Growing Up Green: Becoming an Agent of Care for the Natural World

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ABSTRACT: *This article reviews research that suggests developmental paths to active care for the natural world in childhood and adolescence. It emphasizes studies with young people that explore experiences associated with care for elements of nature, but includes retrospective research in which adults who take action on behalf of the environment recall formative childhood experiences. To provide a framework for the review, the article applies the expectancy-value model of achievement motivation of Jacquelynne Eccles and Allan Wigfield and the synthesis of research on perceived efficacy by Albert Bandura, with the reasoning that children's motivation to care for nature exemplifies general processes in the development of a sense of agency and motivation to achieve valued goals. Within this framework, it looks more closely at how children develop empathy and sympathy for other living things, as a motivation for care, by applying the theory of empathic morality of Martin Hoffman. The conclusion suggests areas for future research.*

A Framework for Environmental Action

This article is guided by the question, "What childhood experiences are associated with actively caring for the natural world, and what developmental processes do these experiences suggest?" Reviews in the field of environmental education show that there have been many more assessments of children's environmental knowledge, values and attitudes than studies to explain how children learn to take action on the environment's behalf (Rickinson, 2001; Rickinson et al., 2004). This article is based on the principle that it is not enough to know about risks that the natural world faces and to hold pro-environmental values and attitudes: Moving to action is essential.

As the naturalist E. O. Wilson observed, humanity has entered a bottleneck of maximum stress on the life-support systems of the biosphere as three great trends converge: population growth, increasing resource consumption, and the degradation of the environment (cited in Musser, 2005). To successfully pass through this bottleneck, societies must maintain human health and well-being while reducing global consumption, protecting and restoring ecosystems, and preserving biodiversity. This requires action on several fronts, including energy conservation and recycling as well as protecting natural areas and wildlife. This article reviews studies that measure pro-environmental behavior in any form, but pays particular attention to children's interactions with plants, animals and other elements of nature—defining "nature" as the world that humans have not created. In addition, it reviews research that connects adult engagement in protecting the environment to childhood experiences.

Figure 1 presents key factors that have been repeatedly associated with active care for the environment. It derives primarily from research with adults, but as this review shows, it is consistent with studies that assess the environmental behavior of children. It draws on meta-analyses of research on pro-environmental behavior by Hines, Hungerford, and Tomera (1986/87) and Bamberg and Möser (2007), as well as research syntheses by Geller (2002), Stern (2000), and Vining and Ebreo (2002). These reviews show that the intention to act and self-reported pro-environmental behavior are associated with knowledge about environmental issues or problems, knowledge of action skills and strategies, people's perception that action for the environment is a social norm, and a sense of efficacy to do what is needed. These reviews also demonstrate the importance of understanding opportunities and barriers that shape action. Figure 1 also integrates the work of Clayton (2003) and Stets and Biga (2003), which indicates that pro-environmental behavior is related to an ecological or environmental identity, which forms when people identify with nature and consider caring for it an important aspect of their self-concept. The contribution of empathy and sympathy to pro-environmental concern and behavior has been shown by Schultz (2000) and Berenguer (2007). Another motivating factor, childhood experiences of nature, has been related to adult behavior either directly (Chawla, 2007; Horwitz, 1996; Vadala, Bixler, & James, 2007; Wells & Lekies, 2006) or indirectly, through an influence on adult values (Ewert, Place, & Sibthorp, 2005; Kals, Schumacher, & Montada, 1999).
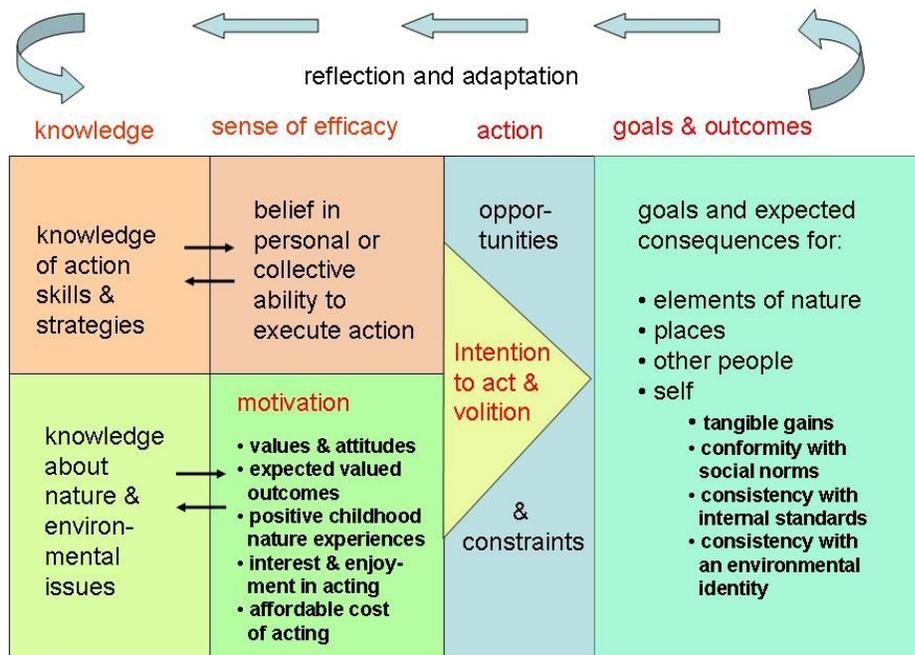
FIGURE 1. Factors associated with action for the environment

This article seeks to understand developmental processes associated with three components of Figure 1: motivation to care for nature, a sense of efficacy, and knowledge of action skills and strategies. As the figure indicates, the different components are interdependent. A sense of efficacy depends in part on knowing action skills and strategies, but children need to feel efficacious, or confident that they can apply skills successfully, in order to take action. Similarly, learning about nature and environmental issues influences environmental values and attitudes, but children are more likely to learn about the environment if they already value it. Through positive experiences in nature, children gain both knowledge and an emotional connection with the natural world. Figure 1 also represents a reiterative process. The experiences that children gain from action reconfigure their knowledge, values and skills and bring their abilities and sense of efficacy to new levels. These new cognitions and capabilities then influence how they respond to future opportunities for action.

Like research with adults, studies that assess children's behavior relative to the environment have been limited by a primary reliance on self-report or a stated intention to act, rather than observations of what children actually do and the contexts in which they do it. Another limitation of existing research is that it has made little use of developmental theory. To address this gap, Chawla (2007) and Chawla and Heft (2002; Heft & Chawla, 2006) have argued for the relevance of

theory in ecological psychology for understanding the development of effective environmental action. According to the ecological approach of J. J. Gibson (1979), E. J. Gibson and Pick (2000), people simultaneously discover properties of the environment and their own competencies through action in the world, as they directly perceive the environment through movement and all five senses. This article seeks to build on this theoretical foundation by suggesting how children learn to combine environmental knowledge and action skills with the motivation to care for nature. For this purpose, it looks closely at processes of socialization that are embedded in three bodies of work: the expectancy-value model of Jacquelynne Eccles and Allan Wigfield (2002), the theory of empathic morality of Martin Hoffman (2002), and Albert Bandura's (1997) synthesis of research on perceived efficacy. Although this work is not directly about children and nature, it suggests processes that may be pivotal, as it shows how adults structure children's experiences and opportunities for action in multiple domains.

Another characteristic of existing research on children's environmental behaviors is that it has tended to measure simple actions like turning out unneeded lights, recycling paper or cans, or conserving water (see review by Rickinson, 2001). Bandura (1997) terms actions of this kind "fixed skills" that need to be repeated in the same way again and again, with little variation. Every expression of concern for the

environment matters, but this article is interested in how children develop a basic disposition to care for nature that also manifests itself in more complex initiatives, such as organizing to protect a natural area in their community or working to restore a natural habitat on their school grounds. These actions are examples of what Bandura (1997) calls "generative skills," which need to be flexibly improvised in changing circumstances. In evaluating these activities, it is meaningful to talk about "standards of excellence"—the criterion which Wigfield, Eccles, and colleagues (2008) use to define "achievement motivation." In their words, it is "motivation relevant to performance on tasks in which standards of excellence are operative" (p. 406).

Young children begin by responding to everyday encounters with nature with simple actions, and this article is interested in these formative experiences, but it also seeks to understand how children take initiative to care for the natural world through increasingly complex forms of action. The Danish educators Jensen and Schnack (1997) call this goal "action competence": the ability to analyze the sources of environmental problems critically and organize to find solutions on a societal as well as individual level. The following sections that apply the theory of achievement motivation of Eccles and Wigfield (2002) and Hoffman's (2000) theory of empathic morality emphasize the development of individual concern and care for nature. A later section shows how Bandura's (1997) synthesis of research on perceived efficacy provides a useful means for understanding how children learn to care for nature through collective action.

