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The Development of Conservation Behaviors in Childhood and Youth

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Abstract

With a focus on childhood and adolescence, this chapter seeks to understand how people come to act responsibly on behalf of the environment. It begins with a brief overview of selected theories related to the development of agency and the motivation to act as a framework for research reviews in three areas of young people's experience: informal play and exploration in nature; environmental education programs in schools and in the field; and wilderness experience programs. The chapter compares research results in these areas with the goal of understanding the types of experiences that prepare young people to take action for the environment, considers how these results correspond with processes that would be predicted by developmental theory, and distills recommendations for the design of school-based programs, wilderness adventure programming, and the design of communities that facilitate free access to nature. Directions for future research are suggested.

Key Words: children, youth, environmental behavior, environmental education, place-based education, significant life experiences, wilderness adventure

The Goal of Action for the Environment

To build a body of knowledge in conservation psychology that can be effectively applied to the solution of environmental problems and the protection of natural areas and biodiversity, it is essential to understand why people take actions that impact the environment for better or for worse, for it is human action that creates problems or contributes to solutions. Therefore, this chapter reviews research that investigates how children and youth develop active care for the environment. It focuses on three areas of young people's activity where behavior outcomes have been assessed: informal play in natural areas, environmental education programs, and wilderness adventures. It seeks to understand the experiences that encourage young people to show care for the natural world and choose sustainable behaviors.

According to the Tbilisi Declaration of UNESCO (1978), the ultimate objective of environmental

education is to enable students to work toward the solution of environmental problems. Agenda 21, the United Nations blueprint for sustainable development, gave children and youth the status of major groups who need to be involved in participatory processes to achieve sustainability (United Nations, 1992). According to the UN Convention on the Rights of the Child, which defines a "child" as anyone under 18, children's basic rights include access to education for respect for the natural environment and a voice in decisions that impact their lives—which are understood to include decisions that impact their environment (United Nations, 1989). In each of these international agreements, informed action is an essential objective.

Leaders in environmental education and children's rights have further defined this goal. Echoing Dewey's (1938) emphasis on learning by doing, Hart (1997) observed that children learn democracy

by practicing it. He argued that they learn most effectively in their local communities, where issues are visible and meaningful, where they can see the effects of their actions and gain a sense of belonging by feeling valued for their contributions. Jensen and Schnack (1997) have elaborated the concept of “action competence,” when young people choose individual and collective actions after critically investigating the causes of problems and effective solutions. Stapp, Wals, and Stankorb (1996) advocated similar processes of action research and community problem-solving, which enable young people to participate in planning, implementing, and evaluating activities to improve their school and community environments, learning in this way that they can be forces for constructive change.

McLaren and Hammond (2005) noted that education for action can proceed in three ways: learning *about* action through simulations, role-plays, case studies, the history of famous conservationists, and the practice of action skills; learning *through* action when students undertake projects with tangible outcomes in the real world; and learning *from* action when they review their experiences from either of the previous approaches, reflecting on the meaning for themselves, their roles as citizens, and future strategies to effect change. While all three approaches complement each other, McLaren and Hammond argued that trying to effect change in the real world, supported by wise teachers and mentors, provides a level of practical experience and preparation for citizenship that cannot be gained in any other way.

This chapter’s focus on action does not mean to imply that knowledge, feelings, and beliefs are unimportant. Research with adults indicates, however, that the relationship between what people know and feel and what they do weakens as pro-environmental actions become more costly and difficult (Gardner & Stern, 2002). Twenty years ago, Hungerford and Volk (1990) took environmental educators to task for assuming that if they conveyed information about the environment, it would follow that children would develop pro-environmental attitudes and take responsible actions. The antecedents of action, they noted, are more complicated. Yet when Zint (in press) prepared her recent review of evaluations of environmental education programs published in peer-reviewed journals, she found that only 10% of the studies measured behavior. The rest measured knowledge, values, attitudes, or the acquisition of skills, as if positive gains in these areas were sufficient. Reviews of gardening

programs (Blair, 2009) and wilderness adventure programs (this chapter) for young people show a similar emphasis on knowledge, attitude, and skill outcomes rather than behavior outcomes.

Part of the explanation for this imbalance may be that knowledge, attitudes, and skills are easier to measure. Ideally researchers would be able to observe what young people do over time—but very few studies attempt this kind of longitudinal tracking. Instead, young people are asked to report what they do or whether they intend to take pro-environmental actions, or teachers or parents are asked what they observe young people doing. As well as being less reliable than direct observations, these measures often fail to include a long-term follow-up, so that there is no way of knowing how lasting these behaviors may be. Although this review highlights studies that involve direct observation or long-term assessments, it also addresses this issue by beginning with research that works backward, identifying adults and youth who exemplify the type of engaged action for the environment that the Tbilisi Declaration and Agenda 21 advocate, and asking them about their formative experiences. It then compares the results of these studies with experiences associated with the development of pro-environmental behaviors through environmental education and wilderness programs. The ages investigated range from early childhood through late adolescence.

Agency and Motivation for Environmental Action

Figure 28.1, “Factors Associated with Action for the Environment,” synthesizes the results of studies with both child and adult samples that identify factors that predict pro-environmental behaviors (adapted from Chawla, 2009). Influences on action include two forms of knowledge: direct experience through immersion in the natural world or learning how to protect it through trial and error; and secondhand information about environmental issues and problem-solving from sources such as books, films, or other people’s instruction and stories. The figure also shows that a sense of efficacy to achieve valued goals is crucial, which people gain when they discover that they can have an impact on the world, working either alone or in groups. Just as positive experiences in nature feed a motivation to protect the natural world, satisfying experiences in the course of taking action fuel engagement. People are drawn to act because they come to care for intrinsic qualities of nature, particular places, or the well-being of people who are affected by the environment.

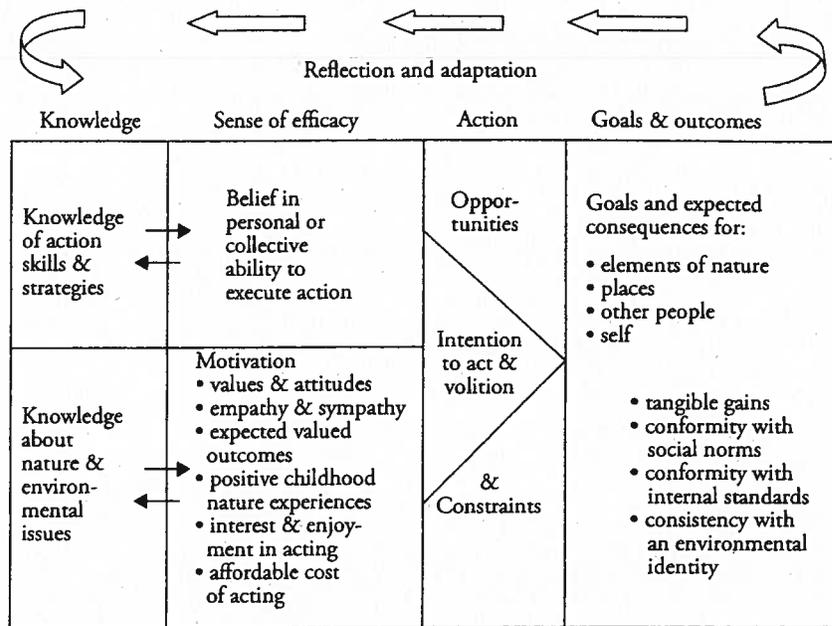


Figure 28.1 Factors Associated with Action for the Environment from Chawla (2009).

because they internalize social norms of environmental responsibility, and because they develop an identity of connection to nature.

As a framework for understanding the associations that Figure 28.1 summarizes, this review is guided by principles of ecological psychology (Heft, 2001, this volume) and social learning theory (Bandura, 1997) related to the development of agency and motivation. The ecological psychology of James Gibson (1979), Eleanor Gibson and Anne Pick (2000), and Edward Reed (1996a, 1996b) is a particularly well-suited foundation for the study of children's developing relations with the environment, as it directs attention to the qualities of places that children encounter and the social contexts of their experiences. Grounded in the evolutionary theory of Darwin, it is consistent with underlying principles of the Tbilisi Declaration and Agenda 21: that human beings depend on well-functioning ecosystems for survival; that they can discover the environment's resources and limits through direct perception as well as instruction; and that they can adaptively adjust their behavior. Its concept of affordances (the potentials for action that the environment provides a living creature relative to its capabilities), as well as a belief in intrinsic value and meaning in the environment, can be applied to children's encounters with nature and help explain why people who take action on the environment's behalf often have an early history of free play and exploration in nature (Chawla, 2007).

Although ecological psychology emphasizes how children learn from direct experiences of the world, Reed (1996a) described how these encounters are influenced from infancy by other people. A key mechanism is joint attention, when children turn their attention to features of the world that other people are noticing, and later begin to control attention themselves by pointing and naming things. In the process children learn what people around them consider worth noticing and how they appraise it, and they find their own spontaneous interests either encouraged, reprimanded, or ignored. Thus a nearby natural area can be a place of fascination that a family explores and appreciates together, a scary place that children are forbidden to enter, or something barely noticed as children ride by in the family car.

These principles are consistent with the social learning theory of Bandura (1997), who marshals evidence to the effect that people develop a sense of efficacy most effectively when they have opportunities to practice action to achieve valued goals, they experience for themselves how the world responds to their efforts, and they taste at least some measure of success. One reason why play in nature may figure so prominently in the memories of people who show care for the environment is that natural areas are places where children can set challenges at levels they choose for themselves and enjoy the effects of their actions: new vistas, for example, as they climb higher and higher in a tree or blaze a

trail through a woodland; shifting currents of water when they build and breach a dam across a creek; the snug enclosure of a hut that they construct from branches. Bandura described how children also learn from people around them when they see others take action and succeed, and when they are coached and encouraged by others—processes elaborated by Vygotsky (1978) in his concept of the “zone of proximal development” and by Rogoff (1990, 2003) in her work on apprenticeship. As Heft and Chawla (2006) and Chawla and Cushing (2007) showed, this basic research on the development of competence and a sense of efficacy not only helps explain why children value nature play but also how they learn the skills and strategies of environmental citizenship. It is consistent with a study of Swedish teenagers and young adults by Ojala (2011) that found that pro-environmental behavior is associated with “constructive hope” that includes trust in one’s own ability to influence environmental problems in a positive direction and trust in other social actors.

Building on the work of Bandura (1997), Eccles and Wigfield (2002) have elaborated an expectancy-value model of achievement motivation, which can be applied to children’s developing motivation to care for the environment (Chawla, 2009). It identifies social interactions and cultural contexts that influence how children experience the world and how they integrate values and goals into their identity, with due recognition that children’s individual characteristics and capabilities impact how they interpret experiences and interact with other people. In the sections that follow, this chapter reviews what research shows about how children and youth learn to take action for the environment in different settings of their lives: in natural areas for free play and in schools, communities, nature centers, and wilderness programs. A concluding section synthesizes this research in the context of these theories of human development, seeking to create a coherent account of the conditions under which motivated action to care for the environment begins.

