Across the Spectrum

RESOURCES FOR ENVIRONMENTAL EDUCATORS

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Edition 3

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Introduction

Environmental education practices often follow larger trends in society. Not surprisingly, the origins of environmental education in the 1970s reflected a growing global concern about environmental degradation. While such concerns remain central to environmental education today, the following societal trends have emerged since then and are being integrated into environmental education as practiced in diverse settings around the world.

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- The journalist Richard Louv brought to the world's attention the possibility that as people spend increasingly more time in front of TV, computers, and other electronic devices, they may become victims of "nature deficit disorder." Louv's work suggests a role for environmental education for children and parents not just in transmitting knowledge or building skills, but also in creating opportunities for unstructured outdoor play, exploration, and observation, which are critical to human development and restoration.

- The rapid rate of urbanization has raised questions about what types of environmental education experiences are important for the vast majority of the world's population. In the face of urbanization, environmental educators can help participants learn about urban ecosystems or "social-ecological systems." They also may engage participants in restoring pockets of nature to cities, for example through planting trees or working and learning alongside community gardeners.

- Society is increasingly realizing that environmental education has a role to play in helping alleviate the stresses faced by communities. For example, some children face the threat of violence daily and lack access to loving relationships and other forms of social support. Environmental education can provide these children with the emotional and psychological benefits of spending time

in nature, as well as with "caring" adults and positive role models. For these reasons, educators and youth program leaders in community, faith-based, and other organizations are increasingly looking to environmental education as a platform to address youth and community development in stressed communities.
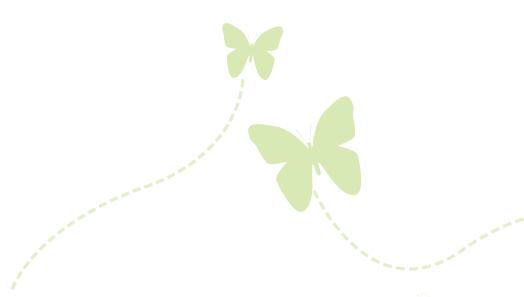
■ Climate change brings additional stresses, including flooding, drought, forest fire and sea level rise. These stresses present society with an imperative to change energy and other consumption patterns, as well as to discover how existing and new practices can become part of the solution. This suggests the need for environmental education to engage participants in learning, experimenting, deliberating, and developing practices that contribute to climate change mitigation and adaptation.

■ Schools face challenges in interesting young people in science and other subjects. Environmental education outside of the classroom can readily apply the results of research that shows how learning occurs through active engagement of the student—with other people, with other organisms, and with one's physical surroundings.

These five interrelated trends—concern about the psychological well-being of people with limited access to nature, urbanization, social stresses as well as those brought about by climate change, and academic achievement of students—pose significant challenges to the field of environmental education. Yet these same challenges are sparking innovative paths in environmental education. Environmental educators are joining forces with youth and community development professionals; museums, zoos, and botanical gardens; and urban green space managers and planners to come up with new practices that reflect societal

concerns. Many of these practices occur outside of the classroom, involve youth and elders working together, and engage a diversity of professionals and participants in urban as well as suburban and rural communities.

As many of those working in these settings have little formal training in environmental education and may feel isolated from other professionals with similar interests, we have begun this e-book with three goals in mind. First, we hope to provide a foundation in environmental education history and application to help newcomers to the field orient practices within a body of knowledge and experience that has accumulated since the formal launching of environmental education in the 1970s. Second, we hope to introduce the readers to environmental education practices that reflect recent societal trends. Finally, we also hope that this e-book will help create a community of interested professionals working in diverse settings but sharing common concerns. New chapters may be added as new practices emerge, and opportunities are planned so that users of these materials will be able to share thoughts about the chapters online.

This e-book is being written by professionals and volunteers *for* professionals and volunteers who want to engage young people and adults in learning about and developing healthy environments. We invite you—whether you are working in a community center or half-way house; church, synagogue, temple or mosque; zoo, botanic garden, or museum; Scout, 4-H, or boys and girls club; community garden or nature restoration program; or a senior center, nature center, or park—to explore the rich tradition of environmental education and to learn how your peers across the continent and in other countries are creating new practices to address societal and environmental concerns. We also invite you to contact us if you have ideas about how to expand our vision of non-formal environmental education.

We hope that this e-book will help create a community of interested professionals working in diverse settings but sharing common concerns.

Foundations of Environmental Education

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Overview

Environmental education (EE) in the United States (U.S.) evolved from a rich assortment of practices in the early 1900s and now embraces a suite of formal and nonformal youth and adult education programs. This chapter highlights the history of EE and provides a foundation to understanding how the field currently accommodates the political and social realities of the context in which it operates.

Foundations and Founders

Nature walks in a city park, planting native trees to build a corridor between forest fragments, a student poster contest to encourage public transportation, and study circles to explore local food options—how can so many different activities all be called environmental education (EE)? These activities and many more help increase environmental literacy and engage people in environmentally responsible actions. The full constellation of strategies, techniques, and opportunities that move the citizenry toward this goal have fallen under the banner of EE for several decades.

A variety of philosophers and practitioners in both education and natural resource management contributed to the origins of EE. While the development of EE was a global phenomenon, this chapter focuses more on American contributions. American writers and thinkers such as John Muir, Henry Thoreau, Aldo Leopold, and Rachel Carson popularaized the environment and spurred concern about environmental problems through their writings, contributing to readers' awareness and knowledge about the natural world. The pedagogy of EE, however, was influenced by people who thought about learning and teaching, particularly the importance of experiential education outdoors. Jean Jacques Rousseau (1712–1778), for example, called for returning to nature and discovering information rather than memorizing facts about science. Sir Patrick Geddes (1854–1933), a Scottish botanist and urban planner, implemented an interdisciplinary approach to educating the whole person by encouraging students to learn by doing.   His contemporary in the U.S., John Dewey (1859–1952), was a strong proponent of experiential education that included

opportunities to explore, reflect upon, and apply newly learned concepts. Dewey also heralded education as a way to promote democratic ideals.   The writings of these thinkers greatly shaped EE by influencing its early predecessors—nature study and conservation education—and continue to challenge us to consider ways to engage learners, build skills, and create effective learning environments.

The fields of nature study, outdoor education, and conservation education set the basic stage from which EE emerged.   Launched in 1891 by American Wilbur Jackman's book *Nature Study for the Common Schools*, and enhanced by the work of Liberty Hyde Bailey and Anna Botsford Comstock at Cornell, nature study was practiced in the United States and Europe during the early 1900s. It revolutionized elementary science education by emphasizing the observation of nature while in the outdoors and through exploration of the relationships of plants, animals, and the physical systems that support them.   The movement was driven, in part, by a surge in urban growth, migration from rural farms to industries, and a concern that youth were missing vital interactions with the natural world that could shape their future careers. Comstock's 1911 *Handbook of Nature Study* clearly suggested that the role of the teacher was to promote interest and excitement in the discovery of nature,   yet since many teachers lacked sufficient training in science and nature observation, the movement found limited appeal.

Outdoor education, in contrast, encouraged teachers to go outdoors for lessons in every subject area, not just science, and aimed to advance not only an appreciation for the natural world, but also outdoor knowledge and skills. As the outdoor education movement of the 1940s and 1950s evolved into residential and day camping, recreation skills were emphasized to encourage youth to continue with outdoor pursuits in their leisure time.   Though it declined somewhat in the 1980s, outdoor education still persists in ubiquitous camp settings across the continent, such as the YMCA's residential programs for elementary and middle schools.

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Conservation education differed from both nature study and outdoor education in that it was led by U.S. governmental agencies. During the Dust Bowl of the 1930s, when erosion and water quality problems were devastating agriculture in the Midwest, government agencies realized the resolution of resource problems must go beyond creating and enforcing legislation. They initiated conservation education to increase awareness about conservation issues, espouse the importance of wise use of natural resources, and encourage the public to understand and comply with environmental laws.

In 1968, **William Stapp,** Ph.D., engaged his students at the University of Michigan in discussions of the limits of conservation education (too descriptive and focused on the natural world) and outdoor education (too limited to using the outdoors to enrich school programs). Stapp and his students came to believe that there was need for a new field that considered the total environment and emphasized problem-solving skills.   Thus, environmental education was developed, and the definition and rationale for EE based on the work of Stapp and his students was appropriately published in the first issue of the *Environmental Education Journal* in 1969. Stapp continued to play a leadership role in the development of EE both in the U.S. and globally as the first director of the International Environmental Education Programme, jointly funded by UNESCO and UNEP   ; and as organizer of the first international conference at Tbilisi, Georgia, USSR in 1977. It was at Tbilisi where the field of EE received an internationally recognized definition, objectives, and action steps.

Many other leaders made important contributions to the founding and development of the EE field internationally. For example, Robert Roth and Harold Hungerford (United States) and Peter Fensham and Arthur Lucas (Australia) are among those named as founders.   Roth, a contemporary of Stapp, published the fundamental concepts of environmental education in the *Journal of Environmental Education* in 1970 and subsequently became the journal's editor. Fensham, the first president of the

Stapp

Australian Association for Environmental Education, pursued educational reform to prepare students to become informed and active citizens by integrating study and analysis of the impacts of science and technology on society in everyday life. Lucas is most known for his detailed analysis of early EE literature, from which he concluded that the term EE had been used to classify education *about* the environment (that is, the content), *for* the environment (that is, skill development to resolve environmental issues), and *in* the environment (that is, located outdoors). This conclusion has significantly aided our understanding of the scope of EE and the distinction between EE and other "educations." Finally, Hungerford and his students played an essential role in developing methods of research and generally defining EE practice through the 1980s and 1990s. Specifically, they explored how to convey and teach skills for investigating issues. Since then, EE has been adapted to the needs of communities throughout the world, with leaders in many nations advancing EE to make it appropriate and relevant.

Lucas concluded that the term EE had been used to classify education about the environment, for the environment, and in the environment.

Evolution of Environmental Education Definitions and Objectives

The evolution of EE into a global practice was facilitated by a series of international meetings and conferences with similar ideas coming from several arenas **(Table 1)**. The development of its definition traces an interesting growth from a scientific perspective of ecology to a more integrated and interdisciplinary field. The first discussion occurred at the 1968 UNESCO Biosphere Reserve conference in Paris.   A call was made at this meeting for developing curricula for all grade levels, promoting technical training, and increasing awareness of global environmental problems. A subsequent meeting co-sponsored by UNESCO and IUCN   in Nevada in 1970 set forth the following definition of EE:

> *…the process of recognizing values and clarifying concepts in order to develop skills and attitudes necessary to understand and appreciate the inter-relatedness among man, his culture, and his biophysical surroundings. Environmental education also entails practice in decision-making and self-formulation of a code of behaviour about issues concerning environmental quality.*

That same year, the United States was the first country to establish EE policy through the Environmental Education Act and creation of the Office of Environmental Education to award grants for the development of EE curricula and to provide professional development for teachers.   Two years later, in 1972, the Stockholm conference on Human Environment resulted in a declaration that education in environmental matters was essential for younger generations as well as adults. This declaration was put into action through the creation of the International Environmental Education Programme jointly funded by UNESCO and the newly UNEP.

The first major goal for the international program was to organize a series of regional workshops for education practitioners in preparation for a much larger international conference for governmental delegations interested in creating EE policy. The final practitioner workshop, held in Belgrade, Yugoslavia, resulted in the influential Belgrade Charter of 1975, which stated the following:

The goal of EE is to develop a world population that is aware of, and concerned about, the environment and its associated problems and which has the knowledge, skills, attitudes, motivations, and commitment to work individually and collectively toward solutions of current problems and the prevention of new ones.

The Belgrade Charter was taken to the first international intergovernmental conference devoted to EE in Tbilisi in 1977. Sixty-six UNESCO member states and multiple NGO representatives participated. Delegates adopted the Belgrade statement and prepared the Tbilisi final report that characterizes EE as a lifelong process; as interdisciplinary and holistic in nature and application; as an approach to education as a whole, rather than a subject; and about the interrelationship and interconnectedness between human and natural systems. The report also formalized the following goals and objectives to guide UNESCO member states in the development of environmental education policies, which are repeated here in their entirety.

Environmental Education Goals:

- **to foster** clear awareness of and concern about economic, social, political, and ecological inter-dependence in urban and rural areas;

- **to provide** every person with opportunities to acquire the knowledge, values, attitudes, commitment, and skills needed to protect and improve the environment;

- **to create** new patterns of behavior of individuals, groups, and society as a whole toward the environment.

Environmental Education Objectives:

- **Awareness:** to help social groups and individuals acquire an awareness of and sensitivity to the total environment and its allied problems.
- **Knowledge***:* to help social groups and individuals gain a v ariety of experience in, and acquire a basic understanding of, the environment and its associate problems.
- **Attitudes:** to help social groups and individuals acquire a set of values and feelings of concern for the environment, and the motivation for actively participating in environmental improvement and protection.
- **Skills:** to help social groups and individuals acquire the skills for identifying and solving environmental problems.
- **Participation:** *t*o provide social groups and individuals with an opportunity to be actively involved at all levels in working toward resolution of environmental problems.

The Tbilisi goals of awareness, knowledge, and ability to take action are often collectively referred to as "environmental literacy." While the first and second goals are undisputed components of this definition, the third goal (to create new patterns of behavior) is still the subject of modest debate. Different interpretations lead environmental educators to disagree about the extent to which EE should recommend specific behaviors, versus focusing on developing the knowledge and skills necessary for learners to explore the advantages and disadvantages of different behaviors.   This is based on the notion that education, rather than promoting specific behavior

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On the international stage, the next major international initiative for EE was the World Conservation Strategy developed in 1980 by IUCN with funding from UNESCO, UNEP, and the World Wildlife Fund.

changes, has traditionally focused on providing information so that learners can make more informed choices on their own. Some maintain that this should also be the role of EE; that is, to promote environmental awareness and critical thinking, problem solving, and decision-making skills but not specific changes in behavior.   Others, however, citing the Tbilisi definition, see the promotion of specific behavior changes as an important component and goal of EE. A more neutral middle ground suggests that quality education is engaging and youth should be appropriately challenged and involved in relevant and meaningful projects that are framed with opportunities to investigate and explore multiple perspectives. Educators find this easier to accomplish with noncontroversial topics such as gardening, ecosystem restoration, or public awareness programs. Environmental Education programs worldwide have followed these guidelines to varying degrees, and they have adopted all or some of the Tbilisi goals and objectives in their quest to enhance environmental literacy.

Once objectives were set in place, nations around the world began to implement environmental education through the development of curricula, courses, and training programs. On the international stage, the next major international initiative for EE was the World Conservation Strategy developed in 1980 by IUCN with funding from UNESCO, UNEP, and the World Wildlife Fund. This key document stressed the importance of sustainable development for conservation and is the first internationally documented discussion on the subject. It clarifies that the goal of EE is to increase public participation in planning, decision making, and management with education programs that target legislators, professionals, interest groups, industry and commerce, local communities, and school children.

This was only the first of many conferences held by the United Nations (UN) to support the development of EE; UN conferences occur at 10-year intervals. In 1987, Moscow hosted the Tbilisi+10 Conference to evaluate the progress of EE since the pivotal statements of 1977. That same year, the Brundtland Report (also known by the title *Our Common Future*) was published, which expanded ideas from the World Conservation Strategy by making economic development a key complement to conservation and providing the most widely used definition of sustainable development. The report states "Humanity has the ability to make development sustainable—to ensure that it meets the needs of the

present without compromising the ability of future generations to meet their own needs."