Socialization to Value and Care for Nature

This review introduces the expectancy-value model of Eccles and Wigfield (2002) because this model focuses attention on children's interactions with key socializers within the context of the surrounding culture. Drawing on social learning and cultural messages about appropriate roles and behaviors, children interpret experiences, build patterns of emotional reactions and memories, begin to develop a sense of identity, and set goals. As they take action to achieve goals, they develop a sense of self-efficacy, or confidence that they can do what is necessary to achieve the goals that they value. These components of the expectancy-value model are presented in Figure 2. Within this scheme, this section focuses on research related to children and nature that explores processes of socialization. A later section discusses an extension of the model that suggests how children come to value particular activities. In the expectancy-value model of Eccles and Wigfield (2002), expectancies refer to "beliefs about how one

will do on different tasks or activities" and values refer to "incentives or reasons for doing the activity" (p. 110). Figure 2 indicates that children learn what they can do and what they *want* to do in the context of interactions with their culture and people in their immediate social group. Although children learn about cultural expectations through many means, to a large degree these expectations are filtered through the socializers' beliefs and behaviors. In these interactions, children are not passive: socializers respond to children's characteristics such as age, sex, and personality, as well as the interests and abilities that children express. Over time children build a history of achievement-related experiences, develop ways of interpreting experience, and learn the roles and practices that are expected of them. This body of experience and memory is colored by emotion, and it contributes to children's developing sense of who they are, who they want to be, what they can do, and what they want to do.

This model is consistent with studies that have asked adults and adolescents to identify sources of their commitment to environmental conservation or environmental careers. In these studies, the two most frequent responses are socializers in the form of influential family members, teachers, or other adult mentors, along with positive experiences of play and recreation in nature (Chawla, 2007). Similar studies of "significant life experiences" that influence a developing environmental ethic (Horwitz, 1996) or an interest in natural history (Vadala, Bixler, & James, 2007; James, Bixler, & Vadala, in press; Matthews, 1992) show the same result. Consistent with Figure 2, people recall how childhood interests in nature were encouraged by key figures in their lives, but they also show that the identity of key socializers changed at different stages of development. When people identify important figures in early and middle childhood who influenced their environmental interests, careers, or conservation behaviors, they mention family members more often than teachers, and typically describe how they conveyed environmental values indirectly rather than through direct teaching. One way that adults did this was through the simple but profound act of drawing the child into appreciative attention to elements of nature (Chawla, 2007). For example, a biologist who fought to protect wild rivers recalled that her mother didn't only take her fishing and berry picking as a child, but also talked about the habits and characteristics of the plants and animals that they found (Chawla, 1999). In a similar vein, an environmental educator remembered that, "As a young child I was taken by my grandfather or mum to see the wildflowers in the hedgerows. We could name all of the varieties" (Palmer, 1993). In a study of amateur entomologists, Matthews (1992) calls this "a contagious attitude of
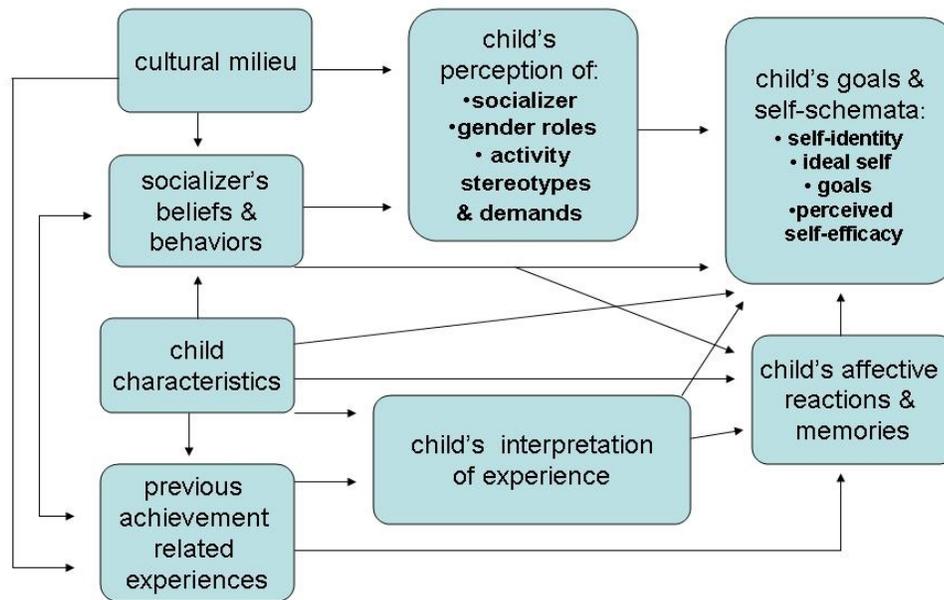
FIGURE 2. Interactions among a child, socializers, and the cultural context as a chid sets goals for action (from the expectancy-value model of Eccles & Wigfield, 2002)

attentiveness on the part of those adults who have meaningful relationships with the child" (p. 326). Socializers were also remembered as expressing sheer pleasure at being out in nature, and occasionally, disapproval of destructive practices (Chawla, 2007).

In addition to showing that nature merits attention and that it can be a source of pleasure, adult socializers often communicated the importance of caring for nature through their own example, by being good stewards of their gardens or farm or by treating wildlife considerately. For example, the following memory of a father combines the influences of both care and attention, "You know growing up my dad was a wildlife rehaber. He would have skunks, owls, ducks… at age eight or nine there was a corn snake that we had that laid eggs in the aquarium and we kept them and watched them hatch" (James et al., in press).

As Figure 2 shows, socialization is an interactive process. A child's experiences are not just shaped by a socializer's beliefs and behaviors, but also by how this person reacts to characteristics of the child and the memories that they form together. The importance of this interaction was a major finding of a study of wild land recreationists and con-servationists by Vadala, Bixler, and James (2007). Parents made nature experiences possible by choosing to live near natural areas, allowing outdoor exploration, sending their child to camp, or taking the family on vacations in wild areas, but

they also responded to their child's display of interest in nature by tolerating mud, permitting the collection of wildlife specimens, and supplying natural history books and magazines. Sometimes peers also played this facilitating role by sharing the exploration of wild areas. In contrast, people who did not report enjoyable activities in nature in childhood were also less likely to report an adult interest in nature or actions to protect it (Chawla, 2007; Vadala, Bixler, & James, 2007).

Two studies that used extended interviews to explore people's developing commitment to the conservation or study of nature found that different types of socializers and outdoor experiences became important at different stages in life (Chawla, 1999; James et al., in press). People typically began by describing free play and exploration in nature in childhood, family activities, and influential family members. In later childhood and adolescence, they often reported formal activities like scouting, summer camp, environmental clubs, or science classes in school, and they mentioned teachers, scout leaders, and close friends who shared these activities as significant influences. In early adulthood, they described how university professors, co-workers, or mentors in organizations helped direct their interests and skills into environmental careers or volunteerism.

In addition to representing the interactive role of socia-lization, Figure 2 points to the importance of culture and

gender. It shows that culture affects a child's perception and engagement with the world directly as well as through so-cializers' beliefs and behaviors. Atran and Medin (2008) illustrate these relationships in their comparison of Mayan, Menominee Indian, and rural and urban majority-culture children in North America. Cultural practices determined how much familiarity children had with the natural world, ranging from very little in the case of the urban children to extensive direct contact in the case of Mayan boys who ventured into the forest with their fathers at an early age. These differences in direct experience were reinforced by each culture's discourse about nature, from Itzá Mayan beliefs that the forest is inhabited by guardian spirits with whom people need to cooperate, to Menominee ideas that all of nature is alive and people are part of nature, to North American majority assumptions that nature is an externality to be exploited, cared for, or learned about. When children had more direct experience of nature, they were more likely to reason in terms of ecological relations, as shown by more ecological reasoning among older versus younger majority-culture rural children and Mayan boys. (Mayan boys' free range included the forest, whereas Mayan girls stayed close to home.) Cultural discourse, however, also played a large role, as shown by the finding that even young Menominee children referred to ecological relations. These cultural differences were reflected in more sustainable practices for gaining a living from the forest among Menominee and Itzá Mayan adults.

As shown by the Mayan division between the forest as a boys' and men's realm versus the home and garden as a girls' and women's realm, one of the strongest ways that culture shapes children's relationship with nature is through gender roles. In a number of cultural traditions in Western society, women are associated with nature more than men (Chawla, 1994); and in survey research, the majority of studies show that women report greater pro-environmental concern and behavior than men (Zelezny, Chua, & Aldrich, 2000). Surveys of fifth grade through high school students in the United States show that girls report stronger concern for the environment, sense of responsibility for improving the environment, and intention to participate in pro-environmental behavior (Zelezny et al., 2000). The researchers related these differences to measures of gender socialization in the form of girls' greater ability to take the role of another and sense of social responsibility.

Explicit in the environmental research but only implicit in Eccles and Wigfield's model, children develop through direct encounters with the physical world as well as social and cultural learning. They learn how their culture and key people in their lives respond to nature through embodied practices *in*

the physical world. In effect, the physical world is the larger context of the model that forms not only its container but also the medium through which social relations are enacted. Both research about significant life experiences and cross-cultural research show that adults structure children's experience through where they live and the access to nature that places and family practices afford. Figure 2 emphasizes the interactional nature of social and cultural learning, but children's environmental experiences are in fact *transactional*, based on characteristics of the child, the child's responses to a physical world in which nature fills a larger or smaller part, and how other people structure and define these experiences.