Play in Nature as a Foundation for Environmental Action

According to principles of ecological psychology, the environment contains so much information that we learn what to notice selectively and how to respond, guided in part by innate drives, such as hunger and thirst, but also by the examples and instruction of other people. Reed’s (1996a) concepts of fields of *free action*, *promoted action*, and *constrained action* are useful lenses for examining

how social contexts create the conditions for children’s experience of nature. When children head outdoors on their own to dig in the dirt, wade in creeks, or climb trees, they are enjoying *fields of free action* where they pursue their curiosity, learning in the process about values inherent in the environment. At the same time, they learn their own capacities for action. They may enjoy these adventures with their parents’ blessing, or because their parents are preoccupied with other matters and don’t have time or inclination to control where their children are or what they are doing. When home life is stressful, taking off for the woods may be a way to escape the adult world—but once there, a refuge full of intrinsic fascination.

When parents and other adults actively encourage outdoor play and make natural areas accessible, children operate in *fields of promoted action*. Family outings to a park, the gift of a butterfly identification book, permission to play in a wooded area during school recess: such forms of facilitation suggest to children that adults around them value nature. Fields of promoted action often combine independent discovery with social learning, including the type of joint exploring that Rachel Carson (1956) advocated in her book *The Sense of Wonder*, when a child and adult venture out together to look up at the sky, listen to the wind, feel rain on their faces, or observe the changing seasons. Although these outings provide opportunities to teach facts about biology, astronomy, or geology, Carson argued that the feelings attached to objects of discovery are the most important learning, whether they involve “a sense of the beautiful, the excitement of the unknown, a feeling of sympathy, pity, admiration or love” (p. 45). Similar shared learning can happen when children explore nature with playmates.

In his book *Last Child in the Woods*, Louv (2008) raised the alarm that, increasingly, children live in *fields of constrained action*, confined indoors and knowing nature secondhand, if at all, through images on a screen. Increasingly, they live in built-up urban areas. Under these conditions, nature becomes a socially mediated abstraction. As a Houston fifth grader explained when he was asked to draw a picture of “nature” and answer questions about it:

“Nature, it’s out there where the lions be. It’s out in the open. And lions be out there. Zebras. And all other things ’cause I seen it on TV. Channel 8. They showed nature and that’s all.”

Do you ever see nature yourself when it’s not on TV?
“Not really. Umm, not really.”

In this random sample of 50 students from five Houston schools, when students were given paper, crayons, and colored pencils and asked to “draw nature,” only 18% drew places in nature that they had personally encountered (Aaron & Witt, 2011). It may be that 82% drew imaginary places or said that they had no knowledge of nature because they had been taught that nature is “not the city”—and therefore not part of their personal experience—but these results are consistent with studies that indicate that contemporary children are contained indoors or within narrow outdoor ranges of free movement to a degree rare in previous generations (Clements, 2004; England Marketing, 2009; Karsten, 2005; Wridt, 2004).

Reed (1996b) advocated “the necessity of experience”: opportunities to engage with the world directly with firsthand, full-bodied encounters. These primary experiences enable children to make discoveries for themselves, and in the natural world, children encounter a dynamic, multisensory flow of information that is essentially infinite in its depth, diversity, and potential for discovery. It is a world of recurring patterns, yet one where nothing ever happens exactly the same way twice, so that every time children go out in the woods or down to a stream, they find a place that is reassuringly the same yet inexhaustibly new (Chawla, 2007). What is also unique about this world is that their human bodies evolved among these natural elements, which still form the foundation on which human existence depends.

A growing body of research indicates that free play outdoors and contact with nature can support children’s healthy development, including increased physical activity, more creative and collaborative play, better balance and coordination, better concentration and impulse control, and better coping with stressful events (Charles & Senauer, 2010). These are important reasons to ensure that children have access to nature, but if we think of healthy environments as interdependent systems that foster human well-being and, in turn, require human action to protect ecosystems and biodiversity, then access to nature should be evaluated for its impact on the development of environmental stewardship as well as its benefits for children’s health. The studies reviewed in the following section suggest that opportunities for free play and discovery in nature motivate pro-environmental behaviors, but they also suggest the importance of the social context in which these experiences occur. In Reed’s (1996a, 1996b) terms, they indicate the importance of

primary experiences in fields of both free *and* promoted action.

Significant Life Experiences of Environmentally Active Citizens

Associations between early experiences of nature and stewardship behaviors in later life have been investigated through three main research approaches: fixed-response surveys with random or representative samples, open-ended questionnaires, and long interviews. Although there are limitations to each approach, general consistency among results suggests that positive nature experiences in childhood are significantly associated with later caring action for the environment. The purpose of these studies was articulated by Tanner (1980), who reasoned that if citizen participation is essential to maintain “a varied, beautiful, and resource-rich planet for future generations” (p. 20), then it is important to understand the types of experiences that produce citizens who are committed to this goal.

An Extended Mixed-Method Research Program

This review begins with a set of studies that combine all three research approaches. To understand experiences that motivate environmental activism in eastern Taiwan, where rich biodiversity has been threatened by rapid economic growth, Hsu (2009) began by mailing questionnaires to activists to collect their memories of significant environmental experiences. A year later he conducted semi-structured interviews with the same subjects. He found a high degree of consistency between the two sets of responses. On this basis, he constructed a questionnaire that asked a new sample of respondents about the type of environmental actions that they engaged in and their frequency, and then asked them to write about experiences “that have affected you to take action to protect the environment” and to indicate their age at the time of events’ occurrence. He distributed this instrument to 40 educators and civil servants known for high levels of political activism on behalf of the environment. From their responses, he refined 17 categories of experiences that showed high inter-coder reliability. People’s most frequent response was experiences of nature in childhood (65% of the sample), followed by participation in environmental organizations, the loss of beloved natural places, the influence of friends, and experiences of nature in adulthood.

Hsu (2009) then created a fixed response survey with questions about these experiences and people’s

environmental behaviors, and sent it to a random sample of 430 Taiwanese educators and civil servants. Independent t-tests showed significant differences between respondents with high versus low scores for environmental action. Environmental activists were significantly more likely to report many experiences of nature in childhood, their college years, and adulthood, as well as more likely to identify books or environmental organizations as influences that impacted their understanding of the environment and how to protect it. Hsu's work is notable for the way that he progressed from open-ended questionnaires and interviews with purposive samples of activists, to a large fixed-response survey with a random sample of citizens with similar demographics, using careful checks on the reliability of his methods and analysis.

Surveys of Significant Experiences

The largest survey that compared childhood experiences with conservation behaviors in adulthood involved a random sample of 2004 respondents in the United States (Wells & Lekies, 2006). It asked four questions related to environmental choices: whether respondents recycled, participated in environmental activities like Earth Day, voted "green," or preferred to go outdoors for recreation. The strongest predictor of positive responses was whether people also stated that they engaged with nature before the age of 11 through hiking, camping, hunting, fishing, or playing in the woods or natural areas. "Domestic" activities associated with gardening were also positively related to pro-environmental behaviors, though not as strongly. (Respondents were not asked whether they had nature experiences after age 11.) Whether respondents said they were outside alone or with others as children was not predictive. This outcome is to be expected, because as ecological psychology observes, children learn about the environment both alone and with other people, and others can communicate appreciative, destructive, fearful, or neglectful ways of responding to the world (Gibson & Pick, 2000; Reed, 1996a).

In Germany, a survey of 1,243 10- to 18-year-olds compared students active in nature and environmental groups with students who were not. It found that the strongest predictors of a stated intention to protect nature, in order of influence, were the environmental behavior of parents, the behavior of peers, nature experiences, action-specific knowledge, and environmental knowledge from media (Bögeholz, 1999, cited in Bögeholz, 2006). In a Swiss survey of a representative sample of 1,004

adults, people who said that they took action for the environment through recycling, voting, signing petitions, and civic engagement at the local level were also likely to report a history of nature experiences and to say that they had these experiences before the age of 20 (Finger, 1993, 1994). In a mail survey of 822 randomly selected Iowa farmers, those who enhanced wildlife habitat on their land, compared to those who did not, were much more likely to say that in childhood they had a wild place where they went to be alone, hunted with family or friends, fished, and read nature books (Pease, 1992).

Using a measure of "environmental sensitivity" that asked people whether they had experiences of hunting, fishing, hiking, camping, or family vacations in outdoor settings sometime before the end of high school, as well as whether they engaged in these activities as adults, two mail surveys in the United States found a positive association between higher levels of environmental sensitivity and more self-reported action for the environment. This was the case when Sia, Hungerford, and Tomera (1985/1986) compared Sierra Club members and elder hostel participants who scored either high or low on self-reports of responsible environmental behaviors, and when Sivek and Hungerford (1989/1990) did random surveys of members of the Sierra Club, Trout Unlimited, and the Wisconsin Trappers Association.

Kals, Schumacher, and Montada (1999) proposed that people are more likely to state a willingness to commit to pro-environmental behaviors if they have developed an emotional affinity toward nature, in the sense of a love for nature and feelings of safety and oneness in it, as well as an interest in nature and feeling of indignation at its inadequate protection. Their hypothesis was confirmed by a survey of 200 men and women who were representative of the general population of Germany and 80 active members of nature protection organizations. The survey also showed that affinity, interest, and indignation were all predicted by more frequent time spent in nature in the present and the past, as well as the accompaniment of significant companions. In childhood, significant companions in nature were family members. Having past experiences in nature with family members was positively correlated with a willingness to commit to private behaviors on behalf of nature, such as installing solar panels or water flow regulators at home.

To understand the importance of contact with nature for young people themselves, Müller, Kals, and Pansa (2009) used similar measures with 403

15- to 19-year-olds in Germany and Lithuania. Each sample was divided between urban and rural environments. Only emotional affinity toward nature and awareness of environmental risks predicted a willingness to commit to protecting the environment, but contact with nature correlated significantly with each of these measures. Given the strength of the association between emotional affinity with nature and a stated willingness to commit to its protection, the researchers concluded that it is important to promote experiences that contribute to this sense of affinity, including frequent positive contacts with nature that begin in childhood and youth.

Open-Ended Questionnaires and Interviews

In addition to fixed-response surveys that examine relationships between childhood experiences and adult behaviors or feelings, there are a number of retrospective studies that use open-ended questionnaires or interviews to ask people about the sources of their "decision to choose conservation work" or "environmental science," their "dedication to the field of environmental education," their "practical concern" for the environment, "environmental sensitivity," "environmental interests," or "commitment to protect the environment." A strength of these studies is that they involve people with demonstrated records of commitment to environmental protection, evident through environmental careers or a personal history of activism. These objective records are a stronger and more valid measure of behavior than the self-reported actions or intention to act on which surveys typically rely.