Continuing this theme of sustainability, the 1992 Earth Summit in Rio de Janeiro, held two decades after the Stockholm Human Development conference, was attended by 120 heads of state and delegates from 170 countries. The resulting Agenda 21 set a global plan for sustainable development. Each of the 40 chapters of the Agenda makes some mention of education, but chapter 36 specifically defines the term Education for Sustainable Development with four mandates: to improve access to basic education, to reorient education toward sustainability themes, to improve public awareness, and to engage in training. Ten years later, in 2002, the Johannesburg Summit on Sustainable Development created a more targeted agenda to focus on five areas: water and sanitation, energy, health and environment, agriculture, and biodiversity and ecosystem management. At this conference world leaders also adopted the UN-sponsored Decade of Education for Sustainable Development from 2005–2014, which became the theme of the 4th International Conference on Environmental Education in 2007 in Ahmedabad, India.

In addition to the opportunities presented by the Decade of Education for Sustainable Development, EE is supported in the United Nation's Millennium Development Goals and the results of the Millennium Ecosystem Assessment. The Millennium Development Goals challenge nations and international organizations to achieve eight ideals by 2015. These include ending world poverty and hunger, establishing universal education, promoting gender equality, improving child and maternal health, combating AIDS, seeking environmental sustainability and engaging in global partnerships. 'The objectives of environment education fit many of these goals, but are particularly relevant to the pursuit of environmental sustainability. The Millennium Ecosystem Assessment, on the other hand, details a scientific basis for promoting conservation and the sustainable use of the world's resources, which educators can use to frame or justify educational programs.

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Environmental Education and Education for Sustainable Development

Recent global events pertaining to EE focus on sustainable development. There is much debate about whether EE is a part of Education for Sustainable Development (ESD), whether ESD is a part of EE, or whether the two must be considered separate entities. ESD's equal focus on society, economy, and environment and its attention to equity, democracy, and human rights, is considered by some to be inherently different from EE, which is perceived as focusing more on developing critical thinking and problem solving skills in, about, and for the environment. Also, ESD was given the agenda of improving basic education worldwide, and such an emphasis clearly separates it from efforts aimed strictly toward environmental improvement.   The attention to development, economics, ethics, and values that some assume to be unique to ESD, however, are considered also vital to EE by those who believe that resolutions to environmental issues are only possible when the full complement of interacting elements are considered. In the 1974 Environmental Education Activities Manual, Stapp and Cox, for example, grouped activities into five major concepts: ecosystems, population, economics and technology, environmental decisions, and environmental ethics.

If there is a difference between EE and ESD, it may be in the ultimate goal that motivates the respective educational enterprises. For EE, this has been addressing environmental issues and for ESD, it has been sustainable development. Consequently, the behavioral goals that each strives toward have different names. EE has historically focused on problem-solving skills and promotion of environmentally responsible behaviors (that is, those that improve or prevent damage to the environment), while ESD has called for sustainable behaviors (those that minimize negative environmental, economic, and social justice impacts and foster development). In some nations, sustainable development is a politically accepted goal; in others environmental protection carries more weight.

At the 2007 International Conference on Environmental Education in Ahmedabad, India, the director of India's Centre for Environmental Education avoided debating the distinctions

between these concepts and suggested instead a focus on the future integration of EE and ESD. In his introduction to the conference materials included the following:

> *EE, at this moment in its journey, stands at the crossroads. It needs to champion ESD so that other disciplines too can play a vital role. It needs to reach out to other stakeholders including the media, the business community, local groups and city governments. EE needs to scale up, and play the role required of it in a world in crisis.*

Regardless of historical foundations or past differences, EE will play a role in ESD in some nations. In other nations ESD is perceived as the more appropriate term and mention of EE has vanished. And some educators believe EE is the bigger umbrella that includes ESD! For the purposes of this chapter, ESD is a logical continuation of and partner to EE, and both are essential for moving society toward change. We suggest that the ultimate goals of affecting knowledge, skills, and behavior as described in the Tbilisi documents are broad concepts that include both environmentally responsible and sustainable behaviors.

Education for Sustainable Development is a logical continuation of and partner to environmental education, and both are essential for moving society toward change.

Centre for Environmental Education in Ahmedabad, India, hosts the 4th International Conference on Environmental Education in 2007. Photo by M. Monroe

Formats and Venues for EE

In addition to its varied definitions, EE takes multiple forms and can be implemented in a variety of settings that contribute to environmental literacy. EE activities are often broadly categorized as formal, nonformal and informal, although terms such as "free choice" and "self-directed" are often used as modifiers. While many terms exist, we will focus this section on common differences between formal, nonformal and informal EE. It is important to note that the lines between these definitions are fuzzy (that is, some activities may seem to fall within more than one category), and learners of all ages can engage in activities in each format.

Fourth graders learn about nonpoint source water pollution at the Lagoon Quest program in Melbourne, Florida. Photo by M. Monroe

Formal EE refers to activities where the educational goals and strategies to reach those goals are determined by the school or other institution developing the program in compliance with standardized school curricula. Most typically this involves primary, secondary, and tertiary (college and university) education that leads to graduation, but formal EE can also be implemented in adult literacy and professional training programs that offer licensure or certificates of completion. It includes instruction within a classroom, as well as lessons directed by classroom educators in schoolyard outdoor classrooms and natural areas, day field trips to local venues like zoos, museums and nature centers, and service learning projects that are specific components of the standardized curriculum.

In Cape Town, South Africa, for example, students whose schools are partnered with the Schools Environmental Education and Development program learn about organic permaculture by working in their school gardens.   In Florida, the Brevard Zoo partnered with the Brevard County Schools to offer a field trip to and unit on a local estuary for all fourth grade classes.   The unit was designed to support and enhance the science curriculum.

Depending on institutional requirements, classroom EE may be a stand-alone topic, or it may be incorporated into subject areas such as science or social studies. The environment may also be

a unifying theme in schools through the implementation of an integrated curriculum. In those schools, students may read books focused on the environment in their language and literature classes, learn nature photography in art classes, and gather and analyze data about natural processes such as species' populations or tree growth in math classes. Project Learning Tree, Project WILD (Wildlife in Learning Design), and Project WET (Water Education for Teachers) are resources commonly used by teachers to enhance environmental education in the classroom in a variety of subjects.

Several forms of EE can enrich or be independent of formal EE. In nonformal EE, the learner can participate in long-term educational opportunities with objectives that are often tailored to their learning needs or desires.   For example, a Boy Scout may engage over time in nonformal EE which leads merit badges. While the procedure to earn the badge is determined by the Scout leaders and their handbook, EE within a Boy Scout setting is nonformal in that it is not part of a standardized school curriculum. Nonformal EE includes extracurricular enrichment programs like those run by parks, museums, and nature centers. Nonformal EE experiences can complement concepts learned in school by encouraging connections to real world examples, but they can also target adult audiences quite well. The Cooperative Extension Service, for example, offers voluntary programs such as Master Gardener for those who wish to learn more about growing flowers and food. Once enrolled, participants follow the established curriculum, provide hours of service, and receive a certificate.

Informal EE can also support classroom curricula, but it differs from nonformal EE in that it is more short term and often interpretive by nature. Informal education occurs anywhere educational information is displayed or conveyed, including but not limited to museums, nature trails and parks, agencies and organizations, educational fairs, and the media.   While touring the White House in Washington, D.C., for example, visitors might see the organic Victory Vegetable Garden, which has interpretive signs about the purposes and workings of the garden. In Sydney, Australia, visitors to Australia's Mount Annan Botanic Garden can read interpretive signs during self-guided tours about how to landscape one's home to conserve water.   Informal EE can also include television programs, radio shows, and Web content.

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State and federal agencies provide many informal EE programs for adults and families who want to learn how to compost kitchen waste in their backyards or how to reduce the use of energy. When a region faces an environmental crisis, such as a water shortage or threat of wildfire, government agencies and Extension services deliver informal environmental education programs by sharing background information, skill-building opportunities, demonstration areas, and media campaigns to alert the public to the problem and what they can do to help resolve it. In many U.S. states, for example, Cooperative Extension, state forest agencies, state emergency response agencies, and the U.S. Forest Service use workshops, field tours, and presentations to help the public understand the risk of wildfire and how they can assist in reducing it.

Informal environmental education opportunities at the Honister slate mine near Keswick, UK. Photo by M. Monroe

Indeed, there are many roles and venues for EE. Fundamentally, however, EE is characterized as a learning process, whose ultimate goal is to educate and encourage people in engaging in more sustainable and environmentally responsible practices. Later chapters present examples of how EE supports and promotes environmental knowledge, skills, and changes in behavior to reach environmental literacy goals.

EE in Context

Though the definition and general goals of EE remain consistent, EE does not occur in a vacuum. The strategies and priorities pursued through EE are strongly shaped by political power, current environmental issues, social priorities, and trends in educational policy. For example, EE within schools has been influenced by the development of curriculum standards. In the

1970s there was a focus on easily implemented activities, while more recent trends in many countries emphasize curriculum standards, student achievement, and service learning projects. Additionally, because in most nations EE is not a standardized academic subject like science, it has the advantage of flexibility and can, therefore, be aligned with a variety of disciplines and championed by partners from different sectors. On the other hand, this flexibility can result in its omission from formal education curricula when budgets are cut and tests restructured. The salience of environmental issues can be similarly influential on EE content. When there is an environmental problem, EE is often a critical strategy in addressing the issue. In the 1970s, U.S. based EE paid a great deal of attention to endangered species and recycling, issues at the forefront of the social consciousness. More recently, programs in urban settings and about sustainability have gained momentum.

Environmental education can also be influenced by government fiscal and administrative policy decisions. In the U.S., EE implementation occurs within many different departments and is shaped by the executive and legislative branches of government, through presidential appointments and congressional funding appropriations. In India, for instance, the government provides financial and administrative support for the Centre for Environmental Education (CEE), which represents a unique partnership between the Ministry of Environment and Forests and an NGO conducting a number of ESD focused projects nationwide. Also in India, an NGO was asked by a national advisory committee to develop an EE course to "facilitate changes in attitudes and develop skills for the sustainable management of village resources" in the rural mountains of Uttaranchal. After pilot testing, the program was expanded to five grade levels and is currently a part of the state curriculum, which is an illustration of how NGO projects can both influence and be enhanced by government EE policy.

Though some form of central government support is often critical to launch national curricula, EE, especially nonformal and informal EE, is not entirely dependent on funds and authorization from governmental agencies. In many instances, nonprofit and for-profit organizations develop and implement
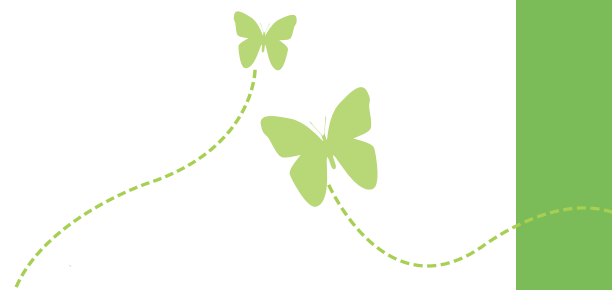
Though some form of central government support is critical to launch national curricula, EE is not entirely dependent on funds and authorization from government agencies.

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Preschool near Almora, Uttarakand, India helps youngsters learn the basic counting and alphabet skills. Photo by M. Monroe

EE programs with substantial or very little external funding. For example, environmental organizations such as the Sierra Club, World Wildlife Fund, and numerous zoos and aquaria place substantial financial priorities on EE. The Uttarakhand Environmental Education Centre in northern India, on the other hand, developed a minimal-cost program to establish preschools in rural villages at the request of the village women. With local young women as teachers, and training and supervision provided by local staff, the program has required minimal costs to develop social skills and empower village women to resolve issues around cleanliness, electricity, and reforestation.
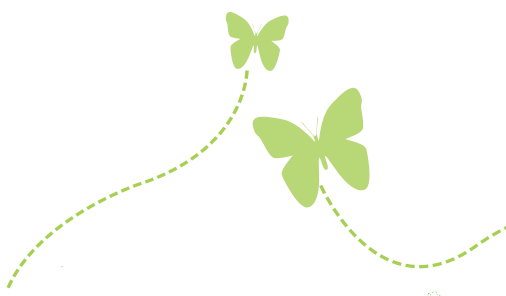
Conclusion

Environmental Education has a long international history leading to its current definitions and strategies for engaging the public in sustainable, environmentally responsible discourse. EE strategies are flexible and influenced by environmental, political, economic, and cultural realities. While these characteristics allow EE to adapt and survive, they can also make identifying EE somewhat difficult. In the following chapters, a variety of examples illustrate how EE is implemented in diverse contexts.

TABLE 1. An Evolution of EE

YEAR	EVENT
1968	UNESCO Biosphere Reserve Conference in Paris calls for environmental curricula, training and awareness development.
1970	UNESCO and IUCN provide initial EE definition.
1970	U.S. creates the Environmental Education Act.
1972	Human Environment Conference in Stockholm sparks UNESCO & UNEP funded EE Programme.
1975	Belgrade Charter proposes initial EE goals.
1977	First international EE congress at Tbilisi—EE goals and objectives established.
1980	World Conservation Strategy declares sustainable development as important for conservation.
1987	Tbilisi+10 in Moscow provides an opportunity to evaluate EE progress.
1987	Brundtland Report provides globally recognized definition of sustainability.
1992	Earth Summit in Rio develops Agenda 21, the first global agenda for sustainable development.
2002	Johannesburg Summit on sustainable development refines 5 target areas.
2005–2014	UN Decade of Education for Sustainable Development (DESD).
2007	4th International Conference of EE in Ahmedabad, India, focuses on the DESD.

Although the roots of EE run into the late 1800s, its formal history is relatively recent.

Chapter 1 Endnotes

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4   J. A. Palmer, *Environmental Education in the 21st Century: Theory, Practice, Progress and Promise* (London/New York: Routledge, 1998). In the UK, Geddes is thought to be a founding figure, particularly in conjunction with field study centres and urban environmental education; see page 4.

5   A. B. Comstock, *Handbook of Nature-Study for Teachers and Parents,* 24th ed. (Ithaca NY: Comstock Publishing Associates, Division of Cornell University Press, 1939).

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A Variety of Strategies Characterize Environmental Education

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Overview

Environmental education (EE) programs cover a wide range of strategies, audiences, and opportunities. This chapter presents seven common approaches that environmental educators have adopted to address environmental and social challenges through communities, agencies, nonformal programs, and schools. Rather than presenting an exhaustive list of strategies and programs, we use these examples to illustrate the wide range of approaches that EE takes in its pursuit of environmental understanding, skill building, and behavior change.

A Wealth of Opportunities

Classroom teachers do it; zoos and museums do it; faith-based study circles do it; evening campfire programs at the state park do it, too. Environmental education can be a chameleon that changes color in various contexts, enabling many educators to create educational opportunities for learners to gain knowledge, attitudes, and skills to understand and adopt actions that enhance the environment. Despite this variation, a few tried-and-true strategies are used across the spectrum of formal, nonformal, and informal education venues. In this chapter we highlight seven such commonly used strategies and provide examples of how they can be implemented in different contexts.