Valuing Environmental Action

In the expectancy-value model of Eccles and Wigfield (2002), the value that children attach to an activity determines what they choose to do, along with their expectation that they can perform the activity successfully. This relationship is shown in Figure 3, which reproduces the second half of the expectancy-value model, relating these direct determinants of behavior choices to children's memories, feelings, goals and self-concepts. Eccles and colleagues (1983) argue that any activity can be assessed on the basis of both extrinsic and intrinsic values, and Wigfield and Eccles (1992) show a progression in the types of values that assume importance at different ages.

Part of an activity's intrinsic value is its "attainment value," which is determined by whether children consider it personally meaningful to do well because this achievement enhances significant features of their self-identity (Eccles et al., 1983). To the extent that children are developing an en-vironmental identity—defining themselves as part of nature and caring for nature as part of their role in the world—acting on nature's behalf should have this attainment value. No current research relates processes of socialization to measures of environmental identity in childhood, but it is reasonable to expect that when family members notice nature, enjoy it, and care for it together, they implicitly communicate that these actions are part of "our" identity as a family. Children could also learn this identity from influential figures beyond the family, such as teachers, summer camp staff, or scout leaders.

Eccles and colleagues (1983) also define the "interest-enjoyment value" of a task, which refers to its intrinsic plea-sure and interest. When children themselves assess why they engage in projects to improve the environment, the intrinsic pleasure of interesting and meaningful activities with friends figures high on their list of reasons (Chawla, 2009). This is not surprising, given the importance of friends and fun in
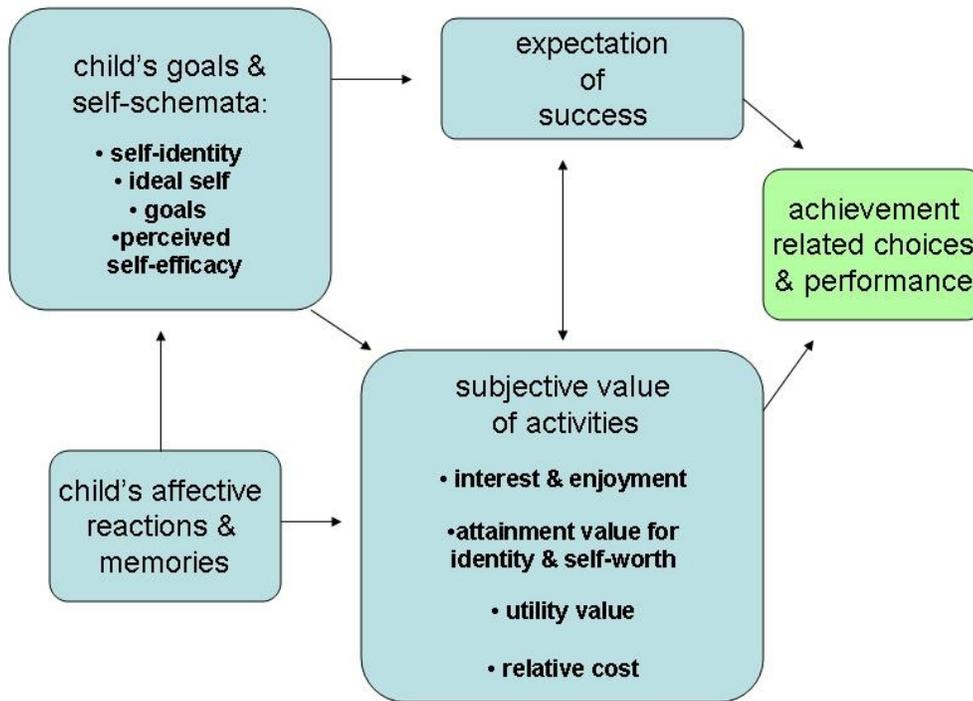
FIGURE 3. Determinants of a child's decision to invest in an area of achievement (from expectancy-value model of achievement of Eccles & Wigfield, 2002)

children's lives; but even with adults, several studies show that enjoying time outdoors in nature, social solidarity, and the intrinsic satisfaction of making a difference sustain environmental activism (Eigner, 2001; Grese, Kaplan, Ryan, & Buxton, 2000; Schroeder, 2000; Zavestoski, 2003).

The "utility value" of an activity concerns how well it relates to a person's current and future goals, even if it is not enjoyable for its own sake. For example, children might participate in cleaning up a creek because the person who bags the most trash will win a prize. Research shows a progression in the type of activity values that are salient at different ages, with an activity's interest and enjoyment value especially important for young children, while both interest and utility values are significant during the early elementary school years, and attainment values gain importance after children develop more stable self-identities, around age 11 (Wigfield & Eccles, 1992).

The expectancy-value model suggests that programs that engage children in caring for the natural world should deliberately try to integrate different activity values, with an emphasis on interest and enjoyment values in the early years. This is consistent with the conclusions of the environmental educator Sobel (2008), who has proposed a "ladder of

environmental responsibility." In the early years, he advocates, adults should focus on fostering children's comfort and pleasure in nature by activities like exploring natural areas, gathering treasures like rocks and flowers, and celebrating seasonal changes like solstices and equinoxes. Later in the elementary years, adults can help children develop an identity as good stewards of the earth through activities like gardening, composting, creating habitat for wildlife, or running a school recycling program. Sobel considers it appropriate to introduce potentially overwhelming problems like global warming only after children have established a foundation of environmental identity and efficacy—no earlier than the middle school years. At this stage too, he argues that it is critical to enable children to feel that they can take action on problems, such as by forming "climate change teams" that initiate projects to minimize carbon emissions at school.

Finally, Eccles and colleagues (1983) note that another important measure of an activity's value is its cost relative to other choices. This is consistent with the meta-analyses of environmental behavior by Hines, Hungerford, and Tomera (1986/87) and Bamberg and Möser (2007), which show that a strong determinant of whether people act on pro-environmental values, attitudes and knowledge is how convenient it is

to do so. Gardner and Stern (2002) and McKenzie-Mohr and Smith (1999) argue that successful programs to engage people in environmental initiatives need to begin with participatory approaches to identify barriers and opportunities for action from the perspective of the people involved. This principle should be applied to programs with children as well.

Although Eccles and colleagues' (1983) taxonomy of intrinsic and extrinsic values applies to how children assess activities, it is worth noting that a division between intrinsic and extrinsic values also underlies measures of how people assess nature. One of the most widely used measures of environmental values among adults is the New Ecological Paradigm (NEP) scale (Dunlap, Van Liere, Mertig, & Jones, 2000). It contrasts anthropocentrism, when people consider nature important solely because of its extrinsic utility for human beings, with biocentrism, when people seek to preserve nature because it has intrinsic value in itself. Manoli, Johnson, and Dunlap (2007) created a revised version of the NEP scale for use with 10 through 12 year-olds.

Wiseman and Bogner (2003) have been critical of this unidimensional contrast between anthropocentrism, on one end of the NEP scale, and biocentrism on the other. With the reasoning that people may believe in protecting nature because of its extrinsic benefits for human beings as well as for its intrinsic worth, they created an alternative Environmental Perception (ENV) scale for use with 10 through 16 year-olds. On this basis, they created a Model of Environmental Values which acknowledges that children may endorse the protection of nature because they believe in conserving nature for its own sake or because they believe that nature is meant to be of utility to humans *and* for this reason they need to be good stewards of the earth (Bogner & Wiseman, 1999; Wiseman & Bogner, 2003; see also Johnson & Manoli, 2008).

The Role of Empathy in Care for Nature

As Figure 1 shows, action for the environment is sometimes motivated by feelings of empathy and sympathy. A number of studies with adults show that pro-environmental behavior or the intention to engage with nature or protect it is predicted by measures of emotional and cognitive connection: empathy for other living things (Berenguer, 2007), emotional affinity with nature (Kals, Schumacher, & Montada, 1999), ecocentric perspective-taking (Schultz, 2000), and a sense of inclusion or connection with nature (Hinds & Sparks, 2008; Mayer & Frantz, 2004; Schultz, 2002). Kals, Schumacher, and Montada (1999) included questions about childhood experiences in their study, and found that time in nature, often in childhood with family members, predicted emotional

affinity with nature, which in turn predicted the intention to protect nature. These findings are consistent with Clayton's (2003) concept of an environmental identity, which she defines as "one part of the way in which people form their self-concept: a sense of connection to some part of the nonhuman environment, based on history, emotional attachment, and/or similarity, that affects the ways in which we perceive and act toward the world; a belief that the environment is important to us and an important part of who we are" (pp. 45-46).

Efforts to measure children's sense of connection with nature have built on this work with adults. When Kals and Ittner (2003) proposed a measure of environmental identity in childhood, they combined indicators of emotional affinity with nature (positive experiences in nature, fascination, curiosity and other emotional reactions), concern for nature, and perceived ability to reduce environmental risks. In a set of four studies with children 9 through 13 years of age, they found generally high levels of positive emotions and concern for nature, but children who scored higher on these indicators also expressed a greater commitment to protect nature. Kals and Ittner concluded that, "Although the development of an environmental identity is a lifelong process, it has its roots in an early age" (p. 137). Kahn (2003) agrees, based on his studies of an evolving "environmental moral identity" from ages 6 through the college years.