Two studies of this kind involved comparison groups. One contrasted 51 people engaged in environmental professions or the study of natural history with 10 people who stated that they had no interest in the outdoors or environmental activities (James, Bixler & Vadala, 2010; Vadala, Bixler & James, 2007). The environmental group reported playing as children in wild areas or "interstitial places" like woodlands and waterways near home, exploring the outdoors, building forts and play houses, and having parents and peers who encouraged their interest in nature. All 10 people in the contrasting group reported either no significant outdoor experiences in childhood or negative experiences. A study in Japan contrasted 188 directors of Nature Game groups, which seek to increase public knowledge and awareness about the environment, with 25 ordinary citizens in a Tokyo community center (Furihara et al., 2007). In workshops,

people independently filled out open-ended questionnaires about their environmental behaviors and experiences that influenced their environmental attitudes or actions. The Nature Game directors were significantly more likely than the community center members to say that they were influenced by nature experiences and to say that these experiences occurred in childhood, although they reported many influential nature experiences in adulthood as well. When 12 respondents who were particularly involved in civic action for the environment were selected for follow-up interviews, all 12 described extensive nature experiences in childhood, followed by adult experiences that triggered or progressively deepened their activism. On this basis, Furihara and colleagues distinguished "fundamental experiences" of nature in childhood from "direct influences" on action in later life.

Most retrospective studies lack comparison groups and simply ask conservationists, environmental educators or environmental scientists to identify life experiences that have led to their vocation. Studies of this kind began when Tanner (1980) sent staff at conservation organizations in the United States a mail survey with an open-ended question about influences that led them to their choice of work. Out of the 45 who responded, all but one described positive childhood experiences in natural habitats. Other frequent responses were parents, teachers, books, and witnessing the loss of nature and wilderness. Interviews or open-ended surveys with conservationists, environmental activists, and environmental scientists in North America, Central America, and Scandinavia (Chawla, 1998, 1999; Farmer, 2011; Horwitz, 1996; Sward, 1999; Wright & Wyatt, 2008) echo these findings, with experiences of nature in childhood and youth the most common response, often with mentors like family members or teachers. When Edmondson (2006) interviewed 20 African Americans who showed a strong connection to wilderness areas and their preservation, results were similar. All 20 talked about extended or intense experiences of nature in childhood or youth, and 13 also described mentors, most often a parent or grandparent.

Young people who are already active in environmental groups give similar responses. When high school students in Wisconsin were asked why they joined environmental action clubs or conferences, 14 out of 20 focus group participants and 61 out of 64 survey respondents referred to regular time spent in natural areas around their homes or schools (Sivek, 2002). They also identified role

models—most often teachers or relatives—and the impact of witnessing environmental destruction. Twelve 16- to 19-year-olds in Nova Scotia who showed environmental leadership were asked how and why they became leaders (Arnold, Cohen, & Warner, 2009). All 12 described time in nature, and all 12 said that their parents were open to their interests. Other sources of social support were friends, teachers, leaders of camps or environmental programs, and peers in environmentally themed youth groups and gatherings. When 63 adolescents who volunteered in a wildlife education program were interviewed, the majority said that their concern for wildlife arose from experiences of animals in early childhood, supported by adults who acted as role models or who showed approval for their interest in animals, and by instruction in wildlife care (Kidd & Kidd, 1997).

Working with 42 10- to 13-year-olds at an International Children's Environment Conference in Canada, Blanchet-Cohen (2008) used drawings and interviews to understand the basis of their commitment to the environment and how they expressed it in action. Although she didn't quantify results, she reported that almost all of the children spoke about experiences of wonder in special places, such as a boulder, a tree, or a beach. The children expressed their concern in a variety of ways, not only through initiating or joining the type of action projects that research has typically assessed, but also through art and writing, questioning existing practices, and maintaining their connection to their special place.

Peterson and Hungerford (1981) initiated studies that asked environmental educators how they developed their environmental sensitivity, interest, or concern. Among 22 environmental educators Peterson (1982) interviewed, 20 attributed their sensitivity to the environment to outdoor experiences in childhood and youth: outdoor play, family vacations, camping, hiking, hunting, fishing. Eighteen discussed role models, such as family members, teachers, and friends. Nineteen said that the interests that they formed during these early experiences led them to study the environment in college and seek environmentally related work. When James (1995) interviewed 50 environmental educators of African-American, Asian-American, Native American, Latino, and multiracial backgrounds about the steps that led to their career choice, these educators identified similar early influences. So did 24 volunteer marine docents interviewed by Peters-Grant (1986, reanalyzed by Chawla, 1998).

Palmer (1993) created a mail survey for environmental educators that included an open-ended question about experiences that led to their "practical concern" for the environment. When Palmer and colleagues used versions of this survey with environmental educators in nine countries, childhood experiences of nature were identified as a significant influence by more than half the respondents in the United Kingdom (Palmer, 1993), Canada, Australia (Palmer et al., 1999), and South Africa (Palmer et al., 1998). Experiences of nature either in childhood or adulthood were mentioned by at least half of the respondents in all countries except Hong Kong and Slovenia (Palmer et al., 1998). Other important influences were people, education, work, and—especially in Greece, Slovenia, Hong Kong, Sri Lanka, and Uganda—negative experiences such as pollution and tree clearing (Palmer et al., 1998).

These studies that lack comparison groups cannot determine whether experiences that characterize conservationists and environmental educators distinguish them from other people who are apathetic or opposed to environmental protection. It is noteworthy, however, that their results are consistent with studies that compare people with different levels of environmental engagement. Most studies indicate the importance of direct experiences of nature and environmental mentors in childhood and youth, but the results from Slovenia, Greece, Hong Kong, Uganda, and Sri Lanka (Palmer et al., 1998) suggest that in some cultures and contexts, other experiences such as witnessing environmental degradation may be stronger influences.

Processes of Development Through Significant Experiences

An advantage of open-ended surveys and interviews is that they can afford a view of what happens during formative experiences. When Chawla (2007) examined the accounts of environmental activists in Norway and Kentucky, she found that role models in childhood only occasionally gave direct instruction about the importance of protecting nature, but as Carson (1956) proposed, often expressed emotions of fascination and pleasure in nature or disapproval when nature was harmed. This is consistent with the way that young environmental leaders in Nova Scotia described their parents, as supportive of their interests but not "explicit teachers" (Arnold, Cohen, & Warner, 2009).

Chawla (1999), Horwitz (1996), Furihata and colleagues (2007), Hsu (2009), and Wright and Wyatt (2008) distinguished influences associated

with different stages of the life span. Life paths varied in different contexts, but all five studies found that experiences of natural areas and family members were major influences in childhood and adolescence. Other factors mentioned during this period were teachers, peers, youth organizations, and witnessing environmental destruction. During the university years and early adulthood, education, books, films, travel, student organizations, and friends helped solidify environmental interests and activism. In later adulthood, people increased their knowledge about issues and strategies for action through work or volunteer activities. In both early and later adulthood, nature experiences remained important, including the loss of valued habitats.

In their study of emerging natural history interests and vocations, James, Bixler, and Vadala (2010) proposed a model of environmental socialization. It begins with direct, socially facilitated experiences of nature during childhood play and exploration, and proceeds to environmental knowledge, skills, and hobbies that people begin to learn in more formal ways in middle childhood. In adolescence and early adulthood, people prepare for environmental work and volunteering. Together these experiences lead to the formation of an environmental identity that crystallizes in advanced education and skills, and in affiliation with other committed environmental professionals, amateurs, or volunteers. This sequence of experiences is consistent with Figure 28.1, "Factors Associated with Action for the Environment." It exemplifies a developing knowledge of nature that begins with informal childhood experiences and proceeds to more formal learning about the environment and environmental skills and strategies. This combination of informal and formal learning is associated with both a motivation to protect the environment and a sense of efficacy to do so—conditions that contribute to an environmental identity.

Opportunities to experience nature freely in childhood figure prominently in this model and almost all of the preceding studies—suggesting that concern over children's diminishing contact with nature is justified. Nevertheless, two further observations are evident. If people fail to have outdoor experiences in nature in early or middle childhood, all is not lost. Intense experiences of nature, inspiring mentors, supportive friends, and engaging organizations in adolescence not only reinforce early experiences but also appear to be able to compensate for missed experiences of early free play in nature, for the purposes of action. What emerges

are different paths into environmental action, although all involve direct experiences of nature in some way, at some time, as well as some form of social support. As a demonstration that childhood experience of nature may not be sufficient in itself if a supportive social context is lacking, Bixler, Floyd, and Hammit (2002) surveyed 1,787 middle and high school students in the United States and found that "wildland" play in childhood was sometimes associated with a preference for consumptive activities like riding off-road vehicles rather than nature appreciation.

With the exception of witnessing environmental degradation or the loss of a favorite place, the nature experiences that motivate action in all of these studies are positive. But Bixler and colleagues (1994) have documented that not all young people respond to nature positively. When they asked interpreters at urban nature centers to recall student fears during field trips, the interpreters described hundreds of reactions of fear and disgust. When Bögeholz and Rüter (2004, cited in Bögeholz, 2006) compared the impact of positively and negatively perceived nature experiences on intentions to take environmental action in a sample of 265 German 11- to 18-year-olds, negative experiences like nettles, mosquitoes, spiders, and snakes weakened the intention to take action. This impact was less, however, than the intention-promoting impact of positive experiences. These studies underscore the importance of role models who can show children how to use natural areas safely and move beyond reactions of fear or disgust.

In the literature on significant experiences, two studies stand out for their methodology of longitudinal observations and interviews. Blizard and Schuster (2004) documented children's reactions to the loss of a natural area near their elementary school in upstate New York. For many years, children at the school had the opportunity to play during recess in an adjacent natural landscape of woods and fields as well as conventional school grounds, and they used the natural areas intensively for fort building and creative play. A researcher was documenting these activities when one morning everyone arrived at school to discover that the owner of the adjoining land was having it cleared. The children were visibly affected, some bursting into tears and some becoming angry. The researcher explored their feelings in focus groups. Children talked about favorite activities and places that were lost, including favorite trees and rocks, and complained that now recess was boring and there was nothing to

do. Observations showed that the children were not, in fact, doing nothing during recess—but now they were more often chasing and wrestling each other. Highly imaginative, constructive play was lost with the woodland. The feelings of attachment to the woods and sense of loss that these children expressed may shed light on why subjects in other studies often remember a favorite childhood place in nature and loss of a beloved habitat as formative experiences.

Also working with young children, Owens (2005) did drawings and interviews at the beginning and end of the school year with first-year students in a village school and two urban schools, interviewed staff, and observed school practices, with a focus on the children's environmental experiences. She also did a case study of an eco-school. She found that students remembered and valued activities such as gathering autumn leaves, looking for animals, and planting a willow shelter, and when these memories were reinforced by a school ethos of care for the environment, the children expressed their concern to conserve the environment. Older students in the eco-school shared memories of positive experiences in nature with supportive practitioners, with memories extending back to their first year of school.