Activity Guides

One way formal and nonformal educators have facilitated the inclusion of environmental education in primary and secondary instruction is through pre-packaged supplemental activity guides. Often designed to be used by elementary school teachers but adapted for learners of many ages and in other venues, activity guides provide basic background information, step-by-step instructions for classroom activities like role-plays, discussions, experiments, and often student worksheets. An educator can choose from a variety of activities that require minimal materials and preparation time and can be adapted to a variety of settings. Because many elementary teachers do not have a background in environmental issues, the activity guides provide strategies

for students to explore concepts while educators guide and facilitate the exercise. The lack of familiarity with environmental issues among teachers also creates a window for nonformal educators, who can provide content assistance to schools and use these activities when classes visit their centers. Kananaski Country Park in Alberta, Canada, for example, offers a variety of free educational activity guides as well as low cost programs such as field trips and rentable educational kits for classroom teachers.   While activity guides of this type are often convenient and somewhat self-explanatory, training workshops are usually suggested to help teachers make the best use of the materials.

There are a large number of activity guides, and many include easy-to-perform science labs or interactive games on environmental topics from wetland ecology to recycling. They are most commonly produced by environmental organizations or sponsored by businesses that have an interest in the environment. Three programs are considered international leaders due to the quality of their activity guides: Project Learning Tree (PLT) uses forests and trees to introduce youth to environmental issues,   Project Wildlife in Learning Design (Project WILD) covers wildlife and conservation issues,   and Project Water Education for Teachers (Project WET) is a water education curriculum.   Each is sponsored and implemented by different environmental agencies and organizations at the national and local level. PLT, WET, and WILD materials are made available to educators through workshops and trainings.
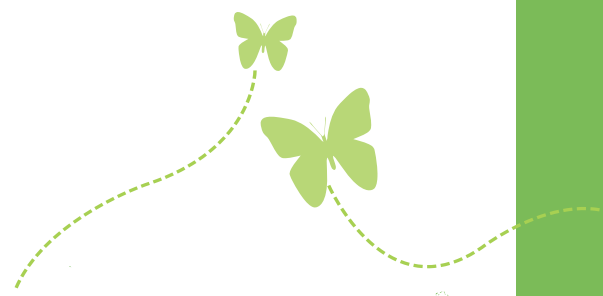
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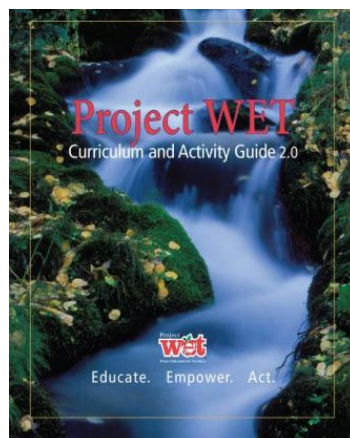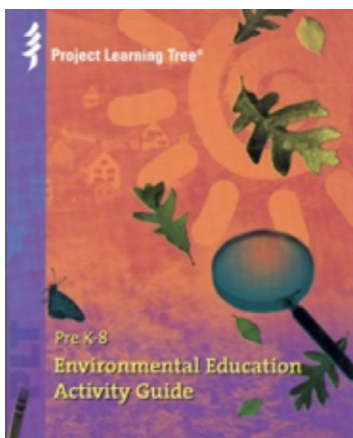
Project Learning Tree, Project WET, and Project WILD provide popular and high quality activity guides for educators.

Critics of this type of material cite educators' lack of time and training to appropriately incorporate the activities into current curricula. In addition, they claim that reliance on pre-packaged activities without thorough consideration of how these fit into learning goals, local context, and existing knowledge of students may not build contextually appropriate understanding, skills, and behaviors.   In our opinion, activity guides are a useful introduction for teachers to become familiar with EE concepts and objectives and may put them on a course of professional development to become comfortable with more advanced EE opportunities. In addition, community educators can sponsor curriculum adaptation workshops to help teachers consider which activities could be most appropriately used at each grade level, creating a sequential guide to EE resources. In sum, activity guides may allow educators to use and students to access environmental information relatively easily. They may support a more effective program if activities are thoughtfully organized in age-specific concepts to effectively promote environmental literacy and meet educational standards, as discussed in the next section.

Integration into Standards-based Education

Public primary and secondary education around the world is increasingly shaped by pressure for accountability. In many countries, particularly more industrialized ones, curriculum is standardized; classroom teachers submit plans that indicate the progress students are making on curriculum benchmarks, and tests measure whether students know the required information. In the U.S., this is driven by education policies such as the No Child Left Behind Act of 2001, which links federal funding with student performance in a way that school districts as well as

individual teachers and administrators are held accountable for the outcomes of their students on standardized tests.   By emphasizing the results of math and reading tests as primary indicators of success, state education agencies have created incentives for these subjects that can negatively affect instruction in nontested subjects like social studies. Some teachers turn their attention toward preparing students for tests to the exclusion of integrative and creative learning opportunities. A 2008 study by the Center on Education Policy reveals that in the process of attempting to meet state and federal standards, environmental education, social studies, and other nontested subjects were sacrificed to spend more time on high-stakes testing subjects like reading and math. A similar cutback in outdoor activities and fieldtrips was noted in the study.

Community educators have responded to the demand for standards-driven programs by emphasizing EE activities and experiences that help teachers support subject-area standards. One way this is done is through the correlation of EE activities to relevant standards. Educators at the Brevard Zoo in Melbourne, Florida, developed classroom activities to supplement the Lagoon Quest program, tying each activity to relevant state standards.   Another strategy is to design curricula that specifically address skills included in achievement tests, such as activities to help biology students practice and improve writing skills.

In addition to subject area curriculum standards, many school systems establish goals for process skills such as critical thinking, problem solving, and communication. Because the emphasis of EE is not just on content but also on skills, EE programs that engage learners in interdisciplinary, community-based projects can be used to increase student achievement, interest, motivation, and test scores.   A study in Florida found that 9th and 12th graders who participated in these projects improved their critical thinking skills and the likelihood that they would use those critical thinking skills.

Following guidelines for best practices is yet another strategy to promote quality education. Seeking to assist educators in their endeavors to provide high quality EE that promotes an

A study in Florida found that 9th and 12th graders who participated in these environmental projects improved their critical thinking skills and the likelihood that they would use those critical thinking skills.

environmentally literate citizenry, the National Project for Excellence in Environmental Education (NPEEE) developed a set of Guidelines for Excellence in Environmental Education (see chapter on Guidelines). NPEEE began in 1993 through the leadership of the North American Association for Environmental Education (NAAEE), a professional association for environmental educators in Canada, Mexico, and the United States. A series of publications, written by EE experts and extensively peer-reviewed, present guidelines (not restrictive standards) for the development of balanced, scientifically accurate, comprehensive, and high-quality EE programs. The guidelines are derived from the Tbilisi definition of EE and address important learning objectives in EE at the 5th, 8th, and 12th grade levels. They also describe key characteristics of EE activities and curricular materials, from ensuring that materials provide fair and accurate accounts of issues to making sure that resources teach skills and are easily used by educators. The guidelines also address the preparation and professional development of environmental educators, nonformal EE programs, and early childhood EE; in addition, community EE Guidelines are in development.

Connecting People with Nature

Environmental education strives to reconnect people of all ages with nature for educational, psychological, and physical benefits. In his 2005 book *Last Child in the Woods*, Richard Louv popularized what environmental psychologists have known for a long time—that direct exposure to nature is critical for the development and sustenance of an emotionally and physically healthy individual. He presented the idea that children today suffer from "nature-deficit disorder," a consequence of a growing divide between children and the outdoors. As children spend more and more time with technology and entertainment that keeps them indoors, and as parents' fears about their children's safety and security grow, children fail to gain the many benefits derived from playing outdoors. Louv reported evidence from a number of studies and coined the term "nature-deficit" to help describe several alarming trends, including increased childhood obesity, attention disorders, and depression.

Enjoying the view over Keswick, England. Photo by M. Monroe

Get Outdoors Day and similar programs help promote the importance of spending time in natural areas.

Unfortunately, many adults already exist in worlds devoid of nature. However, the recent popularity of family events at parks and other natural areas speaks to their interests in enjoying nature. The annual Get Outdoors Day, the More Kids in the Woods campaign, and many other examples sponsored through local, state, and federal agencies and organizations acknowledge that spending time outdoors should be a priority. Similar efforts have been made in other countries. In Honduras, after recognizing that youth were increasingly engaging in delinquent behaviors and that experiences promoting environmental appreciation were rare, a nationwide program established nine environmental education camps with the goal of providing rural and urban youth an alternative pastime. Young and not-so-young adults were recruited to participate in a three-phase leadership training program where they used intensive experiences in nature to develop teamwork, self-esteem, leadership, and ecological knowledge and behaviors.

On the policy front, a No Child Left Inside (NCLI) movement grew from the popularity of Louv's book to establish a national campaign in the U.S. to help teachers use the outdoors as a classroom. The campaign sought to amend the federal

emphasis on testing and standards by adding funding for EE and encouraging outdoor classroom activities. Similarly, states such as California and Florida established Children's Rights to Nature statements that promote connections between state and federal agencies and EE and outdoor recreation opportunities. Through policy and programs, a variety of strategies are designed to provide opportunities for individuals of all ages to connect with nature and receive the social, psychological, and physical benefits of outdoor experiences. Many educators believe that in addition to these benefits, outdoor experiences can help develop an individual's connection with the local environment   and result in the development of environmental awareness and behaviors.

Participants in the Honduras Environmental Youth Leadership Development Program, 2004. Photo by K Biedenweg

Urban Environmental Education

In addition to encouraging people to get outdoors, EE also encourages urban residents to learn more about their surroundings and engage in behaviors that could improve those environments. Helen Ross Russell's *Ten-Minute Field Trips*,   first published in 1973 and recently revised, was one of the first manuals to help educators use sidewalks, playgrounds, and other sources of nearby nature to enthrall youngsters and convey science. Since its beginning, EE has addressed environmental issues associated with urban environments including air and water quality, toxic and hazardous wastes, food production, and energy. Urban EE is essential, since the majority of the earth's population lives in urban areas, and residents of urban areas are

uniquely poised to positively impact their own environment. More information on the development of urban EE can be found in the urban EE chapters in this handbook (coming soon).

Current trends in urban EE include urban agriculture on school grounds, in community gardens, in public spaces, and at private residences. The public is encouraged to practice local organic gardening to promote appreciation of nature, reduce the use of chemicals for food production, reduce the amount of transportation required to bring food to the home, provide quality and specialty foods more economically, and promote healthier lifestyles. There is a clear and important link between these goals, environmental health, and urban environments. In the United States, Vermont FEED is a school-based program that links the curriculum, school lunch program, and school garden with local farmers. Youth learn about nutrition and farming practices as they grow their own food and eat local produce in the cafeteria.

Other examples of urban environmental education include municipal solid waste programs and urban beautification. King County, which includes the city of Seattle, Washington, provides not only curbside recycling of most materials, but also curbside compost. Residents can place their used paper and food and yard waste in a compost container that is taken to the city's larger compost facility.   Online videos and brochures educate the public about this technique, and result in less trash in the landfill and the creation of usable compost. Urban-focused environmental educators can be found in formal and nonformal education working with both youth and adults.

King County composting program provides handy bins. Photo by D. Erickson and E. Canfield. http://sfrc.ufl.edu/extension/ee/woodenergy/index.html

> Current trends in urban EE include urban agriculture on school grounds, in community gardens, in public spaces, and at private residences.

Investigating Issues

While learning about and experiencing the local environment is important (and may be the most appropriate approach for younger learners), working on the resolution of environmental issues, whether in urban environments or wilderness areas, is also an essential component of EE. This involves developing a

specific set of skills, including learning about the context (both ecological and social), exploring alternatives and the predicted consequences, and identifying solutions that maximize benefits and minimize costs for a variety of stakeholders. Some programs also encourage learners to work toward realizing reasonable solutions by engaging with political processes. Students in Chester, Pennsylvania, realized that their lack of fresh produce indicated an environmental problem linked, through food, to community health. With assistance from Earth Force and Home Depot, they created a school garden; tended it over the summer; and harvested beets, squash, and carrots which ended up on the school lunch menu. They also took the time to write to First Lady Michelle Obama about their efforts, and she invited them to Washington. D.C., to help plant the White House Kitchen Garden.

Though an important part of EE, teaching young people about environmental issues can be challenging. If learners select a controversial issue or one that includes deeply entrenched positions, their queries may upset the status quo and could generate negative reactions among parents or within the local power structure. Most classroom teachers shy away from the prospect of such notoriety, and students lose a potentially valuable learning opportunity. In addition, real-world environmental issues are complex, often involving natural resources, pollution, jobs

Youth from Stetser Elementary in Chester, PA, get their hands dirty while addressing food access in their community by planting a garden on their school grounds. Photo from Earth Force.

and economic development, ethics, health, culture and diversity, and science in an intertwined and interdisciplinary web. Few educators feel competent to tackle the mix of topics likely to arise in an exploration of current controversial issues. For instance, in the case of using wood for energy, science teachers may be able to teach about the conversion of biomass to heat and power but not the economics of obtaining a sustainable supply of biomass or the policies that could be needed to make biomass a viable fuel. Additionally, if there is a local paper mill, parents, who may be employed there, may not want students researching and suggesting a competing use of wood. Nevertheless, teachers who orchestrate the interdisciplinary study of a local issue in concert with local stakeholders can serve a helpful role as community educators. Local experts may serve as guest speakers, or local residents may be asked to respond to polls about existing values and perceptions, during which they may learn more about the issue as well.

Finally, it is difficult to address controversial issues without appearing to sway learners to one solution or another. Even in adult programs, audience members may ask about the sources of funding for a program and who will reap the benefits of certain decisions if educators present information that appears to favor one perspective.   As a result, many environmental educators make it clear that they have no opinion   and encourage learners to become familiar with all possible perspectives. These challenges are often addressed in teacher training programs and through guidelines for approaching complex issues in the classroom.

For adults, faith-based organizations, Cooperative Extension Service offices, and public libraries may sponsor study circles, workshops, or classes where people can investigate environmental issues and work together to take action. In Australia, an EE program called Sustainability Street enables people to meet each other, develop friendships, and support each other's efforts to reduce waste and save energy. A three-year evaluation of the program reports a remarkable 30 to 40 percent reduction in greenhouse gas emissions and suggests these groups are "beacon communities" that can help demonstrate what is possible to others.   Such issue investigation programs enable youth and adults to increase their environmental literacy by developing the knowledge and analytical skills that can contribute to behavior change.
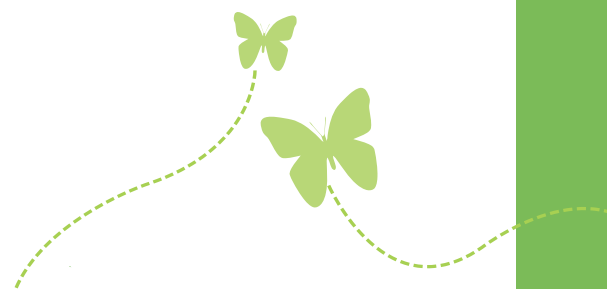
> Issue investigation programs enable youth and adults to increase their environmental literacy by developing the knowledge and analytical skills that can contribute to behavior change.

Service Learning and Citizen Science

While issue investigations allow learners to gain an in-depth understanding of environmental concerns, learners often stop short of implementing a change. Service learning and citizen science are two popular strategies educators use to help learners participate in real-world activities that provide mutual benefits to learners, communities, and researchers—thus helping to bring about change.   Though not focused exclusively on the environment, service-learning opportunities engage learners with local issues that are intrinsically interesting. Authentic service learning experiences, while almost endlessly diverse, have general characteristics that are similar to EE. They are positive, meaningful, and real to the participants, and they involve reflecting on one's experiences to enhance learning. They often involve cooperative experiences, promote citizenship skills, address complex problems in real settings, and offer opportunities to engage in problem solving. Finally, they promote deeper learning because the results are immediate and uncontrived, and as a consequence, service-learning activities are more likely to support social, emotional, and cognitive learning and development.   Service-learning programs link youth with the community and provide a multitude of ways that schools can engage in community EE, which can be a benefit to community educators.