Working with 9 to 10 year-olds, Cheng (2008) created a Connection to Nature Index for children by modifying Mayer and Frantz's (2004) connection to nature scale for adults and Clayton's (2003) environmental identity scale. The index asks children about their enjoyment of nature, empathy for other living creatures, sense of oneness with nature, sense of responsibility to protect it, and belief that their actions can make a difference. Cheng found that children's interest in environmentally friendly practices was predicted by their sense of connection to nature, previous experiences in nature, family values toward nature, and perceived ability to help.

Considering that a sense of connection with nature and empathy for other living things have been related to self-reported pro-environmental behavior or the interest or intention to act by both adults and children, this section reviews the theory of empathic morality of Hoffman (2000), which proposes that empathy and sympathy are a foundation for the development of prosocial action. This section suggests that this theory may be extended to children's encounters with animals, plants and even other elements of nature. In doing so, it looks more closely at the network of interactions in the expectancy-value model of Eccles and Wigfield (2002), with a focus on how empathy, sympathy, and perspective-taking

relative to nature may develop within this network of culture, social interaction, and life experiences.

According to Hoffman (2000), in a healthy course of development children proceed from an initial capacity to feel empathy *with* another to a well-tuned capacity to feel sympathy *for* another. In the beginning, infants show an innate, involuntary reaction to others' displays of emotion, such as when newborns cry when others cry. This apparent lack of distinction between the feelings of oneself and another continues through the first year, but in the second year, young children begin to distinguish the feelings of another from their own. At this point, Hoffman argues, children can begin to combine empathy with the capacity for sympathy for another's condition. In the elementary school years, children begin to realize that others may have lives that are generally sad or happy, as well as respond to people as a group, such as the homeless or hurricane victims. At this age, children begin to be able to imagine other lives and respond with sympathy to people in distant times and places.

According to Hoffman (2000), parents and other "moral educators" play a critical role in leading children along this course. Unless adults require children to consider the feelings and needs of others, children might merely respond with relief to the realization that others' feelings are not their own. Hoffman claims that parents and teachers do this most effectively through the disciplinary method of "induction," when they point out to a child that his behavior has harmful consequences for another and highlight the victim's distress. Induction encourages sympathetic perspective-taking and the internalization of guilt for hurting others. Adults and older peers help stabilize these responses when they state moral principles like fairness and rights and encourage discussions about the reasons that underlie these principles.

In turning to this theory of prosocial development as a potential guide to processes of pro-environmental development, an immediate question is what do concepts like empathy, sympathy, or perspective-taking mean when they are applied to elements of nature? Because nonhuman animals give signs that can be read as joy, fear, pain, or other emotions, several researchers propose that these concepts can be adapted to people's relations with animals. Myers (1998) argues that within the first year of life, children already show an awareness of animals as "others" with coherence, continuity, agency, and feeling. In his descriptions of daily life in a nursery school classroom that contained a variety of animals, he recorded many examples of shared "vitality affects," such as when children became excited around an excited dog, lethargic around resting ferrets, and calm around a snake. These shared affects can be compared to Hoffman's (2000)

descriptions of empathic responses. In their play, the nursery school children imitated the body postures and movements of animals, becoming turtles, dogs, snakes, and other animals that caught their attention. Role playing like this demonstrates a recognition that animals have lives and feelings distinct from one's own: in Hoffman's system, a foundation for the transformation of empathy into sympathy. Myers and Saunders (2002) are reluctant to call these child-animal relations "empathy," given the difficulty of interpreting animal behavior accurately, but they apply the similar concept of "cofeeling"—the ability to participate in another's feelings—and see it as a bridge to a sense of connection between humans and other species. They suggest that children can be encouraged to build on their inherent responsiveness to animals by learning to care for their needs, and by extension, habitats, ecosystems, and the natural world as a whole. Melson (2001) also believes that children's ability to respond to other animals emotionally and imaginatively is a foundation for building environmental stewardship, as it invites children to learn about animal needs and habitats in a caring way.

It is more difficult to extend concepts like empathy and sympathy beyond animals, but Gebhard, Nevers, and Billmann-Mahecha (2003) propose that young children's anthropomorphism may form a foundation for respect and caring for nature. In group discussions with children in three age groups, 6-8, 10-12, and 14-16, they found that children younger than 12 were willing to attribute emotional feelings to trees as well as animals, and that their interpretation of a story about a tree "seems to be closely associated with feelings of empathy for the tree and appears to permit them to assume its perspective" (p. 97). They recommend that rather than seeking to eliminate anthropomorphism, education should cultivate an "enlightened anthropomorphism" by emphasizing the commonalities that exist between humans and other parts of nature. In the same vein, Schultz (2000) advocates that education should reduce perceived separation between the self and nature and encourage perspective-taking and empathy for all living things.

Taking a leap beyond individual living things, Milton (2002) argues that a sense of personhood can be felt in natural entities like the sun, wind, rain, landscapes, and the earth as a whole, as well as plants and animals, in the sense that people perceive them as showing a "responsive relatedness" and often treat them as worthy of moral concern. (Consider the slogans "let the river live" and "save the earth.") She proposes that many environmental activists express this sense of personhood when they talk about the natural areas that they seek to protect. Based on studies in three countries, Kahn (2006) reports that when children reasoned about nonsentient

elements of nature like rivers, the majority claimed that it would be wrong to throw garbage in the water because of ill effects to humans or other animals, but a few treated the water as a being with its own moral ends. As a Brazilian child living near the headwaters of the Amazon River explained, "Because the river was not made to have trash thrown in it, because the river belongs to nature" (Kahn 1999).

A bridge between Hoffman's theory of empathic morality and care for nonhuman things is offered by Trevarthen (1979) and Trevarthen and Hubley (1978), through their concepts of "primary" and "secondary" intersubjectivity. Like Hoffman (2000), Trevarthen (1979) believed that children perceive other people's intentions and feelings directly because they are embodied in facial expressions, voice, and movement. Also like Hoffman, he believed that this level of "primary intersubjectivity" makes empathy possible and remains fundamental to social interaction throughout life, even after children develop complex skills of social perspective-taking and social inference. A pivotal transition, however, occurs around the age of one year, when children add to the immediacy of primary intersubjectivity the abilities associated with "secondary intersubjectivity" (Trevarthen & Hubley, 1978). They begin to engage with others in processes of joint attention, looking to the expressive features and actions of another person to learn what things mean and what they are for, and soon directing attention themselves by pointing. Within this framework, Gallagher and Hutto (2009) note that another milestone occurs when children move from the capacity to point and attach names to objects of joint attention to participating in extended narratives about what things mean. Induction, in Hoffman's (2000) theory, can be considered one form of narrative, but children absorb many stories about the meaning of things from their culture and social groups.

According to Reed (1996) and Chawla (2007), processes of joint attention are essential to learning how to respond to nonhuman things as well as other people. Chawla argues that when a child and other significant people in its life notice elements of nature together, with appreciation for other things' own way of being rather than fear or destructiveness, it lays a foundation for finding intrinsic value in nature. Noticing something with interest in this way implies that it is worth noticing. Later narratives may elaborate the meaning of animals, plants, rocks, and rivers, but according to the research on significant life experiences that Chawla (2007) reviews, they build on these direct encounters.

Language, nevertheless, can cultivate empathy, sympathy and perspective-taking as Hoffman's emphasis on the importance of parents' explanations during the process of induction assumes. The power of language to encourage or discourage empathy was demonstrated by a series of experiments that showed that people who are exposed to visible expressions of distress in another person exhibit significantly more empathic arousal if they are given instructions to "imagine him" or "imagine yourself" in the same situation, versus instructions to "watch him" by objectively focusing on muscle movements (reviewed in Staub, 1978). Schultz (2000) adapted this research design by showing college students pictures of animals in distress, with instructions to either view the images objectively or try to imagine how the animals are feeling. After seeing the pictures, students completed measures of egoistic, altruistic, and biospheric concerns. The "imagine the animal" condition produced significantly higher biospheric and altruistic concerns. Schultz argues that this type of perspective-taking expands the boundaries of the self by increasing the extent to which people perceive themselves to be connected with nature. Myers' (1998) observations of how teachers and peers guided nursery school children's interactions with animals suggest that similar processes operate in early childhood.

How joint attention and language may function together to encourage care for the natural world is evident in Kahn's (1999) description of shared experiences with his 4-year-old daughter. When a hummingbird flew inside their family cabin, the little girl watched as her father carefully captured the bird inside a plastic container and let it go free outside, saying, "Be well and live free." An hour later, when a butterfly flew inside the cabin, the father cupped it in his hands and gently transferred it into his daughter's cupped hands. She opened her hands to let the butterfly fly away, saying, "Be well and live free." Later that day, when she found a bee drowning in water, she asked her father for something to save the bee and held out the container lid that he gave her for the bee to climb to safety.