Strengths and Weaknesses of Significant Life Experience Research

Gough (1999) has charged that most studies of significant life experiences are irrelevant because they involve older generations, whereas contemporary young people have incomparable experiences and responses. As a consequence, she claimed, Tanner's (1980) original goal for these studies—that they may indicate how to foster an informed citizenry who will work actively for the protection of the environment—has no validity. Chawla (2001) defended the value of these studies, which now span several generations of respondents, noting that whether there are generational differences is an empirical question, and if they are occurring, it is important to document them and understand what may be lost and what may be gained as the conditions of children's lives change. In fact, empirical studies with young people yield responses similar to results with adult samples, although young people now talk about environmental youth groups that were not available to previous generations (Arnold, Cohen, & Warner, 2009; Bögeholz, 1999, cited in Bögeholz, 2006; Kidd & Kidd, 1997; Müller, Kals, & Pansa, 2009; Sivek, 2002). These studies with youth samples suggest that direct encounters

with nature, supportive family members, teachers, other mentors, and opportunities to participate in environmental organizations are experiences that remain influential.

Another caution related to this field of research is that it is composed of surveys, questionnaires, and interviews that rely on memory, and memory is fallible. Memory research shows that people are indeed often inaccurate about details of life events, but these studies of environmental experiences tap into the type of memories that are most likely to be valid: general accounts of events of personal importance that people describe under conditions of free recall, which were either routine (such as outdoor play in a special childhood place) or distinctive (such as a family camping trip to the Grand Canyon), and which are associated with emotions (Howes, 2007). Although people may misrepresent some details of these experiences, they are unlikely to falsely recall that they did these things. Methods that compare people's accounts with objective records or that cross-check their stories with family members or friends could address this issue. Background information gathered in this way, in turn, could be shared to prompt more fully developed memories.

A more fundamental issue is that people with different environmental values may reconstruct memories differently. People who have come to believe that the environment needs protection may be more likely to recall positive experiences in nature, role models of nature appreciation, and the other types of experiences that recur in study findings. People who ignore environmental problems or oppose environmental protection may forget if they had experiences of these kinds or discount their significance. To address this issue, longitudinal studies are needed that track environmental experiences and behaviors over time. Experiments could also be designed to expose young people to different experiences and then monitor their behavior.

This concern for what Neisser (1988) called the "verity" or accuracy of memory is legitimate, but it misses a special dimension of open-ended questionnaires and interviews: they seek to understand people's own construal of the experiences that motivate their actions. Neisser calls this the "utility" of memory as people interpret the past to apply it to the present and prepare for the future. It is, he claimed, memory's most important function. To understand how people construct the meaning of memories as they explain to themselves, as well as to others, the sources of their commitment to environmental

protection, this type of introspection is an appropriate approach.

In the Classroom and into the Field: Behavior Outcomes from Formal Programs for Environmental Learning

In research on significant life experiences, people mention “teachers,” “school,” or “education” as an influence on their environmental concern or choice of work in proportions that range from 6% among leaders of Nature Game groups in Japan (Furihata et al., 2007) to 59% among environmental educators in the United Kingdom (Palmer, 1993). In 15 out of 19 study samples that report this data, at least 20% of the respondents say that their actions for the environment were influenced by education in some way. This proportion is notable, but many more respondents mention positive experiences of nature outside of school. In the six studies that involved environmental activists, 65% to 100% say that they were influenced by outdoor play and recreation in nature (Arnold et al., 2009; Chawla, 1999; Hsu, 2009; Sivek, 2002; Sward, 1999; Tanner, 1980). Overall, the influence of formal education is small relative to all the categories of “free-choice learning” outside of school (Falk, 2005) that people refer to, including nature play and discovery, the shock of witnessing environmental destruction, outdoor interactions with family members and friends, participation in environmental organizations, and nature books or films. Nevertheless, formal education plays an important though qualified role in environmental learning, and according to the Tbilisi Declaration (UNESCO, 1978) on environmental education, its ultimate goal is to prepare the type of engaged citizens that people in these studies represent. Therefore, this section will review environmental education research with the goal of identifying the characteristics of programs that encourage conservation behaviors.

There has been a running debate in environmental education about whether, and how, education should influence behavior, most of it centered on whether behavior goals should be determined by curriculum designers and teachers and then shaped through behavior modification, or chosen autonomously by students. Authors such as Stapp, Wals, and Stankorb (1996), Hart (1997), Jensen and Schnack (1997), and Short (2010) have argued that societies require citizens who can independently analyze problems, make pro-environmental choices even when doing so challenges social norms, and work collaboratively to find solutions. Therefore,

education should cultivate autonomous decision-making as well as collective problem-solving. This ideal for education is consistent with the Tbilisi Declaration, Agenda 21, the Convention on the Rights of the Child, and the theoretical foundation that this chapter has adopted as its framework.

Earlier Reviews of Environmental Education Research

There have been several comprehensive reviews of outcomes associated with environmental education that this chapter can build on, by Leeming, Dwyer, Porter, and Coburn (1993), Zelezny (1999), Rickinson (2001), and Zint (in press). Together they cover peer-reviewed published articles from 1971 through 2008. Leeming et al. (1993) examined 34 studies published from 1974 through 1991 that evaluated changes in environmental attitudes, knowledge, or behavior associated with educational programs in classrooms, camps, parks, or nature centers. Out of the 27 studies that involved young people through grade 12 (age 17), only 4 evaluated behavior. When Zelezny (1999) searched publications from 1971 through 1996 for studies of the effect of educational interventions on environmental behaviors, 8 of the 18 studies she reviewed involved children and adolescents. For the period 1993 through 1999, Rickinson (2001) reviewed articles, books, project reports, and government documents that evaluated school-based environmental education, examining evidence of impacts on student knowledge, attitudes, behavior, perceptions of nature, experiences of learning, and ability to influence parents and communities. He identified five studies that related school programs to behavior. Like Zelezny (1999), Zint (in press) focused on evaluations of behavior change, covering articles in peer-reviewed journals from 1975 through 2009. Eight of the 10 articles she reviewed involved students below college age.

One striking observation about these successive reviews is that few studies have investigated the impact of school-based programs on young people’s environmental behaviors. Given the overlapping periods covered, the reviews identify a total of only 17 distinct studies that associate environmental education interventions in primary and secondary school with behavior outcomes. In their initial review, Leeming et al. (1993) noted the disproportionate research emphasis on student knowledge or attitudes rather than behavior, concluding that “this trend is most unfortunate because it is ultimately behavior change that is required to preserve

environmental quality" (p. 19). In her recent review, Zint (in press) calculated that out of the 64 outcome evaluations she identified, only 10% evaluated behavior. Another 10% measured changes in skill levels, with 80% focusing on knowledge, values, or attitudes.

Only one of these 17 studies documented observed behavior versus self-reported or intended behavior. The difficulty of measuring behavior may partly explain why researchers emphasize easier-to-measure knowledge, attitudes, and values. An early study by Asch and Shore (1975), however, demonstrated that behavior observations can be creatively designed. The study observed the behaviors of 24 randomly selected fifth-grade boys during a weekend visit to a nature center, comparing 12 who had two years of environmental education with 12 from another visiting class. Trained raters who were unfamiliar with the nature of the study noted whether the boys treated the environment responsibly or destructively while they were building a small shelter, making changes to a creek, fishing in a small pond, and planting a vegetable garden. On every task, the experimental group showed significantly more conserving behaviors and the control group significantly more destructive behaviors. The study did not control for possible confounding group effects, such as differences between schools, but it demonstrated that behaviors can be feasibly observed in settings that have ecological validity.

Leeming et al. (1993) noted other common methodological weaknesses in environmental education research, in addition to rare attempts to observe behavior directly or to control for group effects. Many studies used measurement instruments constructed specifically for one study, which makes comparisons across studies difficult, or instruments without established reliability and validity, and few studies controlled for experimenter expectancy effects by having a neutral person carry out the outcome measures, or by including long-term follow-up measures. Not only do long-term assessments lessen the likelihood that students will say what they expect experimenters or teachers want to hear, but they also determine whether experiences have a lasting impact.

Zint (in press) noted that some researchers responded to the review by Leeming et al. (1993) by using established valid and reliable measures, collecting follow-up data, and controlling for group effects. For future research, she recommended more mixed-method strategies that report both

quantitative and qualitative data, more case studies, and collaboration with stakeholders such as teachers, school administrators, or nature center staff to define outcome objectives that most relevantly reflect students' experiences and program goals, increasing the likelihood that research results will be applied. She also cautioned that it is critical to document how programs are implemented, noting that in two cases where this was assessed, teachers did not carry out all of the intended program activities and this information helped explain the low rates of change in student behavior.

In a similar vein, Rickinson (2001) observed that very few studies have closely examined actual processes of learning as they relate to outcomes. He recommended that learners be viewed as active agents rather than as passive subjects of educational treatments, and that in addition to understanding how students respond to different teaching approaches, researchers need to theorize the learning processes that take place. He pointed to theories of participatory learning, such as the work by Rogoff (1990) on learning through observation and participation in meaningful tasks. As noted before, Rogoff's work on learning through "apprenticeship" fits well within the theoretical framework of ecological psychology that guides this chapter.

Within the context of these observations about the existing research base, what do these reviews suggest about the characteristics of programs that are most likely to promote pro-environmental behavior? Zelezny (1999), Rickinson (2001), and Zint (in press) concluded that programs of long duration are more effective than short programs. Programs associated with increased pro-environmental behaviors range from a weekend of activities (Padua & Jacobson, 1993) to two years of environmental education instruction (Asch & Shore, 1975), with most programs lasting a week or more. Rickinson (2001) noted the importance of in-class preparation and reinforcement before and after fieldwork. In-class work extends the duration of a program as well as helping students integrate experiences. Students are also likely to report more environmental behaviors when they are actively involved in the learning process rather than passively receiving information (Leeming et al., 1993; Zelezny, 1999; Zint, in press). Successful programs include experiential learning during service projects, field trips, or the investigation of local issues. The following sections describe educational processes associated with positive behavior outcomes, in studies covered by these reviews and in more recent work.

Classroom-Based Curricula

What distinguishes the studies described in this section is that students work through a predetermined curriculum that is delivered primarily within school walls—although in successful programs associated with increases in pro-environmental behavior, in-class instruction is combined with activities that extend beyond the classroom. A water conservation unit evaluated by Aird and Tomera (1977), for example, gave sixth-grade students two weeks of instruction about water resources and the threat of pollution, at the same time as students were asked to monitor their own water consumption, report back to the class, and discuss how they could conserve water. At the beginning and end of the unit, students in this class and a control group listed what they believed they should do to conserve water and then underlined what they felt they really would do. Students who worked through the unit showed a significantly greater increase in intended conservation behaviors than the control group. Because the post-test was delivered right at the end of instruction, students may have been influenced by teacher expectations.

An evaluation of a similar but more extended curriculum by Hanson (1993) suggested that a combination of instruction and activities can have a long-term effect. Hanson compared 1,349 sixth-grade students who had worked through different numbers of units of an energy curriculum for kindergarten through sixth grade, which included a booklet of activities to do at home. Even six years after students completed a unit, the program showed a positive impact on students' energy knowledge, interest, and conservation behaviors. When Bogner (1999) assessed a year-long conservation education program for Swiss secondary schools that combined classroom instruction about the natural history of a local endangered bird with outdoor observations of the bird, constructing nesting boxes, and writing letters to Senegal, where the bird migrated for the winter, questionnaires administered a week before and four weeks after the curriculum showed that program students expressed a greater increase in their enjoyment of nature and intention to act in environmentally conscious ways than a control group.