A group of elementary school children in Guatemala's Maya Biosphere Reserve, for example, were invited to assist in the collection of nest survival data for an endangered native bird, the scarlet macaw.   While collecting the nest survival data is valuable, this activity alone is not considered service learning. The activity was transformed into service learning by adding exercises that build skills addressed in the school's curriculum. The Guatemalan students analyzed the data and shared results with community leaders and scientists. In this example, students engaged in their own learning and skill development while also providing a valuable service to the community.

In some cases, the service also directly benefits the environment. The Global Rivers Environmental Education

Service-learning programs link youth with the community and provide a multitude of ways that schools can engage in community EE, which can be a benefit to community educators.

Network (GREEN) operates in many nations to facilitate opportunities for middle and high school students to study and improve the quality of their local rivers while sharing data with other students around the world. Students develop critical thinking, problem solving, and decision making skills as they collect water quality data, identify problems, and plan steps to improve water quality in local watersheds. In another context, a 2008 study of 54 air quality education programs in the U.S. reported that nearly half of the programs resulted in improved air quality. Those that employed community-based service projects were more likely to report air quality improvements.

In citizen science programs, scientists engage the public in environmental data collection and broaden public participation in science research. Programs are often organized by scientists for the purpose of answering their research questions about migration patterns, preferences for bird seed, or sea bird mortality and can be facilitated or sponsored by community educators who may organize and train citizens to collect data. Citizen science can develop participants' knowledge and sense of stewardship for local resources through participation in research and discovery. One of the most well-known citizen science projects in the Americas is National Audubon Society's Christmas Bird Count in which volunteers from throughout the Americas record every bird they see and hear on a particular day. For more than 100 years, the event has created friendly competition, provided an opportunity to get outdoors and appreciate nature, and resulted in a useful scientific endeavor. Data from the Christmas Bird Count are compiled to assess the long-term status and health of bird populations and have fostered a greater public awareness and stewardship of birds in participants' backyards. Citizen science projects allow participants to engage in beneficial, illuminating data collection that can increase awareness and environmental literacy.

> A 2008 study of 54 air quality education programs in the U.S. reported that nearly half of the programs resulted in improved air quality.

Project Puffin enables people to support seabird conservation.

Social Marketing

While many of the aforementioned examples involve investigating the environment to improve individual understanding and skills, social marketing is used to guide people toward a particular course of action. Many people fail to engage in environmental behaviors either because they do not know how, they forget, they do not have the resources, they do not have the time, their neighbors are not doing the behavior, or they are reluctant to change their habitual ways of doing things.

Social marketing applies concepts from marketing and social psychology to promote specific, generally accepted environmentally responsible and sustainable behaviors. Social marketing is not oriented toward developing critical thinking and problem solving skills, but focuses on promoting behavior change when the audience generally understands why the behavior is important and agrees that the behavior is a good one. Social marketing programs employ basic tools to reduce barriers and increase perceptions of benefits of a particular behavior. Common social marketing tools include visual reminders, modeling the behavior, using role models, providing feedback, establishing incentives, and requesting a commitment.

A community organization or an agency that has a specific mandate to protect a particular resource is often the most appropriate entity to launch a social marketing campaign. Examples of social marketing include road signs throughout the world that remind the public not throw trash out their car windows; Canadian municipalities that have been successful at reducing vehicle idling at bus stops and schools with their "Turn it Off" campaign, and prompts at storm drains to remind pedestrians that anything that enters the drains goes directly into a local lake.

The World Wildlife Fund's Earth Hour is an example of a social marketing campaign that uses many of these tools. Every March since 2007, the Earth Hour project has asked people from all over the world to commit to turning off their lights for one hour to save energy. The project first provides information and persuades a visitor to the World Wildlife Fund website to participate and to make commitment to join this global effort. An email address is all that is necessary to become a member and be counted in the program. Asking people to commit to a behavior is highly effective at ensuring the action. Most people dislike being inconsistent in their words and actions, and thus expressing commitment will likely lead to engaging

in the behavior as long as the person remembers to do it. Once a member, the Earth Hour project sends reminder emails one week, one day, and one hour before the programmed time to turn off lights. These emails serve as reminders, also called prompts, for participants to engage in the behavior that they already committed to do. The website also requests that participants invite as many friends as possible to join. These invitations and the adjoining information about other participants show new recruits that it is both possible and desirable to be part of the process. Such role modeling by people of a similar social group is often crucial to encourage behaviors. After the actual Earth Hour, World Wildlife Fund posts a thank-you video and the results of the night-time activity. This feedback helps participants see that their behavior had a real benefit which encourages them to continue the behavior in the future. In 2007, the Earth Hour program began with 2.2 million homes and businesses in Sydney, Australia, and with its successful use of social marketing tools, had grown to hundreds of millions of people in 150 countries throughout the world by 2013.

While people enjoy being part of positive change, some critics of social marketing see it as manipulation. Indeed, agencies and industries have always manipulated the public by providing information in particular ways. Nonetheless, the use of social marketing in transparent, careful programs that engage community representatives in making decisions is a useful method for encouraging environmentally responsible behaviors. Social marketing is less appropriate, however, for a youth program or for controversial issues where there is not yet agreement on how to resolve the issue. In this context, it is more appropriate to engage in dialogue about the controversy rather than push for a specific behavior.

In Summary

In any community it is likely that various agencies and organizations use all of these seven strategies to help achieve their own missions as well as improve residents' environmental literacy. Community educators may wish to organize offerings to best provide age-appropriate, repeated, and sequential opportunities to residents. This coordination may help reduce the overlap between programs, provide better coverage to the community, and match strategies to those best able to implement them. Such coordination could help community educators make the most of their EE opportunities.
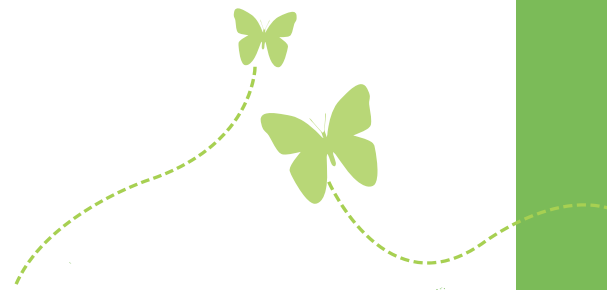
Community educators may wish to organize offerings to best provide age-appropriate, repeated, and sequential opportunities to residents.

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Current Trends in Environmental Education

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> At the core of environmental education is a commitment to make the world a better place for people and other organisms.

Overview

This chapter explores several opportunities that environmental education (EE) practitioners are using to increase their influence in a rapidly changing world, both within the traditional definition of EE and beyond. The themes and approaches described here are not necessarily new. In fact, many of these ideas have existed within EE for several decades, but they are becoming increasingly popular as environmental educators work to increase awareness of and promote skills to respond to new environmental challenges and possibilities. In exploring these future directions, we also offer our perspective on the future challenges and promise for EE.

Introduction

Environmental education is a vibrant field. Because practitioners are dedicated to meeting needs, reaching new audiences, and addressing emerging issues, the strategies and programs that define environmental education are broad and continue to evolve. At the core of EE is a commitment to make the world a better place for people and other organisms.

In this chapter, we address some ideas and approaches relevant in EE today. Namely, we discuss how EE is interfacing with communication technology; themes of systems thinking, sustainability, and environmental justice in EE; the role that EE practitioners can have in resource and environmental management decision-making processes; and the importance of ensuring that EE is implemented in culturally appropriate ways. We conclude by reflecting on the challenges EE is likely to face in the future and how practitioners may be able to overcome these challenges to enhance EE implementation moving forward.

Communication Technologies

The steady march of technological change alters the ways that environmental educators obtain information and skills for themselves and deliver information to others. It also changes how learners interact with one another and available information,

potentially providing greater opportunities to communicate, share data and experiences, and draw on others' resources and insights. The prevalence of technology, however, has the potential to have a dramatic influence on our engagement with the environment. A 2005 study found that decreased attendance to National Parks in the United States (U.S.) over the previous 16 years correlated with increased time spent with electronic media such as video games, watching TV and movies, and surfing the Web.   These results do not mean that technology is causing these changes in attendance, but these types of studies provide food for thought about our relationship with technology versus the natural world. Particularly with the advent of the Internet, the pace of global communication, scientific collaboration, and technological discovery has been permanently altered.

While an increase in time spent online probably means people are spending less time experiencing the natural world,   there can be a silver lining to using technology for communication. Technology provides many tools to more quickly communicate with larger groups of citizens on environmental issues. Since 1992, the director of the Belize Zoo   in Central America has conveyed conservation and educational messages about the flora and fauna of the country of Belize through the popular *Walk on the Wild Side* series, which airs on the radio through the British Forces Broadcasting Service.   Such radio programs are relatively common throughout the world and build on the hugely successful experience of rural health radio education programs. Although these may be considered more environmental communications than EE per se, given their focus on sharing information rather than skill building, these are nevertheless tools that are sometimes employed by EE practitioners.

Television is another effective mass communication outlet for informal EE messages that is very popular worldwide. From a base in England, Television for the Environment (TVE) airs films about the environment and development that have reached viewers in more than 170 countries. Their production *Earth Report* is the longest-running environmental series on global television.   TVE and other international organizations including UNICEF and the European Commission supported the development of the Environmental Education Television Project for China, later called the Environmental Education Media Project,

The steady march of technological change alters the ways that environmental educators obtain information and skills for themselves and deliver information to others.
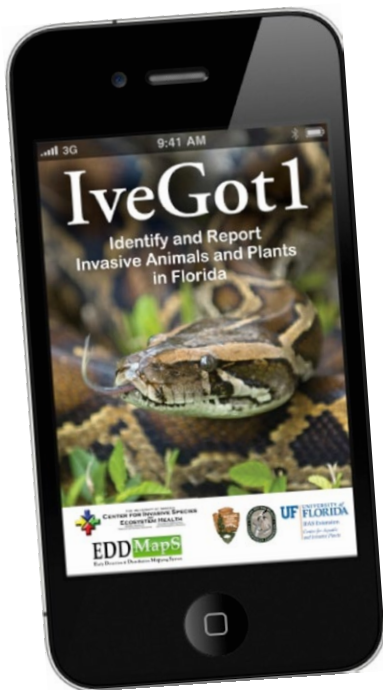
The IveGot1 mobile phone app allows hikers to report sightings of invasive species in Florida. Photo from http://www.nps.gov/ever/parknews/ivegot1mobileapppr112911.htm.

which reaches many millions of people with relevant information on environmental issues.   Discovery Channel and Animal Planet, though originally based in the U.S., are now broadcast worldwide, bringing environmental information about distant reaches of the globe to an expanding audience.

Most recently, the Internet has become a common source of information, and EE programs have quickly expanded into this medium. In the U.S., the number of people who cited the Internet as their primary source of science and technology information more than doubled between 2002 and 2006. Museums, parks, aquariums, and government agencies are some of the organizations that have recognized the potential to reach people via the Internet, and they are doing so with substantive programs, not just marketing messages. Many offer virtual field trips on their Websites that are accessible anytime and include online exhibits, Web games, photos, live cams, and readings. For example, NASA   and Woods Hole Oceanographic Institute in the U.S. offer online expeditions for students to "travel" to distant places like Antarctica and the International Space Station with scientists. Some programs, such as the National Estuarine Research Reserve's Estuary Live Program, provide real-time footage of actual scientists in field settings and are simultaneously broadcast to hundreds of classrooms.   The Internet is also particularly useful for social marketing, public participation, and even citizen science programs such as the Christmas Bird Count, which successfully uses the Web to connect people and engage them in environmental inquiries.

An explosive expansion of mobile technology platforms and Web-enabled applications has created new ways to reach people and for people to engage in EE opportunities. Trail signs provide phone numbers for visitors to listen to recorded messages, and downloadable applications allow people to identify trees or birds as they hike.   They can also enable citizen scientists to report findings; for example, the Florida Invasive Species Partnership collects data from sightings of invasive species through GPS-enabled cell phones.   People can connect through Facebook, Twitter, and other social media websites to learn more about environmental issues or EE opportunities. Outdoor Afro, a social community focused on connecting African Americans with nature, provides information about opportunities to engage through various Web-based programs including an active Twitter feed.

In addition to providing educational opportunities to learners, environmental educators can now use the Internet to find professional development opportunities. Improved Internet connections, interactive software programs, and course management systems are opening new channels for distance education. Online EE courses from University of Wisconsin-Stevens Point and Cornell University provide opportunities for educators to gain information, enhance skills, and develop a learning community of peers. Similarly, Alaskan educators, whose remote communities are an expensive flight away from any training workshop, can participate in online Project Learning Tree (PLT) and Project WILD (Wildlife in Learning Design) certification programs.

Although there are concerns about the potential for information overload and the trustworthiness and reliability of new technologically enabled sources, technology will continue to alter people's interaction with each other and their environment. EE, in turn, will continue to adapt to these changes by using technology to provide current, relevant information about global environmental issues and opportunities for people to learn from one another.

Systems Thinking

The increasing complexity and interconnectedness of global environmental issues—for example climate change and the decline of marine fisheries—requires that they be understood through a systems perspective. This involves scaling up our thinking so that instead of focusing on one piece of a large puzzle, such as car exhaust, we look at many interactions among the parts of the larger system, such as the global carbon cycle and its links to economic and political systems. To help prepare individuals to understand and resolve increasingly complex issues, some EE programs encourage what is commonly referred to as systems thinking. The term suggests that complex problems require a view of the big picture of relationships and interactions rather than the traditional view of subdivided pieces. Systems thinking involves training our brains to look for cycles, feedback loops, and resource flows, and to understand that different events may interact over different time scales. Some educators attempt to build systems thinking skills at a small scale, such as a school or community, which can help learners identify systems at larger scales.

Visitors to Paynes Prairie Preserve State Park in Florida can access interpretive messages from their cell phones. Photo by M. Monroe

Causal and cognitive mapping exercises suggest that students can learn systems thinking skills and apply them to novel situations.

A study of two groups of students and their abilities to use systems thinking skills suggests that people readily transfer skills from one system to another. At the University of Florida, students taking a class on environmental politics were taught about nonlinear, causal relationships in natural resource topics such as global warming and water management. Similarly, in a middle school in Oregon, students practiced systems thinking concepts for non-environmental issues. In both cases, students who were given the opportunity to develop skills to understand the bigger picture, look for feedback loops among issues, and consider impacts of interactions at different spatial and temporal scales, identified a greater number of components of a novel environmental issue and described more causal loops between them. Causal and cognitive mapping exercises suggest that students can learn these skills and apply them to novel situations. A growing number of EE programs will likely incorporate systems thinking in the future, as these skills are crucial to address many of today's complex environmental problems.

Sustainability

As discussed in **Chapter 1**, sustainability has become a prominent topic globally and within EE. Although many definitions for sustainability exist, we use the term to refer to decision-making processes that seek to balance ecological, social, and economic perspectives in an attempt to meet the needs of present and future generations. Environmental educators have worked to create opportunities for learners to use systems thinking to better understand issues and behaviors related to sustainability, to develop ethical frameworks for understanding how to incorporate the multiple facets of sustainability in their decisions, and to practice sustainable behaviors. As with systems thinking, the microcosm of the school can be an ideal setting for this practice; elementary schools through universities are using their built and natural environments as educational tools for sustainability.