As a rule, Myers (1998) and Melson (2001) note, societies communicate extremely contradictory messages about how to relate to animals. Native and industrialized cultures alike surround children with images that Melson calls "animal selves" in the form of anthropomorphized animal characters and stories that feature close bonds between children and animals, as the same time as children see animals exploited for food and other uses. Add to this children's early awareness that animals are "others" (Myers, 1998), and it is not surprising that the same dilemmas that children face in their relationships with other people—whether to respond with empathy, sympathy, objectification, disinterest, or cruelty—characterize their relations with animals as well. Similar conclusions can be applied to plants. Children see that some plants should be carefully tended and watered, while "weeds"

should be torn out by the roots and wild growth can be freely cut and trampled. On the scale of landscapes, children see that some places can be bulldozed and littered, while other places should be protected as gardens, parks and wilderness refuges.

According to E. O. Wilson's (1984) concept of biophilia, people have an innate attraction to other living things but it is a weak genetic tendency that depends on experience and socialization for its expression. Kahn (1999) recommends the concept of "mediated biophilia," which recognizes that culture, social experience, and direct experiences with nature have a profound influence on how these biological tendencies get expressed (see also Kellert, 1997). The result, Kahn (2003) suggests, is that there may be different pathways to biocentric relationships with the natural world. One pathway may be daily intimate contacts with the land in cultures that emphasize human community with the rest of nature. (His story of his interactions with his 4-year-old daughter belongs to a family culture of this kind.) Another pathway may depend on children's exposure to ideas about moral rights and standing for animals and other elements of nature, communicated through stories, images, and other media. Kahn acknowledges that, in an age of globalization, these pathways may converge.

Developing a Sense of Agency

Up to this point this article has reviewed research related to sources of motivation to care for the natural world, but as Figure 1 shows, motivation is only part of the story. People also need to know about environmental issues, know what they can do, and believe that they have the ability to do what is necessary to achieve the goals they set. This section focuses on two interdependent factors in Figure 1: how children learn action skills and strategies, and how they develop a sense of efficacy, as an individual or a member of a group, to achieve environmental goals.

Figure 3, from the expectancy-value model of Eccles and Wigfield (2002), identifies a sense of efficacy as part of children's self-concept, and shows that it plays a key role in determining expectations of success, achievement-related choices, and performance. This part of the model is based on the work of Albert Bandura, but Bandura (1997) is critical of expectancy-value theories on the grounds that they assume that the motivation to act is governed by general expectations that certain actions produce certain outcomes, as well as these outcomes' attractiveness, whereas people are also governed by their beliefs about what they themselves can accomplish, with attention to the specific task at hand. No matter how much people may value an outcome, unless they believe that they can do what is necessary to achieve it, they are unlikely to put

forth any effort.

Eccles and Wigfield (2002) address these concerns by defining expectancies for success as individuals' beliefs about how well they will do on upcoming tasks, a concept similar to Bandura's (1997) definition of perceived self-efficacy as "beliefs in one's capabilities to organize and execute the courses of action required to produce given attainments." Although their model measures general beliefs about competence in given domains, whereas Bandura argues for the importance of measuring expectations of success on specific tasks, Eccles and colleagues (1983) note that their work has shown that children and adolescents do not make a distinction between general and specific expectations of successful performance. Although these measures may be theoretically distinguishable, they are empirically indistinguishable in research with young people.

This section turns directly to Bandura's work on self-efficacy because it suggests how children develop a sense of agency, and includes the concept of perceived collective efficacy—people's belief that they can achieve goals by cooperating as a group. This element of collective achievement is missing from Eccles and Wigfield's model, but it is vital for effective environmental work. Drawing on Bandura's research synthesis, this section suggests how general developmental processes that promote children's sense of efficacy may apply to environmental behavior in particular.

Bandura (1997) observes that a sense of agency begins in infancy, in the recognition that actions produce outcomes and that these outcomes can be attributed to a developing sense of self. Discovering that one is capable of producing interesting or useful effects is itself reinforcing. Chawla (2007) has suggested that natural areas are especially rich in competence-building opportunities of this kind, and that this may be one reason why positive experiences of play in nature in childhood have been repeatedly connected with the disposition to care for the natural world later in life.

As Chawla (2007) notes, natural areas are full of materials that enable children to produce pleasurable effects, such as water to splash, mud to mold, branches to swing on, and sticks and stones to construct forts and huts. They are also full of graduated challenges that enable children to experience new levels of achievement, such as when a child realizes that she can grasp a tree branch that was previously too high or lift a stone that was previously too heavy. As places that are usually beyond adults' direct control, natural areas allow children to use their "outside bodies" as well as their "outside voices," with all the pleasure that this free autonomous movement involves. The natural world also affords unlimited scope for new discoveries. Even areas as small as a weed cove or an

overgrown ditch contain an infinite amount of information that is always in a flux of change. On every visit to this place, there is something new to find; and in contrast to two-dimensional information on television or computer screens, these discoveries involve all five senses. Not least, "loose parts" in nature (Nicholson, 1971)—like sticks, stones, leaves, earth and water—promote cooperative and creative social play and therefore social competence. In addition to contributing to a sense of agency, these positive experiences can be expected to contribute to an emotional bond with nature.

These qualities of the natural world are evident in the following exchange between a teacher and an 8-year-old boy. The boy is a member of a group of classmates who regularly choose to play in the woods during recess, and the teacher is documenting how students use this part of their schoolyard in contrast to an athletic field or built play equipment, and how they talk about their choices (Stanley, in process). The children in the "woods play" group regularly collect and trade found objects like wild fruit and rocks.

> *Why do you go to the woods?*
> It's like making your own small country. And we like the trading. I think it also gives you a sense of power and maturity. For me, it's like my own business or country.

> *What do you do there?*
> I like digging in dirt for crystals—quartz, I mean—and finding animals. And…it's definitely a good way to make friends.

When children are engaged in play of this kind, at the same time as they are building competence, they are building memories of positive experiences of nature.

Heft and Chawla (2006; Chawla & Heft, 2002) note that community programs that involve children in action for the environment can deliberately incorporate similar opportunities to build competence. Drawing on principles of ecological psychology and Barker's (1968) observation that behavior settings allow different levels of penetration and decision-making, they question the value of programs that involve children on superficial levels: merely as onlookers; with assigned roles that have little power; or with potential rather than immediate power, such as the limited authority to elect youth representatives to an environmental conference. Opportunities to develop and refine action skills begin when children have control over at least part of the program, with autonomy to make decisions, take action, and learn from the consequences. When environmental programs offer children opportunities to step into positions of shared leadership, they increase the opportunities for decision-making, action, and corresponding learning.

This process of building a sense of agency through seeing the effects of one's actions is integral to mastery experiences, when people undertake an activity that they consider significant and succeed. In Bandura's (1997) synthesis of research on the means through which people develop a sense of efficacy, nothing is more fundamental. In addition to mastery experiences, children can feel emboldened to attempt a challenging activity by vicarious experiences of other people's success and by verbal encouragement, but nothing compares with the direct taste of success. A fourth means of building a sense of efficacy, learning to cope with physiological reactions like fatigue or anxiety, enables children to understand that struggling to succeed does not detract from their accomplishment. Table 1 summarizes these four processes.

There is considerable research about how to apply these processes most effectively. Bandura (1997) documents that people are more likely to succeed at a complex task if it is broken down into manageable components. While this is standard practice in coaching children in fixed skills, it also applies to the more complex "generative" skills that characterize most environmental initiatives. For example, in building a birdhouse, children need to learn to cut and hammer each birdhouse according to a predetermined pattern. This is a fixed skill, but seeking to create a natural habitat for birds in their schoolyard requires a complex array of generative skills. If children take leadership for this project, they need to research methods for restoring habitats, calculate costs, identify resources, convince other people of the natural area's value, organize support, hold meetings, and communicate through different media. Children can transfer these skills to a new initiative, but they will never repeat them in exactly the same way.

The most ambitious environmental goals all require skills of this kind, with success depending on multiple participants, which means that final outcomes are difficult for any one person to control or predict. In circumstances of this kind, Bandura (1997) recommends breaking an ambitious distant or "distal" goal into a series of proximal subgoals which can be more predictably attained. Continuing the school example, if students' long-term goal is to restore a quarter-acre natural habitat in a corner of the schoolyard, they may begin by planting a butterfly garden and seed-bearing grasses for birds outside their classroom windows. In research with children, Bandura and Schunk (1981) note that proximal subgoals may often be more motivating than the distant goal.

With respect to vicarious experiences of success, people are more likely to imitate modeled behavior if they see someone succeed who is similar to themselves, who performs at a level like their own or slightly higher (Bandura, 1997).

Table 1. Four processes that promote a developing sense of efficacy

Four processes that promote a developing sense of efficacy*
• Most persuasively, children develop a sense of self-efficacy through mastery experiences, when they attempt to do something that they consider significant and experience success. • Vicarious experiences, when children see another person attempt a challenging ativity and succeed, suggest that the observer may be capable of this attainment too—especially if the person they observe is similar to themselves. • Verbal encouragement can also be effective, especially if the person who provides encouragement is considered knowledgeable and credible, gives targeted information about what was done well, and credits success to the child's abilities rather than effort alone. • Because challenging activities may cause fatigue, anxiety or even fear, children need to be told that these reactions are common and natural, and taught techniques for coping with stress so that it doesn't impair their performance.   *from Bandura (1997)

For children, this means that peer models are especially persuasive (Schunk & Hanson, 1985). Models are also especially instructive if they verbalize what they are doing, such as how they make plans, decide on strategies, generate solutions to problems, correct errors, and motivate themselves to persevere (Schunk, 1989).