Several curriculum evaluations show limited impacts on behavior. When Covitt, Gomez-Schmidt, and Zint (2005) compared 535 high school students in the United States who were in an environmental risk curriculum with 305 students in a control group, students who completed the curriculum

were more likely to say that they intended to take individual actions to reduce environmental risks. The curriculum had less impact on their intention to participate in collective actions, but a review of the teacher logs revealed that only 3 of the 28 classes enrolled in the curriculum had participated in all of the recommended activities, including a group action project. Thus the potential impact of the curriculum was not fully tested. Kumler (2011) found a similar failure to implement group actions in her assessment of a land use curriculum of about three weeks' duration in Michigan high schools. Under these conditions, the curriculum failed to affect how many environmental actions students said they had taken or could take, and with few exceptions, students listed what they did as individuals, such as recycling or picking up litter, rather than political actions or information sharing. Rovira (2000) compared students in Spanish primary and secondary schools that were more and less engaged in a global environmental education program. She found that primary school students were more likely to report pro-environmental behaviors than secondary school students, but overall, students' levels of self-report were determined more by whether they came from working-class or middle-class families than by their school's level of engagement. These results are similar to those found by Negev and colleagues (2008) when they evaluated environmental education curricula for 6th- and 12th-grade students in Israel. Sixth graders were more likely to report pro-environmental behaviors than 12th graders, but the curriculum had a modest effect on behavior relative to the students' social class and whether students reported having role models of pro-environmental behavior.

Issue Investigation and Action Training

The Issue Investigation and Action Training (IIAT) approach to environmental education comes out of the Department of Curriculum and Instruction at Southern Illinois University (Hungerford et al., 2003). It also combines classroom instruction with activities, but students often have autonomy in identifying the environmental issues that they want to investigate and address. The approach is grounded in a meta-analysis of factors associated with pro-environmental behavior (Hines, Hungerford, & Tomera, 1986/1987; Hungerford & Volk, 1990), which suggests that people are more likely to take action for the environment if they take ownership of an issue, gather knowledge about it, know action strategies that could address

it, and feel confident that they have the necessary action skills. Consistent with this model, students in an IIAT curriculum study environmental issues in depth and design responsive actions. The curriculum exemplifies a process for learning *about* action, in the terms of McLaren and Hammond (2005). It recommends implementing an action plan, but this is not a required part of the curriculum.

As an illustration of the IIAT approach and its assessment, Ramsey, Hungerford, and Tomera (1981) compared the effects on eighth graders of environmental action training with simple instruction for environmental awareness. The action class identified environmental problems and the value positions implicit in them, investigated the problems, learned problem-solving skills, and developed strategies to address two local problems in their school and community. Their teacher got actively involved in the process, encouraging the students' individual and collective problem-solving. The awareness class engaged in case studies of environmental problems such as endangered species or water management, investigated underlying issues and values, and identified potential solutions, but did not learn action skills or address real problems. Their teacher delivered instruction and information through conventional lectures and demonstrations. A control class had textbook-based science instruction. An open-ended questionnaire asked students to list actions that they thought they could use to help solve environmental problems, and then to list actions they themselves had taken.

The three groups did not differ on a pretest, nor did the awareness and control groups differ on a post-test at the end of seven months of instruction. In contrast, on the post-test the group that received action training showed significantly more knowledge of environmental action skills and significantly more self-reported pro-environmental behaviors than either of the other two groups. When parents were sent a questionnaire two months later that asked them to report environmental actions their children had taken during and after instruction, children in the awareness group were reported to take more actions for the environment than the control group, but the action group showed more pro-environmental behaviors than either of the other two groups. According to Hungerford and Volk (1990), Ramsey conducted an unpublished follow-up three years later by sending interviewers to the high school where the original study participants had transferred. Without knowing students' instructional group, the interviewers found that

members of the action group still reported more environmentally appropriate behaviors.

A number of other evaluations of this approach have used similar pre-post designs. Jordan, Hungerford, and Tomera (1986) compared high school students who were in either action groups or awareness groups in six-day residential workshops in a nature camp and found that training in environmental action strategies resulted in significantly higher levels of knowledge about potential actions as well as self-reported action. Simpson (1989) found similar differences between fifth and sixth graders who engaged in a 10- to 13-week case study of Canada geese and their habitats, which included IIAT elements, versus a group that received typical science instruction. Working with seventh graders in three states, Ramsey and Hungerford (1989) compared four control groups that received conventional science instruction with four experimental groups that received the IIAT curriculum, using a larger battery of measures that included individual and group locus of control, knowledge of potential environmental actions, self-perceived skill to use environmental actions, and self-reported environmental behaviors. There were no significant differences between groups on pretests, but the IIAT groups performed significantly higher on each measure at the end of the 18-week study period. Ramsey (1993) obtained similar results when he compared eighth graders with 18 weeks of IIAT instruction with a control group that had equally long instruction in physical science. In Illinois and Missouri, Cullen and Volk (2000) compared three groups: six classes of seventh and eighth graders who received IIAT instruction during an extended case study of wetlands; four classes with instruction in environmental knowledge and awareness only; and five classes receiving typical science instruction. Pretests revealed no significant differences among the groups, but both experimental groups reported significantly greater knowledge of environmental action skills, self-perceived ability to use skills, and self-reported pro-environmental behavior than the control group, and the group with action instruction reported significantly more pro-environmental behavior than the awareness group.

These evaluations are impressive for their consistency in methods, measures, and results, and because they compare students' independent investigations of environmental issues and processes of planning for action with more conventional approaches to environmental education that simply seek to increase knowledge and awareness. These studies'

limitations are that the behavior measures are based almost exclusively on student self-reports and they lack long-term follow-up assessments, with the exception of the study by Ramsey, Hungerford, and Tomera (1981), which included parents' reports of their children's behaviors two months after instruction ended. In this case, it is notable that the parent reports were consistent with the student self-reports. As Rickinson (2001) and Zint (in press) recommended, it would be valuable to supplement such experimental designs with qualitative measures to understand students' experiences of different learning processes.

The most recent published evaluation of this curriculum addresses these recommendations, and in the process highlights potential discrepancies in outcome results, depending on the measurements used. Volk and Cheak (2003) compared fifth- and sixth-grade students in an IIAT program with an action component on the island of Molokai, Hawaii, with classes that followed a traditional curriculum. In fifth grade, students learned how to analyze local environmental issues and conduct independent research, working under the guidance of more experienced sixth graders. In sixth grade, they mentored fifth graders and organized a public symposium to promote environmental problem-solving to create a more sustainable Molokai. On a fixed-response survey that limited respondents to reporting whether they took discrete environmental actions, such as planting a tree or talking to friends about the environment, students in the traditional curriculum scored higher than the IIAT students on the post-test. When students created their own survey, IIAT students reported more environmental actions, and when students, teachers, parents, and community members were interviewed about IIAT students' accomplishments, they all described high levels of achievement, such as testifying before the state legislature, setting up a recycling program, organizing their families to recycle, and writing editorials for the local paper (actions that were not listed on the standardized behavior survey).

Place-Based Education

Place-based education makes the walls between a school and its community permeable by using the local community and environment as an integrating context to teach subjects across the curriculum (Powers, 2004; Sobel, 2005). The school invites resource people from the community into classrooms and sends students out to work on local issues. It is not a new idea: Dewey (1938)

recommended experiential learning and many progressive schools have practiced it. Since a 40-school study by Lieberman and Hoody (1998) demonstrated that place-based education increases student engagement in learning, raises student grades and scores on standardized tests, and improves attendance and behavior, there has been a resurgence of interest in this approach. The IIAT curriculum has elements of place-based education when it involves students in investigating local issues, but as a movement, place-based education goes beyond single classrooms and subjects to involve whole schools in the interdisciplinary study of local environments and in projects to improve the school itself or the community.

According to a qualitative evaluation of the Jaegerpris Project in Denmark, a form of place-based education that created school-community partnerships to solve local environmental problems, students identified three aspects of this approach as most important: authenticity, as it involves real issues; their participation in forming action plans and making decisions; and their ability to take meaningful actions (Jensen, Kofoed, Uhrenholdt, & Vogensen, 1995). In his portrait of a high school in Oregon where students learn by creating and implementing action plans related to five domains of sustainability, Smith (2011) observed that this approach cultivates a sense of community, care for individuals and the environment, and students' confidence that they can make a positive difference in the world. Implemented in this way, place-based education exemplifies learning *through* as well as *from* action (McLaren & Hammond, 2005).

Duffin, Powers, Tremblay, and PEER Associates (2004) examined outcomes for schools across New England that belonged to a Place-based Education Evaluation Collaborative (PEEC). Students engaged in activities such as community mapping, creating sustainable schools, studying local forests, and improving local environments. The evaluation was guided by a "dose response" measurement strategy on the premise that the more that schools trained teachers in this approach and offered place-based activities to students, the greater the impacts would be. As predicted, there was a positive correlation between teachers' level of training and engagement and student outcomes, including civic engagement and stewardship behaviors. Students with more engaged teachers were more likely to say that in the past two months they had done something to take care of their neighborhood or community, either with classmates or on their own time. Duffin et al.

(2004) also found that there appears to be a tipping point when place-based learning becomes integrated into the school culture and new teachers adopt it as the school norm. (Survey sample sizes, with some variation per question, were approximately 300 for teachers and 1,400 for students.)

A need for time to embed place-based learning in school practices may partly explain the limited outcomes associated with the first year of the introduction of a Green Schools project in western Quebec (Legault & Pelletier, 2000). Schools that joined the project integrated ecological topics across subject areas and involved students in initiatives such as recycling, composting, and energy conservation on the school site. In pre- and post-test comparisons between 85 sixth-grade students in Green Schools versus 99 students in classes that lacked any formal ecological program, students in Green Schools were significantly less likely to say that they engaged in ecological behaviors for extrinsic motives, but otherwise they did not report more pro-environmental behaviors. The Green Schools and PEEC evaluations reflect different goals and measures. Like studies of classroom-based curricula and the IIAT approach that came before them, Legault and Pelletier (2000) surveyed students' performance of discrete environmental behaviors, such as asking for reusable lunch containers or recycled paper. These are similar to measures in many past studies (turning out unneeded lights, turning off the water while brushing teeth, refraining from littering, etc.), which constitute what Stern (2000) called private sphere actions for the environment. Important as these individual choices are, Stern argued that they should not be privileged above other spheres of action that are also vital for the protection of the environment: collective political action and institutional change. In contrast, PEEC adopted a utilization-focused evaluation process that involved schools and community partners in identifying goals and outcome measures (Powers, 2004). The result was a focus on students' civic engagement and community participation in addition to individual stewardship behaviors.