The Association for the Advancement of Sustainability in High Education (AASHE), for example, encourages sustainable practices and educational opportunities at the university level by providing educators and administrators with resources as well as networking and professional development opportunities and by encouraging commitments from American college and

university presidents to take actions to mitigate climate change.   In a tangible demonstration of sustainable design, the Adam Joseph Lewis Center for Environmental Studies at Oberlin College in Ohio was created to be one greenest buildings at any U.S. college or university. Its design and construction involved input and collaboration from more than 250 students and members of the Oberlin Township, and a university curriculum was specifically designed to foster these relationships and to examine sustainability issues in a real-world context. Community-university-school partnerships help learners engage in real issues, help communities make change applying the energy of their youth, and allow agencies or university experts to provide resources and expertise.

The advantages of such sustainability-oriented programs are many. One benefit is that they allow students to work in their own environments and use experiential learning opportunities to better understand complexity in systems, which we have identified as one of the most essential skills for developing sustainable systems. These programs also help students develop specific skills and knowledge necessary to deal with environmental, economic, and social problems. Participants can become empowered by their impacts at the local level and use new skills to tackle other opportunities for transformation.

A very specific component of sustainability education focuses on Environmental Justice, or EJ, which brings to light the importance and challenges associated with appropriately addressing the social and economic components of the sustainability puzzle. The negative results that have emerged as humans tamper with global systems often inequitably impact the world's populations, economies, or environments. The poor are often disproportionately affected by the consequences of environmental mismanagement.   Educators focused on EJ address issues of inequities in the burdens and benefits related to the environment. EJ is often closely linked with environmental health (EH) issues such as indoor air pollution and water contamination.   These pressing global issues have influenced many environmental educators to illuminate these issues for those who suffer from them and those who have the capacity to make changes to the systems that contribute to the inequities. This incorporation of EJ and EH concerns is an important and relatively new area of EE.

> Participants in sustainability-oriented programs can become empowered by their impacts at the local level and use new skills to tackle other opportunities for transformation.

The Adam Joseph Lewis Center for Environmental Studies at Oberlin College in Ohio is one of many green buildings on college campuses.

Public Participation in Resource and Environmental Management Decision Making

One way EE is becoming increasingly influential is by enhancing public participation in environmental decision making. Participation can take many forms.   In this section, we focus specifically on the gains to be made when EE practitioners engage in resource and environmental management contexts.

Environmental educators have often worked with the public and designed programs for anyone who is interested; however, only recently have their roles as facilitators been promoted in environmental and sustainable decision-making processes.   In these settings, environmental educators work with a select group of stakeholders to promote shared learning, understanding, and decision making about specific environmental topics. Globally, there are many opportunities for citizens to participate in environmental decisions in their communities, states, regions, and nations. In some countries, these opportunities are legislated. For example, the public comment process associated with Environmental Impact Statements (EIS) is required by many national and state governments before the implementation of a new policy or development plan.   In the U.S. all major federal actions require an open comment process, which includes the opportunity for the public to receive information about the proposed action, access the EIS for that project, and provide comments to the sponsoring agency on the proposed action.   Though noble in its intent, many citizens feel overwhelmed by what they need to know and understand in order to make comments. Public meetings often suffer the same fate, where information may be provided in a way that is not accessible or understandable to members of the public, who then become frustrated when they feel their voices are not being heard or taken into account.

Environmental educators can create more meaningful environmental policy processes that allow stakeholders to learn from one another for the benefit of themselves and the natural resources they seek to manage. Environmental educators can facilitate participatory processes such that different voices and

perspectives are heard, scientific and nonscientific information is more effectively integrated, and information is shared in ways that can be understood by all involved in a process. This type of process is often called social learning.   The Land Care movement in Australia and New Zealand is an excellent example of community members working with experts to explore solutions to resource challenges. As a leader in social learning facilitation, the Land Care movement works with community groups and government agencies toward more informed environmental decision making.

Though there are many success stories like the Land Care movement, environmental educators face many challenges in their attempts to address complex environmental issues and facilitate meaningful communication. Greater involvement also often brings an increase in the number of viewpoints—and misconceptions—to the process. Bringing people together can also lead to conflict, as ideas and interests clash. Trained environmental educators, however, can overcome these potentially debilitating aspects of participation by using professional and creative conflict resolution strategies and applying social learning tools so that participation benefits both participants and the environment.

Community forums are one method that can involve environmental educators in facilitating the sharing of information and getting citizens involved in local issues. Different from stakeholder processes in which members are meant to have equal voices, a forum is a facilitated meeting during which experts share their knowledge and perspectives on a particular issue.   Other opportunities for participation include land-use planning or zoning discussions. These issues allow citizens direct access to the decision making process, but require significant investments of time to develop trust and a healthy dialogue that reflects the needs and wants of the community. Many government agencies and nongovernmental organizations (NGOs) provide guides to inform citizens about how to become involved in local planning processes.

Environmental educators may also work in one of many natural resource agencies or NGOs that are now implementing adaptive management. Adaptive management is a general term for an approach where natural resource management ideas are applied,

> Environmental educators can facilitate participatory processes such that different voices and perspectives are heard, scientific and nonscientific information is more effectively integrated, and information is shared in ways that can be understood by all involved in a process.

Santa Fe Springs Basin Working Group members listen to a presentation. Photo by O. Wells, Normandeau
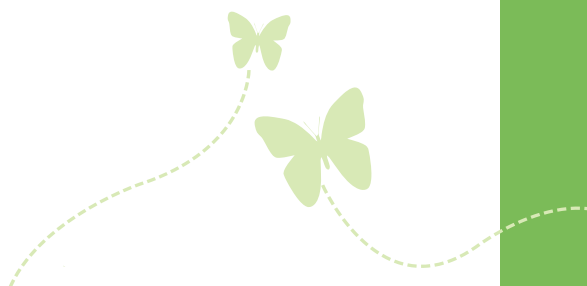
> Social learning can enable community and stakeholder groups to make better, more informed decisions and build their capacities for more effective resource management.

experimented with, monitored, and revised. There are many terms used for similar ideas related to adaptive management, such as Collaborative Adaptive Management (CAM) and Adaptive Collaborative Management (ACM), which specifically acknowledge the important role of stakeholders who work collaboratively and engage in social learning. These approaches have the benefit of revealing shared understandings where they exist, as well as revealing differences of perspectives about the system. In addition, CAM requires that stakeholders learn about changes in their systems, synthesize new information, and take action to accommodate observed changes. Environmental educators can play a key role in these processes, facilitating communication among stakeholders, helping people to see situations in new ways and through a systems lens, and revealing stakeholders' misconceptions and assumptions that may be brought to the process. This social learning can enable communities and stakeholder groups to make better, more informed decisions and build their capacities for more effective resource management.

The Center for International Forestry Research (CIFOR) based in Bogor, Indonesia, is a leader in participatory decision-making processes in tropical forests throughout the world. Their Future Scenarios mechanism is part of a larger CAM program that was implemented in 11 countries: Cameroon, Ghana, Madagascar, Malawi, Zimbabwe, Indonesia, Kyrgyzstan, Philippines, Nepal, Bolivia, and Brazil. Facilitators of Future Scenarios engaged public decision makers with local land users and other stakeholders to illustrate, explore, and discuss ideal futures, potential pathways to those ideal futures, and realistic alternatives. Many of the workshops improved knowledge sharing and created viable, sustainable ideas, which are two critical goals for EE. Additionally, the workshops often improved government transparency and improved the capacity of government agents to gather data from local stakeholders with more participatory strategies.

There is a great opportunity for EE to continue and expand its involvement in participatory processes and public decision making. As facilitators and educators within EIS public processes, Community Forums, and adaptive management, environmental educators can improve communication among stakeholders and thus shape learning processes. These activities directly further EE's environmental literacy goals and have the potential to significantly impact both the EE field and the effectiveness of natural resource management well into the future.

Ensuring Appropriateness

Finally, for EE to excel in a participatory, sustainable and globalized world, it must endeavor to make curricula environmentally and culturally appropriate. In order for EE materials to achieve a mark of excellence, they must address different cultures, races, genders, social groups, and ages in a respectful and equitable way.   Training programs, conferences, and recruitment into academic programs can target underserved audiences and provide a long-term strategy for improving EE's relevance to these communities. It is often possible to tailor existing curricula to include this diversity and select environmental concepts specific to a particular location or culture. This does not always occur, however, and some EE materials are irrelevant to the context in which they are used. Nationally adopted curricula in Honduras, for example, was based on translated U.S. materials, which included information about grizzly bears and recycling, topics lacking relevance in that local environment where there were no bears or trash collection infrastructure.   Although there is certainly value in teaching about global concerns and the environmental challenges of other regions, it is important to ensure that students are able to make sense of new information, that it is relevant, and that it engages locally appropriate environmental behaviors.

In North America, EE programs that draw on origins in nature study and outdoor education often lead to a focus on the environment as a place that is "wild" and "away" from where most people live. Yet the environment is what surrounds us regardless of where we live and a large and growing proportion of citizens live in urban settings. The environment that surrounds city residents looks very different from the notions conjured up by the photographs taken by Ansel Adams or the philosophy of John Muir. Environmental educators must respond to the diverse needs of urban (and other) audiences by customizing EE opportunities to be relevant and culturally appropriate for different geographic settings and cultural groups, while paying particular attention to environmental justice issues.   Environmental education should meet people where they are—not provide "one size fits all"

> Environmental educators must respond to the diverse needs of urban and other audiences by customizing EE opportunities to be relevant and culturally appropriate.

Students from the Satellite Academy High School in the Bronx, NY, interview farmers about sustainable food at the Union Square Greenmarket in Manhattan. Photo by A. Kudryavtsev

opportunities. While there are many examples of EE programs where wilderness or nature study is the focus, there are also a growing number of examples of urban EE programs. EECapacity, for example, is working to build a network of urban environmental educators who can share ideas and resources to address important urban contexts.

Facing the Future

Environmental education takes many forms. It provides basic information about ecosystems and environmental issues as well opportunities to build skills and participate in the resolution of global and local environmental issues. As EE meets environmental, social, and economic challenges, educators work to address issues, help the public make appropriate behavior changes, make programs accessible and relevant to all communities, and help people learn to think about systems and sustainability.

Yet, environmental education faces many challenges. EE is not always a priority globally, nationally, or locally, and it can be left out of the policy arena or remain underfunded where policies do exist. Fortunately, EE is often able to persist on a shoestring budget and survive as a chameleon, able to change its approach to match the social, political, environmental, and educational needs of its times. This plasticity can, however, be

Students from the Satellite Academy High School in the Bronx, NY, monitor oysters in an oyster garden in the Bronx River. Photo by A. Kudryavtsev

perceived by some as demonstrating a lack of direction, drawing criticism. Environmental education does not fit within traditional educational boundaries and can be left out of discipline-specific, standards-based curricula. The interdisciplinary nature of EE, however, can be an advantage because a variety of stakeholders and subject areas can implement EE and advocate for it. EE is often assumed to be only for school children and youth, when there is a host of instructional methods that engage adults in becoming environmentally literate as well. Environmental education continues to be interpreted by some as a subjective field irrelevant in certain circumstances, such as in urban areas or where poor or resource-dependent populations are striving to attain higher standards of living. This interpretation of EE may be largely the result of influence from conservation organizations or historical ties to nature study. But, as we have shown, EE can and should address much more than just natural resources in rural areas, through incorporating issues of environmental justice, health, and overall sustainability. Additionally, the common ground of concern for a quality environment can be an important starting point for programs that work to empower citizens and build civic capacity.

The future of EE will depend on its ability to implement effective programs that reach local audiences with culturally appropriate topics while also addressing important environmental problems. Associated with this, environmental educators must provide adequate communication and opportunities for collaboration that engage all ethnic and racial groups. This can be greatly enhanced through the use of emerging technology, which will allow EE to reach a larger audience and achieve the Tbilisi objectives (**see detailed discussion in Chapter 1**) to develop people's awareness, knowledge, attitudes, skills, and participation.

It is essential that EE programs develop the critical-thinking, problem-solving, and decision-making skills of people who will address environmental issues for decades to come. There is great potential for environmental educators to innovate and implement strategies that will seek to meet these and new challenges.   Its history as a flexible, multidisciplinary field uniquely positions EE to promote educational strategies and develop programs that will address the pressing and emerging challenges we face today and in the future.

> The future of EE will depend on its ability to implement effective programs that reach local audiences with culturally appropriate topics while also addressing important environmental problems.

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Ecological Literacy: Meanings and Approaches

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The Need for Ecological Literacy

The term *ecological literacy* was first coined in 1989 by environmental scientist David Orr in his book titled *Educational Literacy: Education and the Transition to a Postmodern World.* *Ecological literacy* refers to an understanding of the complex interdependent relationships between human beings and their environment for the purpose of maintaining sustainable ecosystems, which balance human needs, resources, and the natural world. Ecological literacy is finding resurgence within the field of environmental education and sustainability. Teaching for ecological literacy equips learners with the ability to see the world in an integrated way and to consider how global ecological issues can be mitigated through long-term, sustainable solutions. This chapter examines *environmental literacy*, *sustainability literacy*, *dark green thinking*, and *educating for cultural commons* to understand their connections to, and influences on, ecological literacy. Additionally, the following topics are reviewed: how ecological literacy has been defined, what it is and what it is not, in both formal and informal education. We maintain that ecological literacy is a core goal of environmental education for which environmental educators need a solid foundation.

Defining Ecological Literacy

David Orr is credited as being the father of ecological literacy and developing its place within the field of environmental education. Lacking a single definition among scholars and practitioners, ecological literacy is often described as a philosophy and teaching pedagogy. In *Ecological Literacy,* Orr summarizes ecological literacy as the ability to understand (and act on this understanding) how people and societies relate to one another and to natural systems in a sustainable manner.

In his work, Orr offers seven propositions that simultaneously define, describe, and apply ecological literacy: (1) all education is environmental education; (2) environmental issues are complex and cannot be understood in a single discipline; (3) teaching and learning should be centered around place; (4) education occurs in part as a dialog with a place; 5) the way education occurs is as important as its content; (6) experience in the natural world is essential to understanding the environment; and (7) education

Lesley University Science Methods Class at observing a red-tailed hawk presented by a Drumlin Farm Audubon Ark Traveling Wildlife Program teacher naturalist. Photo by Mark Tiewes courtesy of Lesley University

relevant to the challenge of building a sustainable society will enhance the learners' competence in understanding natural systems. Debra Mitchell and Michael Mueller describe Orr's vision of ecological literacy as an ability to "read" the interwoven abiotic and biotic relationships that comprise earth.

Using the lens of systems thinking, physicist Fritjof Capra defines ecological literacy as "the ability to understand the principles of organization of ecological communities and using those principles for creating sustainable human communities."

Capra further emphasizes the importance of understanding and developing ecological literacy because humanity's survival depends on its ability to understand how ecosystems function.

Peter Martin, building on the works of Orr and Capra, describes seven key attributes of an ecologically literate person as someone who: (1) is comfortable outdoors; (2) seeks encounters with nature for recreation and health; (3) has the knowledge and skills to safely enjoy nature with minimal impact; (4) has a well-developed sense of place; (5) understands and values interrelatedness; (6) nourishes community, while having a deeply felt concern for the earth; and (7) maintains sustainable beliefs and practices informed by the principles of ecology, critical thought, and action.