Verbal encouragement is only likely to be effective when it is perceived to be credible, which means that it comes from someone experienced, who promotes performance at a level that is realistically within reach (Bandura, 1997). Children are also more likely to respond with an increased sense of self-efficacy when they are told that their accomplishments reflect ability rather than just hard effort (Schunk, 1983). Repeatedly telling children that their achievement is the result of effort appears to imply that their abilities must be limited (Schunk & Rice, 1986). Because undertaking challenges often causes physiological arousal like a pounding heart or butterflies in the stomach, children need to be helped to interpret these sensations as a healthy state of excitement and arousal rather than a debilitating weakness (Bandura, 1997).

There are currently no evaluations of environmental programs for children that explicitly assess whether they include these processes that promote a sense of efficacy. Nevertheless, a number of evaluations suggest that mastery experiences are a critical part of effective programs. In a meta-analysis of 18 classroom and field study programs to increase pro-environmental behaviors, Zelezny (1999) found that the most effective programs actively involved participants. This is exemplified by a series of studies that compared students engaged in an Issue Investigation and Action Taking (IIAT) curriculum with control groups who had simple instruction in science or environmental issues. The curriculum involves middle school students in an 18-week program to identify and learn about an environmental issue in their community, devise ways to address the problem, and implement their action plan. In the process, it gives them opportunities to test their capabilities. Five studies, which together involved 11 through 15 year-olds in a variety of schools, demonstrated that this approach significantly increased students' knowledge of actions that citizens can take for the environment, as well as self-reported actions, relative to control groups (Culen, 1994; Ramsey, Hungerford, & Tomera, 1981; Ramsey & Hungerford, 1989; Ramsey, 1993; Simpson, 1989).

In a variation of the IIAT approach, high school students in a 6-day residential nature camp who received both instruction in environmental issues and training in action strategies were compared with a camp group that only learned about issues (Jordan, Hungerford, & Tomera, 1986). In a post-test two months after the program ended, only the group that had opportunities to practice taking action showed a significant increase in the number of pro-environmental behaviors that they reported. Similarly, a Swiss study compared a control group of secondary school students with a class who participated in a year-long program related to an endangered bird (Bogner, 1999). Students in the action pro-gram learned about the bird's natural history, observed its

behavior, constructed nesting boxes, and wrote letters to the government of Senegal, where the bird migrated for the winter. Only the students in this program showed significant gains in knowledge, enjoyment of nature, and the intention to act in environmentally friendly ways.

Another program factor that has been associated with action for the environment is duration (Zelezny, 1999). In part, longer programs may provide more time for mastery experiences, as annual evaluations of Earth Force programs for students in the United States suggest (e.g., Melchior, 2008). They show that the greatest gains come from programs that last more than 18 weeks and that include an action project. Under these conditions, gains include increases in civic skills, knowing how to work with others, and commitment to work on environmental issues. Longer field-based programs may also promote students' care for nature because they provide more time for positive nature experiences (Bogner, 1998).

An evaluation of a curriculum similar to IIAT, Action Research and Community Problem Solving, reinforces the importance of clearly defined subgoals that ensure that students have some opportunities to experience success. Bull (1992) found that when the program was applied in two inner-city Detroit middle schools, it resulted in a decline in students' perceptions of their ability to solve some environmental problems, which he attributed to a failure to give students clearly defined roles as decision-makers. With less responsibility, they had less opportunity to experience significant achievements. He also found that empowerment was domain specific. Students who said that they felt they could make a difference in solving one type of environmental problem did not necessarily carry this confidence over to the solution of other problems. This indicates the importance of opportunities to transfer skills learned in one context to new initiatives.

These evaluations of environmental programs focus on individual experience, and their findings indicate that young people who have opportunities to engage in environmental initiatives and see their own capacities for action are more likely to report continued pro-environmental behaviors, an outcome that research on a sense of self-efficacy would predict. In undertaking environmental challenges, however, a sense of collective efficacy may often be equally important. A sense of collective efficacy refers to the belief of members of a group "that they can solve the problems they face and improve their lives through unified effort" (Bandura, 1997). The two forms of efficacy are not unrelated. The capacities of a group depend on the skill and commitment of individual members, and individuals in a group draw strength from confidence that they belong to a well functioning group. To address environmental issues, this combination of personal and collective efficacy is often required.

This is the conclusion implied by an assessment of two groups of 10 through 14 year-olds who engaged in participatory action research to improve the environments of their squatter camp and an Asian enclave in downtown Johannesburg (Griesel, Swart-Kruger, & Chawla, 2002). The children lived in harsh conditions, and the evaluation caught them midstream in the daunting process of trying to effect change. In focus groups, participants spoke highly about what they learned about their environment and the intrinsic value of working together, but on a measure of self-efficacy that was created for the study, children in the squatter camp control group scored higher than program participants. One dimension of increasing maturity is that children become more accurate at appraising what they realistically can and cannot do, which may result in their adjusting self-appraisals downward (Bandura,1997). Realistically, however, efforts to tackle environmental problems may also become a lesson in how little one person alone can accomplish and the necessity of working with others. In this case, it is important to measure a sense of collective efficacy as well as self-efficacy. The Johannesburg study also underscores the importance of ensuring that children have opportunities to achieve proximal goals that they consider significant, even if distant goals remain elusive.

Implications for Further Research

This article draws on the expectancy-value model of Eccles and Wigfield (2002), the theory of empathic morality of Hoffman (2000), and the work of Bandura (1997) on efficacy in order to suggest processes that may prepare children to actively care for the natural world. Because there has been extensive research on how children develop a sense of efficacy, sympathy and the motivation to achieve in other fields of endeavor beyond the environment, this broader field of work may serve as a guide to how care for the natural world develops as well. Existing research on children and nature appears to confirm the usefulness of this framework. As the expectancy-value model and the theory of empathic morality predict, interactions between a child and key socializers appear to shape how children value nature, but children are active agents in this process. As basic research on a sense of efficacy would predict, children also need opportunities to learn and practice action skills and see that their actions on nature's behalf can be successful.

While this framework has been useful in organizing ex-

isting research on children and nature and suggesting developmental processes that may underlie the disposition to treat nature with care, it also exposes many gaps in current understanding. Insights into formative interactions between children and key socializers, as children experience nature and learn how to respond to it, come predominantly from retrospective studies of adults recalling childhood. Although this work illuminates the childhood experiences that people associate with their continuing care for nature, it is not a substitute for observations, ethnographic field work, interviews with children, and experimental designs that investigate formative experiences as they unfold. In the retrospective studies, descriptions of interactions between children and key socializers have also focused on the role of the adult. Through observational studies, more attention needs to be given to children's contributions.

In considering the development of care for the natural world, a difficulty is that "nature" is an abstraction, while children encounter *this* animal*, this* plant, and *this* landscape. How do children learn to generalize from empathy or care for individual elements of nature to concern for entire habitats or the natural world at large? This paper reviews attempts to explore this question in the context of empathy or "cofeeling" with individual animals, childhood anthropomorphism, and environmental moral reasoning, but how these emotional and cognitive responses relate to each other and to action relative to nature is still an open field for study. As this paper observes, research on prosocial development suggests some critical processes, but the degree to which processes of prosocial development can be applied to developing relations with the natural world needs to be empirically determined.

This review notes that it is not enough for children to learn values and beliefs about what they *should* do; they also need opportunities to learn what they *can* do. It summarizes research that has identified four general processes that build children's sense of confidence that they can act with competence. A promising area for research is the application of these findings to the design and evaluation of environmental programs. At their best, existing evaluations look for gains in pro-environmental behavior through pre- and post-measures and comparisons with control groups, but as a rule they do not connect outcomes to fine-grained descriptions of what children do during program activities, or relate outcomes to existing knowledge about how to promote efficacious action. As this review shows, some studies have compared the effects of giving children different amounts of practice at taking action, but there is also a need for experimental designs that examine the effects of different levels of responsibility for action, different types of role models, and different amounts of

discussion about effective action, to determine the processes that encourage pro-environmental behavior in the most effective and lasting ways.

Children's own evaluations of programs are also needed. The expectancy-value model suggests that children engage in activities for both intrinsic and extrinsic reasons. It would be useful to explore whether this rubric helps explain how children assess environmental activities and programs. Are certain activity values associated with more positive assessments? Do preferences change with age? In follow-up measures, do certain activity values predict care for nature more strongly than others?

According to the expectancy-value model of achievement motivation, children are surrounded by cultural practices which influence what they experience and how they interpret it. As the research on children and animals that has been reviewed here reflects, cultural messages about nature are often contradictory. To add to the complexity, children participate in diverse cultures as they move from their family to school to peer groups to community programs to messages from mass media—and in the case of many adolescents—to work settings. How children process these messages and sort their way through the contradictions is another important subject for study. Are there ages when children are particularly receptive to messages about how to treat nonhuman animals and other elements of nature? What makes some messages more influential than others? Are some message sources more persuasive? How do children reconcile messages about nature with their own experiences of plants, animals, and natural areas? Answering these questions will require interviews with children and ethnographic research in different settings of their lives, with attention to how children act relative to nature as they navigate their way through images and narratives as well as embodied practices.