Recent research on sustainable schools (reviewed in Barratt-Hacking, Scott, & Lee, 2010) takes as a given that when students are involved in discussions, decision-making, and action to improve their school and community environments, they are demonstrating the type of responsible citizenship that constitutes both process and outcome measures. This is the principle underlying a case study of a Colorado high school that reduced its electrical energy consumption by half over a six year period

(Schelly et al., 2012). The school achieved its shift to a culture of conservation by communicating and modeling sustainable behaviors through its facilities and operations, participatory school governance, and role models such as the principal, teachers, staff, and student leaders. As Volk and Cheak's (2003) evaluation of the IIAT program on the island of Molokai demonstrated, student behaviors may appear very different through the lens of surveys that offer limited fixed choices of behaviors, open-ended interviews that allow respondents to describe what students have done, or objective measures of what students accomplish.

A critical question for future research is whether students in place-based education programs remain environmentally and civically active later in life. Beane, Turner, Jones, and Lipka (1981) showed the potential of a retrospective approach when they assessed the influence of a high school social studies teacher in Pennsylvania who involved his senior classes for four years in assisting the city planning commission in preparing a master plan for anticipated growth. Students' assignment to his class was effectively random. Thirty years later, Beane and colleagues tracked down alumni from these classes and compared them to high school students who were not part of the planning project but were otherwise similar. Over the intervening 30 years, members of the planning class were four times more likely than nonmembers to have belonged to volunteer civic and service organizations and twice as likely to have been organization officers. This study design could be adapted to evaluate the impacts of place-based education on a range of environmental behaviors over varying intervals of time.

Environmental Service Learning

Like place-based education, service learning is commonly community based, and many place-based projects include elements of service. Service learning targets a range of needs that are often social rather than environmental, and it can be the focus of a single class or out-of-school program rather than a whole-school approach. Consistent with assessments of place-based education, evaluations of service learning often show gains in service leadership, defined in terms of awareness of community issues, capacity to develop a project, and commitment to trying to make a difference (Melchior & Bailis, 2002). When it puts social and environmental goals together by preparing young people for sustainable livelihoods that benefit natural habitats and endangered species, it represents a model for

environmental education that is especially relevant for low- and middle-income nations.

These goals are exemplified by the Roots and Shoots program founded by Jane Goodall, which engages youth in community-centered conservation initiatives, such as sustainable agriculture, to reduce pressure on wildlife habitats. Johnson-Pynn and Johnson (2010) worked with 487 youth, most between the ages of 14 and 20, who were randomly selected from active participants of Roots and Shoots clubs in Tanzania and Wildlife Clubs in Uganda. The clubs were typically school based. Whereas the Wildlife Clubs of Uganda were created by the government to instill pride in the nation's wildlife and raise awareness about sustainable development, the mission of Roots and Shoots is to encourage young people's self-determination and community service. The researchers compared outcomes across different program settings, using a Service Experiences Survey and measures of a sense of efficacy and hope, as well as civic attitudes, actions, and skills. Young people also answered open-ended questions about their program activities and involvement. Consistent with their program's mission, Roots and Shoots members scored significantly higher than Wildlife Club members for service involvement and civic action, and generally reported higher perceptions of self-efficacy and collective efficacy, but youth in both programs gave themselves high ratings for civic action and expressed high levels of satisfaction with their program experiences.

In Baja California Sur, Mexico, Schneller (2008) evaluated a year-long secondary school class that sought to engage students as catalysts for community change. Students learned about the region's environmental problems, explored the local environment, practiced pro-environmental behaviors, and performed public service and outreach, such as cleaning beaches and creeks, talking to people about beach protection, and helping to release newly hatched sea turtles into the ocean. Using a retrospective panel design, Schneller conducted pre- and post-class interviews with 21 students who were selected to participate, as well as post-class interviews with 15 students from the previous cohort who volunteered to enroll when the class was initiated two years earlier. He also interviewed teachers, community leaders, and a convenience sample of parents. Three-quarters of the new graduates from the class said that they had adopted at least one or two new behaviors, such as recycling, composting, water conservation, or not eating sea turtles, and most of the students who were in the

class two years earlier reported that they were still practicing new behaviors that they had learned. Of equal importance, more than 70% of each group said that they had talked with their families, with high rates of success in changing family practices, and parents confirmed that these changes occurred. Engaging young people as catalysts for change in their communities is an important element of the environmental service learning model.

Learning at Nature Centers and Forest Schools

In some schools, environmental education is concentrated in field trips to parks and nature centers. Several studies suggest that programs that immerse students in extended field experiences can lead to behavior change. Asch and Shore (1975) evaluated a two-year program in Montreal that combined classroom instruction with outdoor experiences at a nature center. An introductory year of classroom-based instruction about the environment included discussions about what the students heard and felt related to environmental problems and research in small groups on environmental issues of their choice. During the subsequent summer and school year, students took field trips to a nature center in different seasons, where they had chances to observe wildlife and take part in soil conservation experiments. As previously noted, boys who had been through this program demonstrated stewardship behaviors in a series of tasks, in contrast to boys in a control group.

In an evaluation of nature center programs in the Great Smoky Mountains National Park in Tennessee, Stern, Powell, and Ardoin (2008) gathered students' self-reports of their sense of connection to nature, interest in learning and discovery, knowledge about the park and biodiversity, and environmental stewardship attitudes and behaviors. Fourth- through seventh-grade students who visited the residential nature center completed these measures at three points in time: immediately on arrival in the park, immediately following the last park activity, and back in the classroom three months later. Ten students from each of 20 different school groups were randomly selected to complete the measures, divided between participants who attended for three days or five days. Students explored issues related to biodiversity conservation and invasive species firsthand and participated in competitions to reduce food waste. At the end of the program, students showed significant gains in all measures. In the follow-up assessment, they retained significant

gains in environmental knowledge and stewardship behaviors, although mean scores for these outcomes declined during the three-month period. In the follow-up, students in the five-day program differed from students in the three-day program only in the area of greater environmental knowledge.

In a similar evaluation of a five-day residential program on the Chesapeake Bay, Stern, Powell, and Ardoin (2011) tailored pre- and post-surveys to the characteristics of students, who included large samples from low-income families in urban Baltimore, by focusing on a sense of environmental responsibility for home environments and communities. Students were asked whether they were interested in working to make their community a better place and whether they intended to work as a volunteer in their community (immediate post-test) or currently volunteered (three-month follow-up). In two successive years of use, students showed significant gains in a sense of environmental responsibility in the immediate post-test, with significant gains retained three months later only in the second year, after the program made adaptations to more tightly connect program activities to students' home lives. Gains were especially strong among the urban students, compared to suburban and rural students.

In another evaluation of Chesapeake Bay programs, Zint, Kraemer, Northway, and Lim (2002) compared the effects of one-day, three-day, and two-week field trips to the bay, an in-class curriculum, and a curriculum that involved the experiential component of raising juvenile shad in a tank and then releasing them in a local waterway. On adjusted post-test scores, all of the student groups in the experiential programs scored significantly higher than students in the in-class curriculum for their perceived knowledge or skill to take action for the environment or their intention to act. The study included questionnaires sent to former participants in field trips and the in-class curriculum. Former field trip participants were more likely to report knowing how to take action for the environment if they engaged in longer field trips or a combination of field trips, and as a group, former field trip participants were significantly more likely to report taking actions to protect the bay than respondents who had the in-class curriculum. In another assessment of field trip effects, Bogner (1998) compared a one-day and a five-day outdoor ecology program for German secondary school students in a national park. He found that both versions of the program improved environmental knowledge and attitudes, but only the five-day program was associated with

increases in students' stated willingness to plan and take action for the environment. In the five-day group, this gain was still evident in a six-month follow-up. Bogner (1998) and Zint et al. (2002) recommended longer, more in-depth field experiences or multiple experiences over time.

A study of 255 sixth-grade students who attended three outdoor science schools in California also found gains in knowledge and pro-environmental behaviors, as measured by science scores and parents' reports of their children's home behaviors 6 to 10 weeks after the week-long residential program ended (American Institutes for Research, 2005). A delayed treatment design compared half of the group, who attended the program in the fall, with the half who were not going to attend until the following spring. Fifty-six percent of the treatment group, who were mostly Hispanic students from low-income families, stated that they had never spent time in a natural setting before.

The principle of immersion in nature is fully realized in forest kindergartens: mixed-age schools where children (typically ages three to six) are outside in a forested setting for all or part of every school day. After developing in Scandinavia, Germany, and the United Kingdom, they have recently been established in the United States. In these settings, children use nature as a home, for eating, sleeping, and playing; as a classroom, for learning and exploring nature; and as a fairyland, for imagination and creative play (Änggård 2010). One of the most relevant findings from research with low-income British children in these settings is that forest kindergartens produced a "ripple effect," as children and their families who did not previously have much exposure to nature began to seek out nature experiences similar to those in school (Knight, 2009, Murray, 2004, Murray & O'Brien, 2005). Research has not yet examined effects of these programs on stewardship behaviors in early childhood or long term.

Ingredients of Effective Environmental Education Programs

Looking back over these evaluations of formal education, it is apparent that despite the relative neglect of research on behavior outcomes, a body of evidence has accumulated that suggests that well-designed programs can increase pro-environmental behaviors among students. Given the limitation that few studies include follow-up measures and that when they do, the assessments are usually made within three months after a program ends, little is known about long-term effects. Nevertheless, the

fact that some studies have found behavior change after one year (Schneller, 2008), six years (Hanson, 1993), and 30 years (Beane et al., 1981) gives hope that education can successfully introduce lasting habits of action. More research is needed to understand the conditions under which young people learn and maintain active care for the environment.

Three key ingredients are repeatedly evident in effective programs. As Zelezny (1999), Rickinson (2001), and Zint (in press) noted in their reviews, and as this chapter also finds, one ingredient of a program's effectiveness appears to be *an extended duration*. The programs that Beane et al. (1981) and Schneller (2008) evaluated involved year-long curricula that combined work in the classroom with activities in the community, and the program that Hanson (1993) assessed distributed curriculum units on energy across kindergarten through sixth grade, with activities to be carried out both at school and at home. Other programs that show behavior change either involve a term or more of instruction or total immersion in field trip experiences for several days. In addition to an extended duration or at least intense immersion in field experiences, these programs share a second key ingredient: *they connect learning to the real worlds of students' homes, communities, or regions*.

As Leeming et al. (1993), Zelezny (1999), and Zint (in press) also noted, successful programs *involve students actively*. Evaluations of the IIAT curriculum that compared students' investigation of local environmental issues and training in action skills with curricula that only emphasized science instruction or environmental knowledge and awareness have repeatedly shown that if pro-environmental behaviors are a goal, students need opportunities to learn action skills (Culen & Volk, 2000; Jordan, Hungerford, & Tomera, 1986; Ramsey, 1993; Ramsey & Hungerford, 1989; Ramsey, Hungerford, & Tomera, 1981; Simpson, 1989; Volk & Cheak, 2003). When students take action at school, at home, in their local environment, or during field work in a natural setting, they can see issues for themselves and the effects of their efforts.