From these definitions, we see that ecological literacy encompasses knowledge, understanding, behaviors, practices, and actions. Discrepancies in the definition of ecological literacy likely result from synonyms such as *environmental literacy, environmental education*, *sustainable literacy*, *dark green thinking*, and *educating for cultural commons.* In the following sections we use Orr's comprehensive vision of ecological literacy as a foundational backdrop to consider concepts and understandings that arise from these related areas of study.

Environmental Literacy

When environmental educators discuss the possibility of a global populace that is informed about the natural world and its own connections to it, the concept they most often use is that of *environmental literacy.*   Some educators

> Ecological literacy encompasses knowledge, understanding, behaviors, practices, and actions.

Children exploring the pond at Ravenwood Maine. Photo by Nicole Weber

**Snowman in play space.
Photo by Susan Rauchwerk**

and scholars use the term *ecological literacy* interchangeably with *environmental literacy*, yet these terms are not used synonymously within much of the literature. To minimize confusion, we outline how they differ.

Environmental literacy has been defined in various ways—from mere acquisition of scientific knowledge to one's ability to address environmental concerns.   Charles Roth, environmental educator and pioneer of state-wide environmental literacy plans, states that environmental literacy is the capacity to perceive and interpret the relative health of ecosystems and take appropriate action to maintain and restore the health of those systems.   Similarly, the United Nations Educational, Scientific, and Cultural Organization defines environmental literacy as functional education that provides people with the knowledge, skills, and motives to cope with environmental needs and contribute to sustainable development.   The term *ecological literacy* also encompasses a philosophy and pedagogy using ecosystems and ecology not only as a content base, but as a model for systems-based thinking, teaching, and learning.   Ecological literacy seeks to holistically advance knowledge about and action toward *social* and *natural* ecological issues that are connected to a place.   In contrast, *environmental literacy* focuses on using nature or the environment as a learning tool to support learning outcomes across subject areas and teaching philosophies with a goal of providing a person with a knowledge base rooted in environmental content about the natural world. The Framework for 21st Century Learning defines an environmentally literate student as one who can demonstrate knowledge of the environment and societal impacts on the natural world, investigate environmental issues, and take action on these issues.   Key differences lie in ecological literacy's focus on place, socio-ecological systems, and sustainable solutions whereas environmental literacy focuses more broadly on environmental knowledge and experiences leading to action. Siegmar Otto and Florian G. Kaiser documented that environmental knowledge is positively correlated with ecological behavior,   and popular belief suggests that knowledge leads to awareness and action   , but it is important to note that this has not *always* proven to be the case.

Literature and national advocacy have recently focused more on environmental literacy than ecological literacy, likely a result of the national movement for environmental literacy plans. Many states are currently drafting, adopting, and implementing plans through

departments of education, professional environmental education organizations, and/or departments of environmental and resource management. These plans aim to provide the environmental awareness, knowledge, and skills that can enable the citizenry to become agents of change. The 2015 proposed reauthorized Elementary and Secondary Education Act has, for the first time, budgeted for environmental education and, if passed, would provide funding to states that have developed environmental literacy plans.

The mainstream growth of state environmental literacy plans and the widespread use of the term *environmental literacy* is exciting news for the field of environmental education. If the terms *ecological* and *environmental* literacy are to be used interchangeably, a widely-accepted and concise definition of ecological literacy can provide a more expansive view which includes deeper consideration of place and the importance of understanding social systems, and enables environmental educators to identify goals and approaches that can both unite and expand the field.

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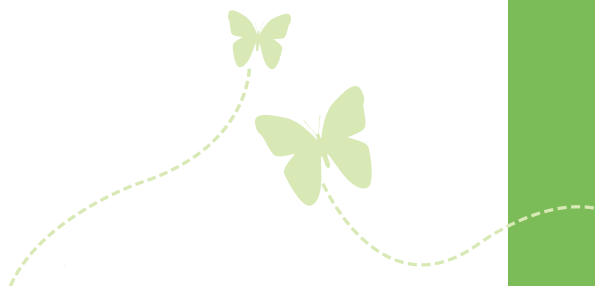
Lesley University Science Methods Class and visiting children observing a red-tailed hawk presented by Drumlin Farm Audubon Ark Traveling Wildlife Program teacher naturalist. Photo by Mark Tiewes courtesy of Lesley University

Sustainability Literacy

Sustainability literacy arises from the work of Capra, co-founder of the Center for Eco-literacy. It focuses on the elements of ecological literacy that support systems thinking. According to Capra, achieving ecological sustainability means that we must learn from past societies—their sustainability successes and failures—and model our current human communities after natural ecosystems that are inherently system supporting.

Sustainable communities are examples of how Capra's ideas are applied. Such communities and those living within them have a deeper focus on sustainability and are more likely to be ecologically literate. Sustainable communities "reflect the interdependence of economic, environmental, and social issues by growing and prospering without diminishing the land, water, air, natural and cultural resources on which communities depend" and understand the principles of ecology.

Lesley University Organic Garden built by students. Photo by Susan Rauchwerk

To educate for sustainability is to understand the systems, structures, pressures, and realities that influence both the present and the past, and utilize those understandings to develop a more sustainable future. How we get to that future is as important as recognizing the need to get there. Ecologist Christopher Uhl asserts that there are five sustainability principles that schools, businesses, and households should live by: (1) respecting life and natural processes; (2) living within limits; (3) valuing the local; (4) accounting for full costs consumption; and (5) sharing power. These skills, Uhl contends, can be easily transferred into everyday life. Sustainable literacy then focuses on the practical skills that learners need in order to survive and adapt in a world that is rapidly changing.

When we compare sustainability literacy with Orr's early vision of ecological literacy, it seems that sustainability literacy may in fact be the new face of ecological literacy for the 21st century. Michael Stone identifies nature as the teacher, learning in the real world, and sustainability as a community practice rooted in place as central tenants of sustainability literacy. His principles reflect Orr's vision through the focus on systems thinking, past and present culture, and structures of justice.

Dark Green Thinking

Sustainability educator David Selby discusses ecological literacy under the name *dark green thinking* and calls for a shift from an anthropocentric philosophy to a bio-centric philosophy, viewing issues of culture, development, environmental and social justice, equity, health, and peace as inseparable. There are many parallels between Selby's definition of dark green thinking and Orr's summary of ecological literacy. A key difference is Selby's emphasis on issues relating to humanity and peace as primary avenues toward global ecological sustainability. Here, dark green thinking refers to a shift in the way we frame culture. The focus on humanness adds more depth to the argument for ecological literacy. Selby's use of the term *dark green thinking* can also be seen as a rebranding of ecological literacy, further strengthening how we define ecological literacy.

Educating for Cultural Commons

Environmental studies professor and environmental education advocate C. A. Bowers uses *educating for cultural commons* to frame sustainability. To Bowers, education is the backbone of communication. Overconsumption, exploitation, and technology have become embedded in western society and have had a strong influence on actions that have brought about our current ecological crisis. Bowers suggests that we must begin teaching in an interdisciplinary manner that is rooted in culture through "activities, knowledge, skills, and patterns of mutual support that do not rely on a monetized economy." To understand just what Bowers means, we can juxtapose his ideas against ecologist Garrett Hardin's historic essay "The Tragedy of the Commons" where the world's expanding population, natural resources, and shared systems are destined to collapse because when resources that sustain human life are shared by all, the result is often exploitation and overuse to the point of depletion. Bowers brings attention to a component of ecological literacy that no one else addresses in depth—culture. Educating for cultural commons identifies connections between environmental issues and cultural norms influenced by western culture's perspective on the ecological crisis. Culture may in fact be the

> Culture may in fact be the most important element to consider when it comes to discussing ways to define and teach for ecological literacy.

Child exploring farm and forest area in Great Smokey Mountain National Park. Photo by Susan Rauchwerk

most important element to consider when it comes to discussing ways to define and teach for ecological literacy. "The cultural assumptions about the nature of reality and humans' relation to the environment are reproduced through education and manifested in nearly every aspect of modern culture." If our cultural norms are indeed what brought us into the ecological crisis, then perhaps only a deep cultural analysis will get us out.

Summary

Variation within the literature on ecological literacy suggests an expansive rather than concise definition. Identifying the coherent threads across Orr, Capra, and Bowers, we see ecological literacy as *the ability to understand how people are connected to each other, to society, and to the natural world through understanding the earth's natural systems, and to use an ecological systems approach to identify and design globally relevant ecological solutions.*

Approaches to Educating for Ecological Literacy

In a paper about what citizens should know about ecology, Rebecca Jordan, Frederick Singer, John Vaughan, and Alan Berkowitz postulate that ecological literacy is largely unknown in the general population, thereby limiting human capacity to respond to global ecological issues. Ecological literacy can be integrated into both formal and informal learning environments. Those who embrace the principles of ecological literacy understand the importance of teaching it, but do not necessarily agree on the approaches. When implemented well, ecological literacy moves beyond environmental awareness and understanding to a robust knowledge base of how everything on our planet is connected, and that global sustainability requires long-term, sustainable solutions. Teaching for ecological literacy takes environmental literacy to a deeper more connected sphere.

Here we outline the four most commonly cited approaches to educating for ecological literacy that often fall under the umbrella of environmental education: *place-based education, experiences in nature, interdisciplinary teaching, and systems thinking*. Additionally, we discuss the challenges to successful implementation.

Child exploring shells on the coast of Maine. Photo by Nicole Weber

Place-based Education

Central to the principles of place-based education is an in-depth observation of how landscape, community, and culture interact and shape each other at a local level.   Place-based education addresses teaching and learning on a micro level where people live, work, and go to school. Additionally place-based education focuses on local rather than global and national perspectives.

According to Orr, developing ecological literacy through place combines intellectual thought with physical experience, is relevant to the problem of overspecialization or linear thinking, and educates people in the art of living well. Through place-based learning, teachers and learners focus on ecological connections within their local environments and neighborhoods so that the enormity of the ecological crises becomes manageable through the lens of everyday lives. Amy Powers' study found that this contextualized learning about place exposed students to their local environment and issues, resulting in higher levels of motivation and engagement in learning for traditional students.   Powers also found that special education students performed better on reading and math assignments. Place-based approaches can aid students in developing problem-solving skills and are fast becoming as important as academic test achievement in the 21st century.   These findings support not only the utilization of place-based education to enhance teaching for ecological literacy, but also for overall literacy, skill building, and engagement in school.

Place-based education can be a highly effective way to teach for ecological literacy, but is not easy to implement within current public schooling focused on state and national standards for learning through nationally published textbooks and curriculum support kits. Many out-of-school or field trip experiences occur beyond students' immediate environment, thereby limiting authentic opportunities for place-based connections. The practice of travelling beyond the community invites comparison that can sometimes devalue a community's own ecological story. Place-based education supports student ownership of learning and helps students find greater value in the communities in which they live.

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Shelter building in New Hampshire. Photo by Nicole Weber

Outdoor play at a North Carolina nature center. Photo by Susan Rauchwerk

A study conducted by Yvonne Meichtry and Jeffrey Smith outlines an approach to implementing place-based teaching and learning. The authors suggested that (1) educators should set clear objectives; (2) programs should be evaluated; (3) learning should be aligned to state and national standards; (4) place-based units should be required of every classroom; (5) educators should be given opportunities to see effective place-based learning in action; (6) schools should use resources in their community and; (7) schools must implement long-term training and support for place-based learning over time. As research continues to show the positive connection between place-based learning and academic gains, place-based learning can contribute to ecological literacy.

Experiences in Nature

Many environmental educators consider *experiences in nature* as the central pillar of ecological literacy. The literature suggests that there is no substitute for time spent outdoors to develop ecological literacy. Additionally, how we use that time is important. Maxwell helps define what is meant by experiences in nature, suggesting that we use all of our physical, emotional, and cognitive capacities to interact in the natural world; we cannot just look, but instead we must see, smell, and feel the world around us. Environmentalist and educator Mitchell Thomashow shows that human connections to the natural world can stem from a number of different experiences in nature ranging from childhood encounters with and in nature, visits and reflection in wild places, and perceptions of disturbed places. For Thomashow, ecological literacy is more than knowledge about the environment; it involves how humans relate to the outdoor world and to each other. Beery and Wolf-Watz add depth to this perspective by showing how experiences in nature, identity, and ecological literacy are connected. Orr links experiences in nature to cognitive capacities stating that "experience in the natural world is both an essential part of understanding the environment and conductive to good thinking."

Louv argues that human capacity for connection to the natural world is jeopardized by advancing technology and urbanization.

Boys exploring an urban river Waltham, MA. Photo by Susan Rauchwerk

He advocates for placing a priority on experiences in nature, warning that a society that is less connected to the natural world suffers from "nature deficit disorder."

Experiences in nature as a means to teach for ecological literacy need not specifically come from interactions at the local level. While outdoor experiences are cited as a support for place-based education, these experiences can include trips to faraway places or simple explorations in your own backyard. Experiences in nature focus more on the experience than the place.

Catching frogs in Maine. Photo by Nicole Weber

Interdisciplinary Teaching

Interdisciplinary teaching connects literacy, math, science, social studies, physical education, and the arts, and is well-documented as an approach to ecological literacy. Ecological education integrates different scientific fields of study within a wide variety of socialization and learning experiences. In this view, an interdisciplinary approach to ecological literacy is not seen as an "add-on" to any one subject, but the "energy" that supplies the whole system. The subject of ecology itself bridges many fields of study and as such advocates of traditional education systems need not worry about students missing out on math and literacy skills.[50] The real world is not fragmented into silos by subject matter, yet our education system continuously

> Ecological education integrates different scientific fields of study within a wide variety of socialization and learning experiences.

Students engaged in a critical exploration of seeds. Photo by Susan Rauchwerk

employs that approach, making it challenging for learners to see the reality of our interconnectedness.

By failing to include ecological perspectives in any number of subjects, young people are taught that ecology is unimportant for history, politics, economics, society, and so forth. The result is a generation of ecological yahoos without a clue why the color of their rivers is related to their food supply, or why storms are becoming more severe as the planet warms. The same persons as adults will create businesses, vote, have families, and above all consume. If they come to reflect on the discrepancy between the splendor of their private lives in a hotter and more toxic and violent world, as ecological illiterates they will have roughly the same success as one trying to balance a checkbook without knowing arithmetic.

Orr's comments echo the sense of urgency for the need to address ecological literacy through an interdisciplinary approach. Interdisciplinary connection is central to the approaches suggested by Orr and Maxwell. A shared belief among scholars of ecological literacy supports the importance of interdisciplinary teaching in schools.

Others see science as an effective arena for ecological literacy. Jordan, Singer, Vaughan, and Berkowitz say that science literacy, understanding science, and science processes, enable people to evaluate scientific claims as they relate to ecosystems. However, in a study conducted in secondary schools in Ontario, Canada, Tom Puk found that attempting to infuse ecological literacy into existing science curricula was not successful. Puk recommends that schools introduce ecological literacy as a meta-discipline with a sequenced curriculum available from kindergarten through twelfth grade. Puk suggests that we cannot assume that learners will see the connections between science or the environment and ecology. Whether we use an interdisciplinary approach or imbed ecological literacy in a particular content area, the research suggests explicit and intentional teaching is what builds connections to the principles of ecological literacy.