A critical issue in all research on the development of active care for the natural world is that it requires reliable and valid measures of behavior. Most of the studies reviewed here have measured environmental behavior indirectly, through self-report or a stated intention to act. When self-report is cross-validated with objective measures of behavior, its accuracy varies across studies (Lam & Cheng, 2002). Given this inconsistency, future research should rely on observed behavior whenever possible, and when self-report is used, increase its trustworthiness through written records like journals or cross checking children's responses with parents' or teachers' reports. When Evans et al. (2007) created a measure of environmental behavior for 6 to 8 year-olds, they compared children's self-reports with mothers' reports of their children's actions, and found the strongest correlations for

behaviors that the mother and child shared together or that the mother could easily see. Another promising direction is the creation of measures of self-efficacy and collective-efficacy that are specifically targeted to the behaviors that environmental programs seek to foster. While Bandura (1997) challenges the value of general measures of efficacy, he presents evidence that targeted measures of efficacy are strong predictors of actual behavior.

In all of this research, it will be important to compare outcomes by gender as well as age. The surveys reviewed here (Zelezny, Chua, & Aldrich, 2000) show that girls tend to report greater environmental concern, sense of responsibility, and intention to act on the environment's behalf than boys, but how gender differences are learned, beginning in early childhood, has not been systematically documented. Understanding these differences may offer insights into how to foster greater care for the environment in both sexes.

As research on the development of care for the natural world is being done, the historical context of children's experience of nature is changing. This is the thesis of Louv's (2005) book *Last Child in the Woods,* that contemporary children enjoy less freedom in nature than previous generations, as play becomes more structured, supervised, and confined indoors. Attempts to document change confirm this trend (England Marketing, 2009; Gaster, 1991). Considering that childhood play and exploration in nature has been an important motivation for care for nature later in life, it is important to compare children's feelings, values and behaviors as they learn about nature in different contexts: through free play, environmental education fieldwork, or second-hand from representations in books and on screens. Kahn (2003) has proposed that there may be two pathways to biocentric relations with nature, through intimate daily contact with the land in cultures that emphasize human inclusion in nature, or through narratives about the rights and standing of animals and other living things. Comparing outcomes associated with different pathways to valuing nature, and whether different approaches can be combined to reinforce each other, is a fertile field for research, using longitudinal designs whenever possible.

References

Atran, S., & Medin, D. (2008). *The native mind and the cultural construction of nature*. Cambridge, MA: MIT Press.

Bamberg, S., & Moser, G. (2007). Twenty years after Hines, Hungerford, and Tomera: A new meta-analysis of psycho-social determinants of pro-environmental behavior. *Journal of Environmental Psychology, 27*, 14-25.

Bandura, A., & Schunk, D. H. (1981). Cultivating competence, self-efficacy and intrinsic interest through proximal self-motivation. *Journal of Personality and Social Psychology, 41*, 586-598.

Bandura, A. (1997). *Self-efficacy*. New York: W. H. Freeman.

Barker, R. (1968). *Ecological psychology*. Stanford, CA: Stanford University Press.

Berenguer, J. (2007). The effect of empathy in proenvironmental attitudes and behaviors. *Environment and Behavior, 39*(2), 269-283.

Bogner, F. X. (1998). The influence of short-term outdoor ecology education on long-term variables of environmental perspective. *Journal of Environmental Education, 293*(4), 17-29.

Bogner, F. X. (1999). Empirical evaluation of an educational conservation programme introduced in Swiss secondary schools. *International Journal of Science Education, 21*(11), 1169-1185.

Bogner, F. X., & Wiseman, M. (1999). Toward measuring adolescent environmental perception. *European Psychologist, 4*, 139-151.

Bull, J. (1992). *The effects of participation in an environmental action program on empowerment, interest and problem solving skills of inner city students.* Unpublished dissertation, University of Michigan.

Chawla, L. (2009) Participation as capacity-building for active citizenship. *Les Ateliers de l' Ethique*, Spring issue.

Chawla, L. (1994). *In the first country of places: Nature, childhood and poetry*. Albany: State University of New York Press.

Chawla, L. (1999). Life paths into effective environmental action. *Journal of Environmental Education, 31*(1), 15-26.

Chawla, L. (2007). Childhood experiences associated with care for the natural world. *Children, Youth and Environments, 17*(4), 144-170.

Chawla, L., & Heft, H. (2002). Children's competence and the ecology of communities. *Journal of Environmental Psychology, 22*, 201-216.

Cheng, J. (2008) Children, teachers and nature: An analysis of an environmental education program. Unpublished dissertation, University of Florida, Gainesville.

Clayton, S. (2003). Environmental identity: A conceptual and an operational definition. In S. Clayton, & S. Opotow (Eds.), *Identity and the natural environment* (pp. 45-65). Cambridge, MA: MIT. Press.

Culen, G. (1994). *The effects of an extended case study on environmental behavior and associated variables in seventh and eighth grade students.* Unpublished dissertation, Southern Illinois University.

Dunlap, R. E., Van Liere, K. D., Mertig, A. G., & Jones, R. E. (2000). Measuring endorsement of the New Ecological Paradigm: A revised NEP scale. *Journal of Social Issues, 56*(3), 425-442.

Eccles, J., Adler, T. F., Futterman, R., Goff, S. B., & Kaczala, C. M., et al. (1983). Expectancies, values, and academic behaviors. In J. T. Spence (Ed.), *Achievement and*

achievement motivation (pp. 75-146). San Francisco: Freeman.

Eccles, J. S., & Wigfield, A. (2002). Motivational beliefs, values, and goals. *Annual Review of Psychology, 53*, 109-132.

Eigner, S. (2001). The relationship between "protecting the environment" as a dominant life goal and subjective well-being. In P. Schmuck, & K. Sheldon (Eds.), *Life goals and well-being* (pp. 182-201). Seattle: Hogrefe and Huber.

England Marketing. (2009). *Report to Natural England on childhood and nature: A survey on changing relationships with nature across generations*. Warboys, Cambridgeshire: England Marketing.

Evans, G. W., Brauchle, G., Haq, A., Stecker, R., Wong, K., & Shapiro, E. (2007). Young children's environmental attitudes and behaviors. *Environment and Behavior, 39*(5), 635-659.

Ewert, A., Place, G., & Sibthorp, J. (2005). Early-life outdoor experiences and an individual's environmental attitudes. *Leisure Sciences, 27*(3), 225-239.

Gallagher, S., & Hutto, D. D. (2009). Understanding others through primary interaction and narrative practice. In J. Zlatev, T. Racine, C. Sinha & E. Itkonen (Eds.), *The shared mind: Perspectives on intersubjectivity*. Amsterdam: John Benjamins.

Gardner, G. T., & Stern, P. C. (2002). *Environmental problems and human behavior* (2nd ed.). Boston: Pearson Custom Publishing.

Gaster, S. (1991). Urban children's access to their neighborhood: Changes over three generations. *Environment and Behavior*, *23*(1), 70-85.

Gebhard, U., Nevers, P., & Billmann-Mahecha, E. (2003). Moralizing trees. In S. Clayton, & S. Opotow (Eds.), *Identity and the natural environment* (pp. 91-111). Cambridge, MA: MIT Press.

Geller, F. S. (2002). The challenge of increasing proenvironmental behavior. In R. B. Bechtel, & A. Churchman (Eds.), *Handbook of environmental psychology* (pp. 525-540). New York: John Wiley.

Gibson, E. J., & Pick, A. D. (2000). *An ecological approach to perceptual learning and development*. Oxford: Oxford University Press.

Gibson, J. J. (1979). *The ecological approach to visual perception*. Boston: Houghton-Mifflin.

Grese, R. E., Kaplan, R., Ryan, R. L., & Buxton, J. (2000). Psychological benefits of volunteering in stewardship programs. In P. H. Gobster, & R. B. Hull (Eds.), *Restoring nature* (pp. 265-280). Washington, DC: Island Press.

Griesel, R. D., Swart-Kruger, J., & Chawla, L. (2002). Children in South Africa can make a difference. *Childhood, 9*(1), 83-100.

Heft, H., & Chawla, L. (2006). Children as agents in sustainable development. In C. Spencer, & M. Blades (Eds.), *Children and their environments* (pp. 199-216). Cambridge: Cambridge University Press.

Hinds, J., & Sparks, P. (2008). Engaging with the natural environment: The role of affective connection and identity. *Journal of Environmental Psychology, 28*, 109-120.

Hines, J. M., Hungerford, H. R., & Tomera, A. N. (1986/87). Analysis and synthesis of research on responsible environmental behavior: A meta-analysis. *Journal of Environmental Education, 18*(2), 1-8.

Hoffman, M. L. (2000). *Empathy and moral development*. Cambridge: Cambridge University Press.