For these reasons, place-based education is especially promising, as it is a whole-school approach that seeks to involve students in study and service in the local environment as part of every subject area and in every grade. It embodies the extended duration, investigation of meaningful local issues, and opportunities to practice action that have been associated with effectiveness, and according to the evaluation by Duffin et al. (2004), it is associated

with increased stewardship and civic service. The environmental service learning models assessed by Schneller (2008) and Johnson-Pynn and Johnson (2010) demonstrate that in regions characterized by poverty as well as threats to the environment, meaningful action can address social and environmental issues simultaneously.

Stewardship Outcomes from Wilderness Experience Programs

Wilderness adventure programs began in the 1940s in Asia and in the 1960s in the United States. These programs have shown growing popularity at the turn of the 21st century, with a burgeoning number of programs that provide challenge, adventure, therapy, and sometimes reflection or stewardship (Dawson et al., 1998; Ewert, 1987; Gasner & Russell, 2008). In 2000, Ewert and McAvoy estimated that more than 700 wilderness organizations provide some form of wilderness experience, with this number growing at a rate of approximately 15% per year. These programs have been categorized as adventure education, wilderness therapy, outdoor experiential education, wilderness experience, and wilderness challenge (Dawson et al., 1998). Most programs are rooted in the philosophy of John Dewey (1938), who believed that all education should come from experience, reflection, and practical skills. These programs typically serve youth ranging from 14 to 25 years in age, in a wilderness setting that provides for interpersonal and intrapersonal growth coupled with any number of additional foci, including intervention, education, leadership, and therapy, as well as personal or technical skills (Friese, 1996). Well-known wilderness programs include Outward Bound, the National Outdoor Leadership School, the Wilderness Education Association, and the Student Conservation Association. Additionally, some Youth Conservation Corps programs provide similar wilderness experiences, typically with a stewardship focus.

Programs generally run a minimum of 5 days, and typically 10 or more days. Most programs provide some education about minimizing human impacts on the wilderness area used for the program. These experiences allow for a variety of social and psychological benefits including interpersonal relationships (e.g., group problem-solving and communication), personal development (e.g., self-esteem, self-concept, autonomy, self-awareness, locus of control, spiritual growth), and technical skills development. These benefits of engagement with nature are well documented (Daniel, 2003; Driver et al.,

1987; Ewert et al., 2007; Ewert & McAvoy, 2000; Faber Taylor & Kuo, 2006; Gass et al., 2002; Gillett et al., 1991; Hazelworth & Wilson, 1990; Kellert & Derr, 1998; Schuster et al., 2005). Actual benefits of these programs depend on specific program goals (such as therapy, education, or personal growth). Importantly, only those with an educational focus have the goal of influencing environmental knowledge, skills, positive environmental attitudes, or pro-environmental behaviors (Friese, 1996).

Less understood is the impact of wilderness experiences on environmental awareness, knowledge, attitudes, and behaviors. It is assumed that wilderness experiences will promote positive environmental attitudes, awareness, and behaviors, yet this has not been well documented (Ewert et al., 2007). Even more limited is our understanding of how youth might apply wilderness experiences and the values and attitudes they gain to their everyday lived experiences (Haluza-Delay, 2001). The limited evidence that does exist suggests that these can be powerful experiences for adolescents; for some, they are considered among the most influential and worthwhile experiences in a lifetime (Daniel, 2003; Kellert & Derr, 1998).

As with the evaluations of formal environmental education, more studies of wilderness experiences have focused on the effects of programs on attitudes, knowledge, and intention to act rather than on actual pro-environmental behaviors. While heightened appreciation for nature and increased knowledge are integral factors associated with action for the environment (Figure 28.1), research on wilderness programs frequently does not take into account the sense of efficacy necessary to take action, or measure actual changes in behavior.

A handful of studies have evaluated the impact of wilderness experiences on behavior change. These studies all report similar findings, which are that participants show an increase in pro-environmental behavior, and that program influences diminish over time (Hammit et al., 1995; Kellert & Derr, 1998; Mazze, 2006; Morrison, 2010). Most of these studies record impacts within the first year following programs, and some also examine longer-term effects through retrospective studies.

Daniel (2003) conducted retrospective studies with 210 participants of a wilderness expedition offered by Montreat College in North Carolina. Subjects participated in the program anywhere from 1 to 25 years prior to the time of the study. Daniel found that 20% of participants were working in a field related to outdoor education, and that of these,

87% had participated in multiple wilderness experiences, including the program being investigated. Many stated that it was the accumulation of these experiences that contributed to their choice of profession. Because of their repeated experiences in wilderness programs, they did not attribute explicit significance to any one wilderness program in shaping their career path.

Morrison (2010) conducted in-depth interviews with 20 alumni from the Wild Rockies Field Institute (WRFI), an outdoor education program that combines wilderness experience with field courses. His research found that the program did result in perceived behavior changes, such as academic or career goals, lifestyle choices, and political involvement. Participants reported significant changes in their environmental awareness and ability to reduce their environmental impact.

Haluza-Delay (2001) and Morrison (2010) both touched on the inability of many participants to transfer pro-environmental behaviors learned in a wilderness experience to lived experiences at home:

Despite the emphasis on sustainable living, WRFI courses are a product that is consumed. Hence, participants may have a great time on a WRFI course, but do not necessarily walk away with core behaviors changed because they viewed the experience as just a good time in the woods. (Morrison, 2010, p. 114)

This disconnect was the focus of Haluza-Delay's (2001) research with eight youth, ages 14 to 16, who participated in a 12-day wilderness program in Alberta, Canada. Haluza-Delay attended the program as a participant observer and then used semi-structured interviews two weeks and six months following the program to assess how participants responded to nature at home. Most of the teens showed environmental concern and awareness but did not see a link to environmentally responsible behavior back at home. Many youth said they wanted wilderness areas to be preserved but did not see anything natural in their home community and therefore did not engage in any environmental behaviors.

Mazze (2006) considered this question in depth when she considered the transference of skills to everyday lived experiences among students of the National Outdoor Leadership School (NOLS). Mazze interviewed 9 NOLS students before, immediately after, and several months following program experiences as well as 10 NOLS alumni who had participated in the program anywhere from 3 to

28 years prior. Mazze found that all subjects were able to transfer some skills to their behaviors at home, with the majority of longitudinal subjects and about half of the retrospective subjects attributing their pro-environmental behaviors directly to the wilderness experience. Changes in behaviors included reducing consumption of goods, electricity, or water; increasing alternative transportation and organic food purchases; and participating in environmentally active groups. Interestingly, prior to the program experience, most longitudinal subjects attributed pro-environmental behaviors to their parents while retrospective subjects attributed their behaviors to other factors, such as NOLS, career choices, and place of residence. Though many alumni said NOLS was one of the most influential events in their lives, only 2 of the 10 subjects attributed their pro-environmental behaviors to their NOLS experience. However, many alumni did state that NOLS was an important catalyst for their current pro-environmental behaviors, and all 19 subjects said that NOLS increased their sense of responsibility toward the environment.

Subjects ascribed their motivation to care for the environment to a variety of factors, including the beauty of wilderness areas, the experience of living minimally in the wilderness, the amount of time they spent in the wilderness, increased knowledge and skills in general, and the program's explicit focus on transferring skills to home. In addition, those alumni who practiced only a few pro-environmental behaviors attributed this not to a lack of desire or concern for doing more, but to constraints in their current setting. Some of the longitudinal subjects thought the experience might influence college curriculum choices or careers; however, this was not measured due to the limited length of the longitudinal study. In general, the wilderness experience provided by NOLS significantly influenced participants' motivation for pro-environmental behaviors, with greater impact during the short-term experiences of longitudinal subjects than across the long-term experiences of alumni.

Kellert and Derr (1998) also found this trend in their comprehensive study of participants of National Outdoor Leadership School, Outward Bound, and Student Conservation Association (SCA) programs. They conducted longitudinal research with 296 participants before, immediately after, and six months after the wilderness experience, as well as retrospective research with 450 individuals who had participated anywhere from one to six or more years ago. Both the longitudinal and retrospective research

involved structured, semi-structured, and in-depth interviews to evaluate program effects on attitudes, knowledge, and pro-environment behaviors.

Both forms of research found that wilderness experience programs had a significant impact on environmental attitudes (with more than 80% expressing increased connection to and affinity for nature). In addition, 72% of retrospective subjects felt the experience had made them more environmentally responsible. Many participants reported elevated feelings of awareness and connection, as exemplified below:

After five weeks, I realized that the world is my home, the stars are my roof, the dirt, my floor. I can no longer isolate building life (urban life) from the rest. I know that everything we do affects everything else. The great web. (Kellert & Derr, 1998, p. 19) Before the program my feelings of ethical responsibility and stewardship were just ideals. Through the program, I gained confidence and incentive to actually act on these feelings. Ever since, I have felt a connection with the environment and a desire to continue that stewardship. (Kellert & Derr, 1998, p. 21)

Yet when the study asked participants to report their environmental behaviors, only 15–30% of participants in the retrospective study reported increased behaviors in recycling or avoiding products that are environmentally detrimental. Retrospective participants' membership in conservation or environmental organizations was higher, at 40–60%. Program influence on activist behaviors, such as writing letters, attending meetings, working with citizen groups, or volunteering on behalf of the environment, were low among the retrospective study participants, with most of these behaviors increasing 2–7%. These changes also diminished over time, with those who participated 6 or more years ago showing fewer program influences on behavior than more recent participants. Among organizations, SCA participants reported more significant program impacts on various conservation activities, including interest in community service, volunteering, and environmental education and careers. This is likely due to the stewardship activities and conservation focus of many SCA programs (Kellert & Derr, 1998), and perhaps to a self-selecting bias of those who chose SCA programs over those with different experiential goals. Indeed, part of SCA's mission statement is to "build the next generation of conservation leaders and inspire lifelong stewardship" (Hoffman, 2004).

These findings correlate with the analysis by Dawson and colleagues (1998), which identified varying goals associated with wilderness experience programs. Their analysis revealed that while the majority of programs seek to provide opportunities for personal growth and the transfer of skills learned during the experience to everyday life, only the programs with an educational focus seek to develop responsible behaviors and advocacy for the environment (Friese, 1996; Dawson et al., 1998; Adkins & Simmons, 2002). Even for wilderness experience programs that do have a primary focus of education, significant differences exist in the extent to which these programs identify increases in responsible behaviors as an explicit program goal (Dawson et al., 1998). Programs that emphasize stewardship behaviors during the program experience have greater long-term impacts on behavior change at home, as Kellert and Derr (1998) found for SCA programs and Mazze (2006) found for NOLS.