Leaves changing in an urban park in Massachusetts. Photo by Susan Rauchwerk

Systems Thinking

Systems thinking approaches to ecological literacy have become increasingly useful to environmental educators. Capra, a leader in systems theory, notes that the roots of systems thinking and systems theory come from the fields of biology, Gestalt psychology, and nonlinear dynamics, and within the context of ecological literacy its focus is on the organization of nature or living systems.   A systems thinking approach is similar to an interdisciplinary teaching approach in that the goal is to move curriculum out of isolation and nest it within a larger context. Systems thinking strives to find connections between parts and systemic wholes. Following a systems thinking approach means that nothing can be studied separated from the system in which it exists.   In practice, systems thinking can synthesize fragmented ecological content by orienting learners to connections. A systems approach to teaching ecological literacy provides a new way of thinking about and viewing the world, which includes shifting from parts to the whole, objects to relationships, measuring to mapping procedures, quantity to quality, and structure to process.   This ultimately allows for a deeper understanding of how humans and the natural world are connected.

Systems thinking is not always embraced by teachers, so implementing this approach in schools often takes time: teachers must learn how to include such lessons and develop skills so students can become aware of the complexity of connected systems as they shape and affect an environment. However, researches have noted significant gains through the use of systems thinking.   Davies argues that "without systems thinking, society will continue to apply ineffective solutions that do little to resolve underlying problems."

One way to incorporate systems thinking would be to align it with place-based learning. Here learners can make connections and take action within their own environments.   Stone states, "When nature is our teacher, we see connections everywhere.

> A systems approach to teaching ecological literacy provides a new way of thinking about and viewing the world, which includes shifting from parts to the whole, objects to relationships, measuring to mapping procedures, quantity to quality, and structure to process.

Pond at Hale Reservation, Westwood, MA. Photo by Susan Rauchwerk
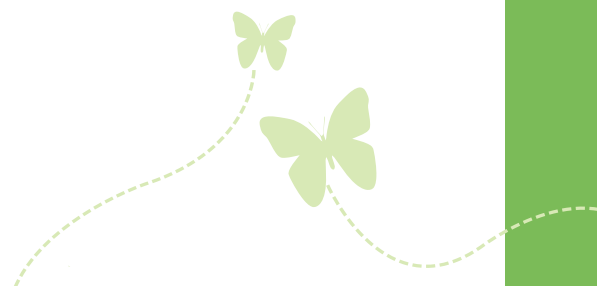
Lesley University student harvesting carrots from Lesley University urban organic garden. Photo by Susan Rauchwerk

Challenges

Cultural beliefs, time, academic constraints, and environmental practices are some of the barriers to ecological literacy in formal and informal learning environments. Capra identifies two main challenges for implementing systems thinking: (1) historic approaches to the sciences have been linear and filled with cause and effect models, and (2) western culture is materialistic in its worldview; that is, we look at products in isolation and are often unaware of the life cycle of our "stuff." Educating for systems thinking challenges educators to teach against the norm of linear instruction.

Cutter-Mackenzie and Smith suggest that an important step toward ecological literacy involves helping educators understand their own levels of ecological literacy. The authors have identified a correlation between a teacher's ability and his/her desire to infuse ecological literacy into teaching. If a teacher is not ecologically literate he/she may be unable to teach for ecological literacy, despite the desire and effort to do so. Mueller believes that in the past, environmental education in schools often reduced teaching of ecological literacy to isolated environmental projects such as recycling programs, school gardens, or monitoring animal populations that have failed to consider the environment as a whole.

In an alternative framework that stimulates robust levels of ecological literacy, Maxwell suggests the following: (1) an environmentally conscious staff, (2) teaching of basic ecological principles from an early age, (3) a physical property that promotes sustainability ("green" buildings and outdoor spaces), (4) an interdisciplinary approach to teaching and learning, (5) opportunities for young people to go outside to learn, and (6) use of biophilic principles in the curriculum.

Another barrier is the time constraint often produced by an education system defined by achievement testing for math and literacy skills. Teachers believe they cannot afford to spend time teaching for ecological literacy when it may be more important to cover curriculum. Environmental educators can do much to help schools address this issue of time by building explicit connections between curriculum standards and ecological literacy.

Lesley University Elementary Science methods class and visiting children exploring fruits, flowers, and seeds. Photo by Susan Rauchwerk.

An additional barrier is the issue of safety with regard to teaching in the natural world. One study that examined ecological literacy under a place-based framework found that youth living in lower income neighborhoods where parents had major fears about safety had lower levels of connectedness and understanding of nature in their community.   Educators are responsible for both honoring and mitigating issues of safety that can impact engagement.

Conclusion

There are compelling arguments for developing an ecologically literate society: people can understand how they are connected to each other, to society, and to the natural world; they can understand the earth's natural systems; and they use an ecological systems approach to identify and design globally relevant ecological solutions. Much of the literature about ecological literacy focuses on concepts of being "green" or issues of sustainability. In our ever-changing, deeply connected, complex communities, we need a more connected and expansive understanding. Defining ecological literacy within the context of place-based education and ecological identities will enable environmental educators determine where ecological literacy is best situated, and how it can be incorporated into formal and nonformal learning environments. To meet our goals for an ecologically literate society we must continue to document the ways in which we understand and define ecological literacy.

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Promoting Excellence in Environmental Education

Tools for Nonformal Educators

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Introduction

What does it mean to be environmentally literate? What makes great environmental education instructional materials so good? What should be kept in mind as new programs are developed at a nature center? Nonformal educators—those who teach at zoos, museums, and nature centers and in a variety of community settings—wrestle with these questions on a daily basis. They reach out to young and old and everyone in between. They teach people who come to their programs for a fun family day and those who come with a very specific education goal in mind. In the morning, a nonformal educator may be teaching kindergarten students and in the afternoon, leading an Elderhostel program. All of this means that nonformal educators are responsible for an enormous range of environmental education efforts.

Trying to help environmental educators meet these challenges and improve their practice is at the core of the National Project for Excellence in Environmental Education. As an initiative of the North American Association for Environmental Education (NAAEE),   the National Project for Excellence in Environmental Education   promotes the development of balanced, scientifically accurate, and comprehensive environmental materials and programs by establishing sets of guidelines. These guidelines are designed to help educators create meaningful, high quality environmental education programs that nurture environmental literacy and empower program participants with the skills, knowledge, and inclinations to make well-informed choices and exercise the rights and responsibilities of members of a community.

Guidelines for Excellence Publications

To date, the National Project for Excellence in Environmental Education has published five sets of guidelines, each of which is relevant to the work of nonformal environmental educators:

1. *Environmental Education Materials:Guidelines for Excellence.* These guidelines describe a set of recommendations for developing and selecting environmental education instructional materials.

2. *Excellence in Environmental Education – Guidelines for Learning (K-12),* and its companion piece, *Excellence in Environmental Education – Guidelines for Learning (K-12) – Executive Summary & Self Assessment Tool.* The *Guidelines for Learning* outline a comprehensive framework for environmental education that delineates the understandings and skills needed for environmental literacy.

3. *Guidelines for the Preparation and Professional Development of Environmental Educators.* Created for those who design and deliver environmental education programs, these guidelines describe a set of competencies needed for those preparing to teach environmental education in a variety of job settings.

4. *Nonformal Environmental Education Programs: Guidelines for Excellence.* This set of guidelines describes recommendations to be used in the development of comprehensive environmental education programs or to trigger improvements in existing ones.

5. *Early Childhood Environmental Education Programs: Guidelines for Excellence* and its companion piece *Early Childhood Environmental Education Rating Scale.* This set of guidelines outlines recommendations to be used in the development of comprehensive early childhood environmental education programs. The rating scale provides a formative evaluation tool for early childhood centers that wish to increase the effectiveness of their environmental education programs.

How Were the Guidelines Developed?

From the very beginning, there was a strong desire to ensure that each set of guidelines reflected a widely shared understanding of environmental education and environmental education practice.
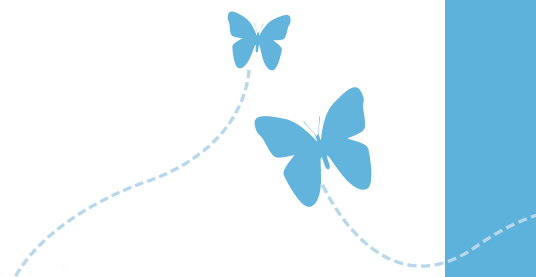
> To date, the National Project for Excellence in Environmental Education has published five sets of guidelines, each of which is relevant to the work of nonformal environmental educators.

> As individuals and organizations volunteered to review the draft documents, distribution lists were created. Revisions to the drafts were made based on an analysis of comments from literally thousands of individuals and organizations.

For each publication, a 10- to 12-person writing team was formed, which was comprised of environmental education professionals from a variety of backgrounds and organizational affiliations. The writing teams took on the challenge of turning ideas about quality, gleaned from environmental education practice and research literature, into a detailed outlines. The outlines and successive drafts of the guidelines were circulated widely through a national process of review and comment. Short articles announcing the availability of each draft and inviting participation in the review process were published in newsletters. Presentations were made at state, regional, and national environmental education, formal education, and environmental meetings to publicize the effort and encourage participation. Any interested individual or organization wishing to participate in the process was encouraged to do so. Efforts to publicize the project and the availability of review drafts were made continuously throughout the development process. As individuals and organizations volunteered to review the draft documents, distribution lists were created. Each time new drafts were developed, they were sent to everyone on the distribution lists. Revisions to the drafts were made based on an analysis of comments from literally thousands of individuals and organizations. As comments were received, they were entered verbatim into a master database. General comments were listed together, and comments relating to specific sections of the draft (e.g., introduction, key characteristic, glossary) were grouped together. This allowed the writing team to consider each comment individually and within the context offered by the draft document. Changes were made in the successive drafts based on an analysis of these comments. Where conflicting views could not be reconciled, revisions were made, in most instances, to reflect the preponderance of opinions expressed. Review comments were used not only to test and revise the basic framework for the individual set of guidelines, but also to develop every detail of the final documents from overall structure to examples, and glossary terms to references. Although comments were received from individuals from over 30 countries, the vast majority of comments were from North America.

Quality Environmental Education Instructional Materials

First published in November 1996 and revised in 2009, *Environmental Education Materials: Guidelines for Excellence* provides a set of recommendations for developing and selecting environmental education instructional materials. These guidelines help developers of activity guides, lesson plans, and other instructional materials produce high-quality products, and offer educators a tool for evaluating the wide array of available environmental education materials.

The guidelines are organized around what reviewers agreed were six key characteristics of high-quality environmental education instructional materials: fairness and accuracy, depth, emphasis on skill building, action orientation, instructional soundness, and usability **(see Box 1)**. For each of these characteristics, specific guidelines are listed that support the implementation of the key characteristics. Finally, each of the guidelines is accompanied by several indicators listed under the heading "What to Look For." These indicators suggest ways of gauging whether the materials being evaluated reflect the characteristics sought by the guidelines. These indicators are simply clusters of attributes that might help determine whether a guideline is embodied in the materials under review. These guidelines are also frequently used in the development of materials, by authors and advisory committees, to make sure the process is on track to result in effective and useful materials.

Taken as a whole, these guidelines offer a way of judging the relative merit of different instructional materials and a set of ideas about what a well-rounded environmental education curriculum might be like. Given that nonformal environmental educators teach in a variety of settings with differing goals and constraints, it is not reasonable, perhaps, to expect that all environmental education materials will follow all of the guidelines. If used as a touchstone, however, the guidelines point out limitations that instructors can compensate for in the way they use instructional materials or make their own improvements.

These guidelines have been used in the curriculum development process by such diverse groups as Earth Force **(Box 2)**, USDA Forest Service, and Johnson Controls. The guidelines are also being used as a formative evaluation tool **(see Box 3)**.
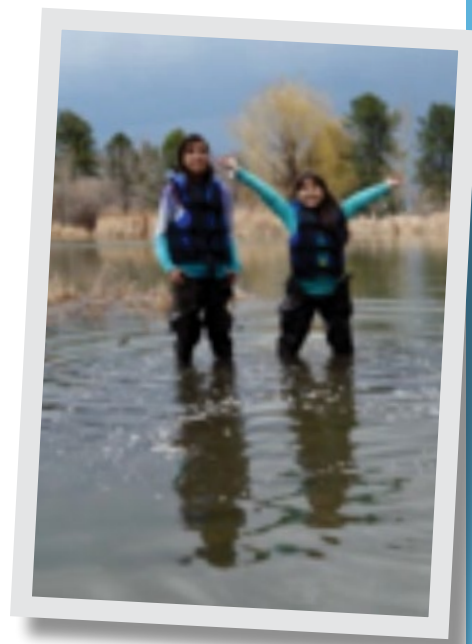
Kunsmiller Creative Arts Academy 6th graders celebrate their student-produced Water Festival at Harvey Park Lake in Denver, CO. Photo by Molly O'Malley

BOX 1
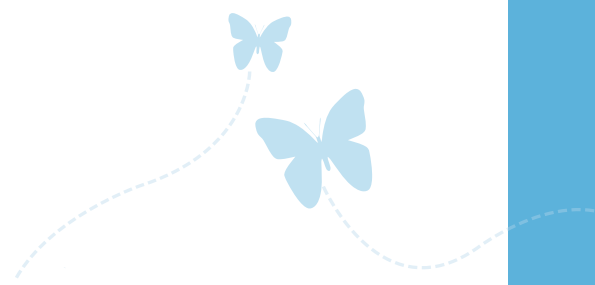
Summary of the *Environmental Education Materials: Guidelines for Excellence*

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Key Characteristic #1. **Fairness and accuracy***:* EE materials should be fair and accurate in describing environmental conditions, problems, and issues, and in reflecting the diversity of perspectives on them.
1.1   Factual accuracy
1.2   Balanced presentation of differing viewpoints and theories
1.3   Openness to inquiry
1.4   Reflection of diversity

Key Characteristic #2. Depth: EE materials should foster an understanding and appreciation of environmental concepts, conditions, and issues, as appropriate for different developmental levels.
2.1   Focus on concepts
2.2   Concepts in context
2.3   Attention to different scales

Key Characteristic #3. Emphasis on skills building: EE materials should build lifelong skills that enable learners to address environmental issues.
3.1   Critical and creative thinking
3.2   Applying skills to issues
3.3   Action skills

Key Characteristic #4. Action orientation: EE materials should promote civic responsibility, encouraging learners to use their knowledge, personal skills, and assessments of environmental issues as a basis for action.
4.1   Sense of personal stake and responsibility
4.2   Self-efficacy

Key Characteristic #5. Instructional orientation: EE materials should rely on instructional techniques that create an effective learning environment.
5.1   Learner-centered instruction
5.2   Different ways of learning
5.3   Connection to learners' everyday lives
5.4   Expanded learning environment
5.5   Interdisciplinary
5.6   Goals and objectives
5.7   Appropriateness for specific learning settings
5.8   Assessment

Key Characteristic #6. Usability: EE materials should be well designed and easy to use.
6.1   Clarity and logic
6.2   Easy to use
6.3   Long lived
6.4   Adaptable
6.5   Accompanied by instruction and support
6.6   Make substantiated claims
6.7   Fit with state or local requirements

BOX 2

Using the *Environmental Education Materials: Guidelines for Excellence* for Instructional Materials Development – KIC-NET (Keep It Clean - Neighborhood Environmental Trios): Triangulating Next Generation Science Standards, Clean Water Act Education & Outreach, and Stewardship of Urban Waters

Donny Roush, CMEE, Sr. Program Manager, Earth Force, Denver, CO

Denver Public Works contracts Earth Force to provide educational services, a Clean Water Act requirement of Denver's municipal separate stormwater sewer system permit (MS4). From an engineering standpoint, an MS4 is straightforward: collect precipitation from places where it can't soak into the ground, keep it clean, and move it downstream. Most U.S. municipalities of 100,000 or more have an MS4, with a nonconnected sanitary sewer system. (Some cities still have combined systems, however.) With little fanfare but lasting effect, the Clean Water Act amendments of 1980 began requiring MS4 permittees to conduct education as part of their management.