Horwitz, W. A. (1996). Developmental origins of environmental ethics. *Ethics and Behavior, 6*(1), 29-54.

James, J. J., Bixler, R. D., & Vadala, C. E. (in press). Environmental socialization: A developmental model for natural history oriented environmental professionals. *Children, Youth and Environments*.

Jensen, B. B., & Schnack, K. (1997). The action competence approach in environmental education. *Environmental Education Research, 3*(2), 163-178.

Johnson, B., & Manoli, C. C. (2008). Using Bogner and Wiseman's model of ecological values to measure the impact of an earth education programme on children's environmental perceptions. *Environmental Education Research, 14*(2), 115-127.

Jordan, J. R., Hungerford, H., & Tomera, A. (1986). Effects of two residential environmental workshops on high school students. *Journal of Environmental Education, 18*(1), 15-22.

Kahn, J., Peter, H. (1999). *The human relationship with nature*. Cambridge, MA: MIT Press.

Kahn, J., Peter, H. (2003). The development of environmental moral identity. In S. Clayton, & S. Opotow (Eds.), *Identity and the natural environment* (pp. 113-134). Cambridge, MA: MIT Press.

Kahn, J., Peter, H. (2006). Nature and moral development. In M. Killen, & J. Smetana (Eds.), *Handbook of moral development* (pp. 461-480). Mahwah, NJ: Lawrence Erlbaum.

Kals, E., & Ittner, H. (2003). Children's environmental identity: Indicators and behavioral impacts. In S. Clayton, & S. Opotow (Eds.), *Identity and the natural environment* (pp. 135-157). Cambridge, MA: MIT Press.

Kals, E., Schumacher, D. & Montada, L. (1999). Emotional affinity toward nature as a motivational basis to protect nature. *Environment and Behavior, 31*(2), 178-202.

Kellert, S. (1997). *Kinship to mastery*. Washington, DC: Island Press.

Lam, S. P., & Cheng, S. I. (2002). Cross-informant agreement in reports of environmental behavior and the effect of cross-questioning on report accuracy. *Environment and Behavior, 34*(4), 508-520.

Louv, R. (2005). *Last child in the woods*. Chapel Hill, NC: Algonquin Books.

Manoli, C. C., Johnson, B., & Dunlap, R. E. (2007). Assessing children's environmental worldviews: Modifying and validating the NEP scale for use with children. *Journal of*

Environmental Education, 38(4), 3-13.

Matthews, J. R. (1992). Adult amateur experiences in entomology. In J. Adams (Ed.), *Insect potpourri: Adventures in entomology* (pp. 321-328). Gainesville, FL: Sandhill Crane Press.

Mayer, F. S., & Frantz, C. M. (2004). The connectedness to nature scale. *Journal of Environmental Psychology*, *24*, 503-515.

McKenzie-Mohr, D., & Smith, W. (1999). *Fostering sustainable behavior*. Gabriola Island, BC: New Society Publishers.

Melchior, A. (2008). *Earth Force: Youth for a change! Summary of 2006-2007 evaluation results*. Waltham, MA: Center for Youth and Communities, Brandeis University.

Melson, G. F. (2001). *Why the wild things are*. Cambridge, MA: Harvard University Press.

Milton, K. (2002). *Loving nature: Toward an ecology of emotion*. London: Routledge.

Musser, G. (2005). The climax of humanity. *Scientific American, 293*(3), 44-47.

Myers, O. E. (1998). *Children and animals*. Boulder, CO: Westview Press.

Myers, O. E., & Saunders, C. D. (2002). Animals as links toward developing caring relationships with the natural world. In P. H. Kahn, & S. R. Kellert (Eds.), *Children and nature* (pp. 153-178). Cambridge, MA: MIT Press.

Nicholson, S. (1971). How not to cheat children: The theory of loose parts. *Landscape Architecture, 61*, 30-34.

Palmer, J. A. (1993). Development of concern for the environment and formative experiences of educators. *Journal of Environmental Education, 24*(3), 26-30.

Ramsey, J. M. (1993). The effects of issue investigation and action training on eighth-grade students' environmental behavior. *Journal of Environmental Education, 24*(3), 31-36.

Ramsey, J. M., & Hungerford, H. (1989). Effects of issue investigation and action training on environmental behavior in seventh grade students. *Journal of Environmental Education, 20*(4), 29-34.

Ramsey, J. M., Hungerford, H., & Tomera, A. (1981). The effects of environmental action and environmental case study instruction on the overt environmental behavior of eighth grade students. *Journal of Environmental Education, 13*(1), 24-29.

Reed, E. S. (1996). *Encountering the world*. New York: Oxford University Press.

Rickinson, M. (2001). Learners and learning in environmental education: A critical review of the evidence. *Environmental Education Research, 7*(3). Whole issue.

Rickinson, M., Dillon, J., Teamey, K., Morris, M., Choi, M. Y., Sanders, D., et al. (2004). *A review of research on outdoor learning*. Shrewsbury, UK: Field Studies Council.

Schroeder, H. W. (2000). The restoration experience: Volunteers' motives, values, and concepts of nature. In P. H. Gobster, & R. B. Hull (Eds.), *Restoring nature* (pp. 247-264). Washington, DC: Island Press.

Schultz, P. W. (2000). Empathizing with nature. *Journal of Social Issues, 56*(3), 391-406.

Schultz, P. W. (2002). Inclusion with nature. In P. Schmuck, & P. W. Schultz (Eds.), *Psychology of sustainable development* (pp. 61-78). Boston: Kluwer Academic Publishers.

Schunk, D. H. (1983). Ability versus effort attributional feedback: Differential effects on self-efficacy and achievement. *Journal of Educational Psychology, 75*, 848-856.

Schunk, D. H. (1989). Self-efficacy and cognitive skill learning. In C. Ames, & R. Ames (Eds.), *Research on motivation in education* (pp. 13-44). San Diego: Academic Press.

Schunk, D. H., & Hanson, A. R. (1985). Peer models: Influence on children's self-efficacy and achievement. *Journal of Educational Psychology, 77*, 313-322.

Schunk, D. H., & Rice, J. M. (1986). Extended attributional feedback. *Journal of Early Adolescence, 6*, 55-66.

Simpson, P. R. (1989). The effects of an extended case study on citizenship behavior and associated variables in fifth and sixth grade students. Unpublished dissertation, Southern Illinois University, Carbondale.

Sobel, D. (2008). *Childhood and nature*. Portland, ME: Stenhouse Publishers.

Stanley, E. (in process). *Encounters with monkey brains (and other affordances): An ecological approach to outdoor play at school.* Unpublished dissertation, Antioch New England Graduate School, Keene, NH.

Staub, E. (1978). *Positive social behavior and morality, Vol. 1, Social and personal influences*. New York: Academic Press.

Stern, P. C. (2000). Toward a coherent theory of environmentally significant behavior. *Journal of Social Issues, 56*(3), 407-424.

Stets, J. E., & Biga, C. F. (2003). Bringing identity theory into environmental sociology. *Sociological Theory, 21*, 398-423.

Trevarthen, C. B. (1979). Communication and cooperation in early infancy. In M. Bullowa (Ed.), *Before speech*. Cambridge, MA: Cambridge University Press.

Trevarthen, C., & Hubley, P. (1978). Secondary intersubjectivity: Confidence, confiding and acts of meaning in the first year. In A. Lock (Ed.), *Action, gesture and symbol* (pp. 183-229). London: Academic Press.

Vadala, C. E., Bixler, R. D., & James, J. J. (2007). Childhood play and environmental interests: Panacea or snake oil? *Journal of Environmental Education, 39*(1), 3-17.

Vining, J., & Ebreo, A. (2002). Emerging theoretical and methodological perspectives on conservation behavior. In R. B. Bechtel, & A. Churchman (Eds.), *Handbook of environmental psychology* (pp. 541-558). New York: John Wiley.

Wells, N., & Lekies, K. (2006). Nature and the life course. *Children, Youth and Environments, 16*(1), 1-24.

Wigfield, A., & Eccles, J. S. (1992). The development of achievement task values. *Developmental Review, 12*, 265-310.

Wigfield, A., Eccles, J. S., Roeser, R. W., & Schiefele, U. (2008). Development of achievement motivation. In W. Damon, &

R. M. Lerner (Eds.), *Child and adolescent development* (pp. 406-434). Hoboken, NJ: John Wiley.

Wilson, E. O. (1984). *Biophilia*. Cambridge, MA: Harvard University Press.

Wiseman, M., & Bogner, F. X. (2003). A higher-order model of ecological values and its relationship to personality. *Personality and Individual Differences, 34*, 783-794.

Zavestoski, S. (2003). Constructing and maintaining ecological identities. In S. Clayton, & S. Opotow (Eds.), *Identity and the natural environment* (pp. 297-315). Cambridge, MA: MIT Press.

Zelezny, L. C. (1999). Educational interventions that improve environmental behaviors. *Journal of Environmental Education, 31*(1), 5-14.

Zelezny, L. C., Chua, P. P., & Aldrich, C. (2000). Elaborating on gender differences in environmentalism. *Journal of Social Issues, 56*(3), 443-457.