While many programs have the goal of transferring skills to home life, the emphasis largely has been on transferring personal and social skills rather than pro-environmental behaviors (Dawson et al., 1998). In their analysis, Dawson and colleagues (1998) further found that “wilderness” (defined as areas with conditions consistent with those set forth in the 1964 Federal Wilderness Act) is an essential component in successful wilderness experience programs, and that regardless of whether a program had an explicit educational focus, the remote and wild characteristics of wilderness that allow youth to “get away” from everyday life create an inherent disconnect when youth return back home. That youth connect to the essential nature of “wilderness” without necessarily gaining transferable skills leads to an important question: Will youth come to see nature as a medium to be used for personal growth and benefit, or will it also be respected and cared for? As Morrison (2010) emphasized, though a program may include sustainable living in its ideals, participants more frequently may come away from an experience as a “good time in the woods” rather than with any lasting change in core behaviors. Wilderness, then, becomes a product for consumption, a means to personal growth and benefit, rather than something to be responsible for through everyday actions. This is a potentially significant shortcoming in program execution. Wilderness programs with an educational focus might do more to bridge this disconnect between the wilderness experience and the ability to act on behalf of the environment once at home. As Mazze’s (2006) research showed,

an explicit emphasis on transferability can be a powerful motivation for behavior change. For research, the implication is that transferability to home life constitutes one of the most significant and least understood aspects of wilderness program evaluation. Research that considers the transferability of experience, the impact of single programs versus repeated experiences, and influences on sustaining long-term changes in pro-environmental behaviors would help address this important aspect of conservation psychology.

Implications for Research and Practice

This concluding section asks the questions: What do the different bodies of research that have been reviewed in this chapter tell us that can be applied to promote the development of active care for the environment? What are their implications for different fields of practice that shape children’s experience of the environment? How can further research enable us to answer these questions more effectively?

Implications for Education, Planning, and Design

Existing research suggests that if societies seek to achieve a sustainable world where not only will people act to protect the biosphere today but also future generations will value this goal and work for its achievement, then children need to be provided with regular access to nature. Research has linked a background of childhood play in nature with every form of care for the environment: informed citizen action, volunteerism, public support for pro-environmental policies, environmental career choices, and private-sphere behaviors like buying green products, conserving energy, and recycling. For the fields of planning, architecture, landscape architecture, real estate development, parks and recreation, wilderness management, and education, this means weaving natural areas for play, exploration, and experiential learning into the fabric of children’s lives at every scale: from housing sites and the yards of child care centers and nursery schools, to naturalized schoolyards and gardens, to greenways where children can travel safely to school and other community resources, to networks of parks, to opportunities for wilderness adventure. This recommendation is consistent with biophilic design principles, which seek to connect people to nature and their local landscapes (Kellert, Heerwagen, & Mador, 2008; Moore & Cooper Marcus, 2008).

This recommendation assumes places of graduated risk, where challenges in the environment

match children's developing capabilities to identify and negotiate risks. As Tovey (2007) noted, children gain competence and autonomy by learning to understand and overcome challenges. Ironically, while parents and school administrators often try to prevent children from taking risks such as climbing trees, accident data show that children are much more likely to be seriously hurt or killed in the built environments of the home, in cars, and on local streets with traffic (Centers for Disease Control, 2011). Risks that children cannot manage include those they cannot see, such as toxins in soil, air and water. Children's developing bodies, for example, are especially vulnerable to the herbicides and insecticides often used on lawns and gardens (American Academy of Pediatrics Committee on Environmental Health, 2003; President's Cancer Panel, 2010; Steingraber, 2011). Access to nature needs to allow for appropriate challenges while protecting children from unmanageable and invisible risks.

Along with regular access to nature, the research reviewed in this chapter indicates the importance of social support for the development of care for the environment. Research on formative experiences of environmentally active adolescents and adults repeatedly shows the role of parents and other family members who model care for nature and encourage their child's interests, as well as friends, teachers, and mentors in environmental clubs or organizations. James, Bixler, and Vadala (2010) observed that while an interest in nature and a commitment to its protection may begin with direct, socially facilitated experiences of nature through free play and discovery, in middle childhood and adolescence young people need opportunities to extend their environmental knowledge and skills in more formal ways. In addition to a tapestry of nature in different spaces of their lives, children need people who can help them appreciate and understand what they find there.

Evaluations of formal programs for environmental education and wilderness programs for youth also point to these conclusions. They indicate the importance of immersion in nature through field trips to parks or nature centers, excursions beyond school walls through place-based education or environmental service learning, and wilderness adventures. Research on wilderness programs for youth also indicates the importance of repeated, accumulated experiences and opportunities for young people to transfer what they learn in distant places to responsible environmental practices when they

return home. Bixler, James, and Vadala (2011) gave detailed recommendations for how interpretive naturalists can apply research findings to have the greatest possible impact on children and youth in their programs—and their suggestions can be applied to other domains of work with children as well.

Another research conclusion is that it is important to give young people opportunities to learn about, through, and from action (McLaren & Hammond, 2005). As this chapter's review of evaluations of the IIAT approach to environmental education showed, conventional teaching about science and environmental problems is not sufficient to promote environmentally responsible behaviors: students need opportunities to learn action skills. They also need opportunities to apply these skills to issues that they find personally relevant. Place-based education, environmental service learning, nature centers, and wilderness programs can engage young people in activities that form both process and goal: enabling young people to exercise active citizenship as they encounter and address environmental issues firsthand.

Directions for Future Research

These research results are consistent with the theories of child and youth development that form the framework for this chapter. Ecological psychology helps explain the significance of free play in nature in childhood as well as the importance of processes of joint attention when children explore nature with family members, friends, teachers, or other guides (Chawla, 2007). The social learning theory of Bandura (1997), which identifies key processes that contribute to children's sense of competence, can be applied to competence in environmental care and problem-solving (Chawla, 2009; Heft & Chawla, 2006). The model of achievement motivation of Eccles and Wigfield (2002) is relevant to the development of an environmental identity, which includes a feeling of connection to nature and may include care for the environment as part of a person's goals and self-definition (Chawla, 2009; Clayton, 2003). Rickinson (2001) and Zint (in press) noted that research about young people's environmental learning and behavior needs to be guided by a theoretical framework to build coherent narratives that can be meaningfully applied in practice. These theories are offered as an appropriate framework. By showing how knowledge, feelings, values, and action are connected, they suggest how to bring more balance to environmental education research, which has been dominated by a focus on

knowledge, values, and attitudes at the expense of behavior.

Consistent with the need for a theoretical structure, Rickinson (2001) and Zint (in press) also recommended more qualitative studies that can provide insight into processes of learning and how young people themselves interpret experiences. If increased care for the environment is associated with a particular program in a school, nature center, or wilderness expedition, what happens that makes the difference? Do program activities embody the processes that theories would predict? What experiences do children, teachers, program leaders, and parents consider most formative and why? According to young people themselves, how do they develop a sense of affinity with nature and learn to express it in action? To answer these questions, observations, interviews, and qualitative methods, such as photography, drawing, journaling, and program logs, can complement quantitative measures of behavior change. These methods can also serve as a means to verify which program goals and curriculum plans are actually implemented in practice. Three studies by Rickinson, Lundholm, and Hopwood (2009) demonstrated the importance of hearing students' own perspectives of environmental learning experiences.

Ideally, qualitative and quantitative measures progress together, as Hsu (2009) demonstrated when he used interviews and open-ended questions to identify key items for a fixed-response survey with a larger population. When statistically significant differences emerge between groups that exhibit greater or less care for the environment, qualitative research can be used again to better understand experiences that explain these differences.

Not only are observational methods integral to qualitative descriptions of young people's environmental learning, but they also can address a current weakness of most research in this field, which is its primary reliance on self-report or reports by parents or teachers about young people's behavior. As the quasi-experimental design by Asch and Shore (1975) demonstrated, and as Camargo and Shavelson (2009) suggested, situations can be created where it is practical to directly observe young people's treatment of the environment. As Blizard and Schuster (2004) showed, case studies can include repeated observations that follow how children respond to events in the environment over time.

Future research also needs to include more long-term, longitudinal, and retrospective assessments. Through their account of Ramsey's work, Hungerford and Volk (1990) suggested how students

can be tracked longitudinally as they move through grades. Another approach is a panel design, such as Schneller (2008) used to compare different cohorts of young people. Retrospective pretests can ask young people what they believe their level of action was before embarking on a program—a method with demonstrated validity (Pratt, McGuigan, & Katzev, 2000). Long-term assessments are necessary to understand whether behavior changes are lasting, to compare the effects of a single program experience versus repeated experiences, and to determine whether young people can transfer conservation practices learned in a special setting like the wilderness or a nature center back to everyday life when they return home.

As Beane and colleagues (1981) have shown, sometimes it is possible to contact people years after they experienced a special environmental program in childhood or youth to determine whether they became more environmentally or civically engaged than others in their cohort. Similarly, Zint and colleagues (2002) used questionnaires to compare former participants in Chesapeake Bay field trips with former students in an in-class curriculum. Wells and Lekies (2006) have used survey data to connect adult levels of pro-environmental behaviors with childhood experiences, including free play in nature. More retrospective and correlational studies like these are needed to understand experiences that encourage pro-environmental behaviors over time.

Given concerns that many children no longer experience nature directly, it is important to understand the impact of vicarious experiences of nature through media. When do images of nature leave children with feelings of fear and powerlessness, or a sense of connection with nature and a motivation to conserve it? Can media augment children's skills for taking action? Kahn (2010) suggested in his book *Technological Nature* that "(media)ted" nature may not substitute for direct experience but may encourage care for nature nonetheless, but how this can be achieved is an area for future research. In an increasingly urban world, how can media and opportunities to experience nature directly in schoolyards and urban parks be used together to reduce the feelings of fear and discomfort in nature that urban children often express?

Finally, the research covered in this chapter has been largely limited to high-income countries in North America, Western Europe, and Asia Pacific. Although high levels of consumption in these regions of the world have a disproportionate impact on the

environment and it is important for young people in these regions to become environmentally aware and engaged, most population growth is occurring in low- and middle-income countries of Asia, Africa, and Latin America, where many hot spots of threatened biodiversity are located. It is critical to invest more research in these parts of the world. As the studies by Johnson-Pynn and Johnson (2010) in Tanzania and Uganda and by Schneller (2008) in Mexico have demonstrated, environmental service learning is an approach that can simultaneously address environmental protection and people's needs for livelihoods. How to most effectively support youth initiatives to develop sustainable livelihoods should be a future research emphasis.

The theme of this chapter has been how children learn to act for the benefit of the environment. In closing, it is possible to observe that providing the conditions for this learning is a win-win objective. One condition for the development of care for the environment is access to nature, but as the beginning of this chapter noted, contact with nature has the "windfall" benefit of supporting children's physical and mental health and positive social relations. Creating a mosaic of green spaces around homes, schools, and communities can not only provide young people with grounds for environmental learning but also offer restorative spaces for children and adults and habitats for diverse species. A second condition for learning care for the environment is to enable children and youth to take action for the environment through their schools or programs for service learning or wilderness adventure. These opportunities for action can not only increase young people's sense of competence and feeling of value in the context of meaningful action, but yield tangible gains for their communities. Creating conditions for children to learn to care for the environment has the potential to benefit not only children but all ages and all other living things as well.

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