almost equal in relative frequency, and recreation (111.87) sessions were frequently mentioned as something about which students wanted to learn more. This also confirms the observation that some responses in Question 2 reflect curiosity and a desire to know more specific information. The social category was much less frequently (45.41) named as an aspect of the NJSOC experience about which students would like to learn more.

Responses to Question 3 were generally less specific than those to Questions 1 or 2, with many students simply naming a session or topic. Those students who did provide a lucid answer frequently wanted to expand their knowledge of a topic or clarify some confusing point, such as "I would like to learn more about bears. We briefly learned about them but not a lot" or "I would like to learn more about orienteering because I don't really get it." It is interesting that Question 3 contained responses that related both to Questions 1 and 2, though these questions are antithetical. In fact, some responses contained the same topic in Question 3 and Questions 1 or 2. Some students were interested in a subject because it was meaningful, for instance, whereas others wanted to learn more because they were still confused regarding a subject.

That the social category was mentioned less frequently as something about which the students would like to learn more is surprising in light of the obvious importance that students attached to safety and social skills in Question 1. Students were obviously not interested in learning more about ASEs, the cable bridge/confidence course, or the climbing wall. The responses to this category in Question 3 seemed to be less specific regarding the motivations behind wanting to do more social activities, with many students giving examples, such as "I would like to learn more about the climbing wall" or "I would want more confidence." This may suggest that students feel social topics are sufficiently addressed at the NJSOC. More likely, students do not associate the development of social relationships with formal learning. The low relative frequency of social answers to Question 3 is understandable if social topics are not perceived as something to be learned, but rather a trait to be developed individually.

As the relative frequency of the social category decreased from Question 1, relative frequency of responses corresponding to scientific topics increased from Question 1. Many of the responses in the scientific category of Question 3 were related to wildlife, such as "I will like to learn more about the animals and bugs" or "I would like to learn more about the different kinds/types of animals in the woods and how to find them." Many of those were not attributable to a specific session, usually

because the student had more than one session that discussed wildlife. Deer (*Odocoileus virginianus*), amphibians, and birds are abundant in Stokes State Forest, and it is likely the presence of these animals reinforced what was presented in wildlife sessions.

This reinforcement could have fostered more intense curiosity about wildlife, which might explain the interest in scientific sessions. The dichotomy between the interest in the scientific category and how important students perceived it to be may also be explained by a difference in relevance. Students were obviously no more interested in safety topics than in scientific sessions, but they felt that safety skills were relatively more important or meaningful, probably because personal safety in the wilderness is more important than any other knowledge or skill.

The number of responses that were considered related to the trip experience was small in Question 3 (n = 21, 1%), indicating that students were more interested in the content of the sessions than the facility at which they were taught. Site specificity is inherent in any case study, but the extremely low number of students who wanted to know more about the NJSOC as a facility may indicate the findings of this research are more generalizable than they would be if curiosity about the NJSOC were high, as would be indicated by a large number of trip-related responses to Question 3.

EE Concepts

Most students demonstrated knowledge related to a part of the NJSOC mission statement, indicating that the NJSOC is effectively educating students about the environment. All three questions received responses that correspond to one of the three attributes that the NJSOC seeks to promote in its students. Regarding, for example, the mission components (a) knowledge about Earth system processes and human effects on those processes, (b) environmentally responsible behavior, and (c) self-confidence, we obtained responses such as "[I learned] that animals, people and everything else need the forest and we can help 100% in our home. We need to protect and respect our forest" and "[I learned] to take care of the world and not use so much water or electricity to prevent acid rain" and "I learned that self confidence is important because then you don't have as much fear and you can get things done."

Responses also indicated that EE at the NJSOC succeeds in achieving the first two goal levels identified by Hungerford and Volk (1990). Students showed definite knowledge of ecological concepts and conceptual awareness. It is unclear whether this experience increased students' abilities to evaluate and act on environmental issues and problems, the two higher order goals of EE. Based on the importance of increased confidence and teamwork skills reflected in Question 1, it is likely that students have developed these skills and will hopefully use them for environmental purposes.

A Grounded Theory for Residential EE

Based on these findings, we offer the grounded theory that effective residential EE (a) ensures that students' safety and social well-being needs are met before engaging them in scientific or even recreational sessions; (b) is more efficacious when the program is presented based on a learner-centered model of content and skills selection and delivery and not an educator-driven, top-down approach; and (c) recognizes that students are often receptive to learning more about an environmental issue or problem they find confusing or developing a skill they initially find challenging.

Further Research

This study was based on a grounded theory analysis of the perceptions of the NJSOC program from students' perspectives. It was the goal of this study to provide insights into how students per-

ceive various aspects of their residential EE experience. Further research can use these findings in program development by incorporating the identified categories into research using both qualitative and quantitative methodologies. Future studies could also focus on the effects of student participation in scheduling, for example. This study indicates that many students were confused concerning the purpose of their sessions and, in some cases, the trip in general. If students were allowed to make informed decisions about their sessions, they might be more involved and interested in the experience.

As U.S. students become more sedentary, urbanized, or enamored of technology, they also become less familiar with nonhuman-dominated areas. It is not surprising that students may feel anxious at residential EE centers. Little reported research in EE has focused on the efficacy of programs at sites with which students are familiar versus those with which they are unfamiliar. Students may benefit from repeated visits to a facility; research about the effects of geographic unfamiliarity on students' experiences may also lead to more user-friendly facility design and customer service.

More research into how students learn about the environment is also necessary. The grounded theory methodology could be used for evaluating individual sessions or topic areas, thereby allowing educators to modify sessions to better engage students in learning. Grounded theory is a process of building theory from constant comparison of data collection methods and data analysis results. We hope that further studies will use the categories formed in this study to improve the theory underlying NJSOC programs.

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