Since then, most MS4s have relied on traditional channels for public education and outreach—festival booths, brochures, badges on storm drains, and school assemblies. In Denver's case, Earth Force pioneered an in-school, service-learning component to this work beginning in 2004. The instructional strategy begins with a detailed environmental inventory and leads to a culminating service project. Youth learn by engineering solutions to neighborhood issues.

During the last year, we've evolved MS4 education efforts by combining community engagement and youth leadership alongside—and on equal footing—with more standard science content. With links to national education reform embodied in the Next Generation Science Standards (NGSS), Common Core State Standards, and the *Environmental Education Materials: Guidelines for Excellence,* we're developing and piloting a new MS4-compliant way to teach.

We call this new approach Keep It Clean – Neighborhood Environmental Trios (KIC-NET). A KIC-NET is a place where a school, park, and body of water are within 10 minutes' walk of each other. These three elements make a trio, as do their respective governmental entities: school district, public works agency, and parks and recreation department. Our pilot, funded by Denver Public Works and EPA's Urban Waters Federal Partnership, will have 10 KIC-NETs involving 750 students by 2014.

KIC-NET development falls into two categories: partnership building and toolkit creation. Within a trio, each partner is able to work toward its organizational goal—be it academic achievement, water quality improvement, or well-cared for and loved parks—while contributing to the overarching outcome of empowering youth to actively "Keep It Clean," whether "it" is the neighborhood, park, or closest stream or lake.

KIC-NET educators will be provided with toolkits. Each toolkit will have a tailored guide with water-centric, hyper-local lessons, supplemented by site-specific environmental histories, and a package of equipment and supplies, including items for water quality testing and macro-invertebrate sampling, and a copy of the *Environmental Education Materials: Guidelines for Excellence.* So far, we've selected a standard roster of 25 lessons to include in the toolkit. We're currently adapting, editing, and updating to make them coherent and complete, an integrated instructional unit. The guidelines continually remind us to assure the materials are designed to include fairness and accuracy, depth, emphasis on skills building, action orientation, instructional soundness, and usability. For example, regarding Key Characteristic #6, digital files for each activity are being built within Adobe Creative Suite and include numerous customizable fields for geographic references in the text and grade-level appropriate concepts.

By using the guidelines, we are embedding qualities that will allow us to scale up KIC-NET, from an intriguing pilot to a transferable model. Through KIC-NET, we can deliver next generation science education, engage youth, raise environmental literacy, and measure improvements in water quality.

For more information: Keep It Clean Denver (stormwater pollution prevention program for Denver Public Works): http://www.keepitcleandenver.org | Earth Force: http://www.earthforce.org

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BOX 3

Using the *Environmental Education Materials: Guidelines for Excellence* –
A Formative Evaluation of Natural Inquirer and Investi-gator

Kris M. Irwin, Ph.D., Warnell School of Forestry & Natural Resources, University of Georgia, Athens, GA

Natural Inquirer and *Investi-gator* are two related educational journals designed for middle school and elementary school students, respectively. These free journals (www.naturalin-quirer.org) are produced by the USDA Forest Service and the Cradle of Forestry in America Interpretive Association. All editions of these journals contain articles written from published research conducted by Forest Service scientists investigating natural resources as well as outdoor recreation behavior and management.

Students are guided through each article with a specific learning outcome in mind—to comprehend the scientific process. This is achieved by the layout of each article; students are introduced to the scientists who conducted the original research and then read about natural resource science research projects. The "FACTivity" provides an opportunity for students to experience and demonstrate their abilities to think and function like a scientist. A glossary is provided with each article to expand student's vocabulary, and a "Reflection Section" is part of the intentional learning design to get students to stop and think about what they just read.

The *Environmental Education Materials: Guidelines for Excellence* were used to conduct a formative evaluation of *Natural Inquirer* and *Investi-gator*. Forest Service staff involved in the production of these two journals contacted the Georgia Environmental Education Alliance, which formed a three-person review team to conduct the evaluation. The guidelines were selected as a credible evaluation tool with national prominence.

Prior to starting the review, Forest Service staff met with the review team to introduce the instructional intent and design of a typical article. A 5-point Likert-type scale was created and used to rate the 128 indicators, where 1 = poor, 3 = average, and 5 = excellent. Team members conducted independent reviews of four issues of *Natural Inquirer* and two issues of *Investi-gator*, and then came together to discuss and justify scores, which strengthened reliability. Mean summed scores and standard deviations were calculated. For all items with mean summed score of less than 3, the team provided a written justification for the score, adding value to the usefulness of the review.

Overall, both publications scored above average with four of the six characteristics having mean scores between 3.7 and 3.9. Skills and action characteristics scored below average and recommendations to improve these two areas will be provided in the final report. This evaluation of the online journals shows how the guidelines may be used to assess an education resource, and it demonstrates the value of the guidelines as independent evaluation criteria for nonformal education.

A Framework for Environmental Literacy

Excellence in Environmental Education – Guidelines for Learning (K-12) (first published in 1999 and most recently revised in 2010) offers an instructional framework and vision for environmental education that promotes progress toward sustaining a healthy environment and quality of life. This publication provides guidance for fostering and gauging environmental literacy in kindergarten through twelfth grades.

Developed to provide students, parents, educators, administrators, policymakers, and the public with a set of common voluntary guidelines for environmental literacy, the K–12 learning guidelines provide explicit links between the standards-based school curriculum and environmental education. These guidelines also seek to support state and local environmental education efforts by defining environmental literacy outcomes at specific age levels. By setting expectations for what young people should know and be able to do by the end of fourth, eighth, and twelfth grade levels, they suggest an age-appropriate framework for effective and comprehensive environmental education programs that can be used in both formal and nonformal settings.

These guidelines provide a vision of environmental literacy that acknowledges that an informed, skilled, and active citizenry is critical to preventing and resolving current and future environmental problems. The guidelines offer a framework for environmental education efforts motivated by an examination of the relationship between the environment and quality of life, emphasizing the thinking and action skills central to environmental literacy. They rest on the idea that environmental literacy must be a goal of society and that environmental education must play an integral role throughout educational systems. These guidelines, therefore, aim at providing a series of tools designed to help educators develop effective, locally relevant environmental education programs leading to environmental literacy.

> These guidelines provide a vision of environmental literacy that acknowledges that an informed, skilled, and active citizenry is critical to preventing and resolving current and future environmental problems.

Students share results from water quality tests as part of their presentation "Environmental Citizen." As 6th and 7th graders at Noel Community Arts School they studied Parkfield Lake, a Denver Park, across the street from their school. Photo by D. Rousch

> Although these guidelines help address education reform issues in the formal classroom, the larger purpose was to provide a framework for comprehensive formal and nonformal programs leading to environmental literacy.

The guidelines are organized into four strands, each of which represents a broad aspect of environmental literacy: (1) questioning and analysis skills, (2) knowledge of environmental processes and systems, (3) skills for understanding and addressing environmental issues, and (4) personal and civic responsibility **(see Box 4)**. Individual guidelines and performance measures are suggested for each of three grade levels—fourth, eighth, and twelfth. These performance measures or indicators were designed to assist educators in developing age appropriate learner assessments.

BOX 4

Summary of the *Excellence in Environmental Education: Guidelines for Learning (K-12)*

....

Strand 1. Questioning, Analysis and Interpretation Skills

Strand 2. Knowledge of Environmental Processes and Systems
1.1   The earth as a physical system
1.2   The living environment
1.3   Humans and their societies
1.4   Environment and society

Strand 3. Skills for Understanding and Addressing Environmental Issues
3.1 Skills for analyzing and investigating environmental issues
3.2 Decision-making and citizenship skills

Strand 4. Personal and Civic Responsibility

**El Paso Independent School District students learning about the Air Quality Index
Photo by R. Baquera**

Although these guidelines were developed, in part, to address education reform issues in the formal classroom, the larger purpose was to provide a framework for comprehensive formal and nonformal programs leading to environmental literacy. To this end, curriculum developers such as the El Paso Independent School District **(see Box 5)**, Will Steger Foundation, Project Learning Tree, and Project WILD use the guidelines in their efforts. In addition, the Kentucky Environmental Education Council **(see Box 6)** created tools to help teachers and nonformal educators see how environmental education, through the guidelines framework, addresses the new Common Core State Standards for English Language Arts and the Common Core State Standards for Mathematics.

BOX 5

Using Excellence in *Environmental Education: Guidelines for Learning (K-12)* to Design a Community-Wide Air Quality Curriculum in El Paso

Elaine Hampton, University of Texas at El Paso and The teachers of El Paso Independent School District[20]

The *Excellence in Environmental Education: Guidelines for Learning (K-12)* are elevating educational standards to a higher plateau through the call to personal and civic responsibility. In the El Paso, Texas community, the EPA-funded Border Environmental Education program created a partnership with University of Texas at El Paso and the El Paso Independent School District to write modules about air quality that will become part of the district's official curriculum. A required component of this program is social justice education. Together this partnership is creating a stimulating environment for border citizens to learn about relevant air quality issues along the United States-Mexico border and to take action to address air quality issues.

El Paso hosts commercial movement of an estimated 6 percent of the U.S. national economy at its three international bridges. In addition, it hosts the nation's heaviest southern thoroughfare, Interstate 10, as well as an oil refinery, a large military base, and the shared environment with its sister city in Mexico, Ciudad Juárez, home to about 1.2 million people and about 170 U.S. factories.

Twenty-five El Paso teachers have been working for three years to explore the issues in this environment and to implement lessons that strive to meet the high standards of the guidelines, particularly focusing on Strand #4's personal and civic action. Many of these approaches are on the way to being institutionalized:

- Elementary children taught younger children about the Air Quality Index (AQI) and have set in progress the implementation of AQI charts and daily ozone monitoring district-wide. They involved the physical education program to help avoid outdoor activities on ozone alert days.

- Military maneuvers on the military base left visible black particulate matter on the surfaces of the local school's playground. When the health significance of this was understood, a discussion with the military liaison resulted in changing the maneuvers away from the school.

- Schools that are near busy thoroughfares are examining ways to reduce congestion by implementing a walking school bus program where children, along with at least one adult walk to school together. They also are implementing ways to discourage idling in the pick-up locations and some have created idle-free school zones.

- Middle school students are creating animated public service announcements illustrating tips for how citizens can find ways at home and when driving to reduce energy consumption to help decrease global CO_2 levels. Teachers are planning to post these in the school's announcement systems.

- Asthma and other respiratory problems are common in the dry, desert environment of the Southwest and are exacerbated by air pollution. Children in several grade levels are studying asthma causes and asthma rates through surveys and interviews, as well as how to avoid the air quality problems that threaten health.

- High school students investigated air-quality related apps for their smart phones and are sharing this information and the apps with others.

For an environmental issue such as air quality, the guidelines have helped El Paso teachers think beyond individual lesson plans. By using the guidelines as a framework, teachers are explicitly discussing how they can work together to develop environmental literacy and how personal and civic responsibility can be woven into the curriculum.

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BOX 6

Using the NAAEE *Guidelines for Excellence* to Strengthen Implementation of the Kentucky Environmental Literacy Plan

Elizabeth Schmitz, Executive Director, Kentucky Environmental Education Council, Frankfort, KY

In 2010 the Kentucky Environmental Education Council (KEEC) convened an advisory committee to develop the Kentucky Environmental Literacy Plan (KELP). The committee included the Kentucky Association for Environmental Education (KAEE); the Kentucky University Partnership for Environmental Education (KUPEE); and other members representing a broad spectrum of environmental, science, social studies, arts, math, and English language arts (ELA) education. Teachers, curriculum and assessment specialists, and administrators from K-12 school districts and the Kentucky Department of Education (KDE) also helped write the plan.

Additionally, an Implementation Plan was developed that highlights low- and no-cost strategies that can be accomplished while funding for the implementation of more expensive KELP strategies is sought. One such strategy was the correlation of NAAEE's *Excellence in Environmental Education: Guidelines for Learning (K-12)* to the Kentucky Core Academic Standards (KCAS). Kentucky adopted the National Common Core Standards for English language arts and math in their entirety, so the alignment is beneficial for those individuals in any of the 46 states that have adopted the Common Core. This is especially relevant for nonformal educators who want to showcase how their programs support school curriculum. Additionally, correlations help educators understand more fully what children are learning at various age levels.

These correlations clearly convey that environmental education is a multidisciplinary subject. There has been a concerted effort to select those connections between environmental education and the standards that would be evident to teachers and administrators who are less familiar with the field of environment education and avoid stretching correlations beyond what seemed reasonable.. We have found that many of the ELA and math standards meet the goals of Strand #1, with limited connections in Strands #2 and #3. Next Generation Science Standards (NGSS) correlations are under development and should be published in late 2013. Strong connections to Strand #2 and several NGSS Crosscutting Concepts are indicated. The KELP, Implementation Plan, and correlations are all available on the KEEC Website, at http://www.keec.ky.gov/publications/.

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Preparation and Professional Development of Environmental Educators

Environmental educators work in a variety of settings, at a variety of jobs. They teach in public and private classrooms, and lead activities for children and adults at nonformal educational institutions such as nature centers, zoos, museums, and parks. They teach at universities in environmental studies, geography, natural resource, education, and science programs. They develop curriculum materials and administer national, state, and local programs. Regardless of the setting, *Guidelines for the Preparation and Professional Development of Environmental Educators* (first published in 2000 and revised in 2010) offers recommendations about the basic competencies that educators need in order to use instructional materials and other resources to be successful in their efforts and to help learners achieve environmental literacy.

Students from Whittier Elementary School (K-8) sample macroinvertebrates in Estes Park, CO, near the Continental Divide. Photo by E. Masse

The guidelines provide a mechanism for gauging the quality of pre-service and in-service preparation programs and the abilities of environmental educators working in the field. Instead of offering fixed rules, these guidelines suggest a broad vision—a goal to work toward and a guide for professional development. The guidelines are organized around six themes: environmental literacy, foundations of environmental education, professional responsibilities of the environmental educator, planning and implementing environmental education programs, fostering learning, and assessment and evaluation **(see Box 7)**. Each theme describes the competencies that should be included in environmental educators' pre-service and on-going professional development.

The guidelines are used as texts and reference materials in undergraduate and graduate education courses and as a template for designing environmental education courses. For example, the guidelines were used for the development of on-line master's degree courses in natural resources at the University of Wisconsin-Stevens Point. The guidelines are used by supervisors interested in creating staff development programs and as a self-assessment tool for anyone wishing to plot a personal professional development plan. For example, the Colorado Alliance for Environmental Education (CAEE) uses them to design training curricula for youth **(see Box 8)**.

BOX 7

Summary of the *Guidelines for the Preparation and Professional Development of Environmental Educators*

Theme #1. Environmental Literacy: Educators must be competent in the skills and understandings outlined in *Excellence in Environmental Education-Guidelines for Learning (K-12)*.
1.1   Questioning, analysis, and interpretation skills
1.2   Knowledge of environmental processes and systems
1.3   Skills for understanding and addressing environmental issues
1.4   Personal and civic responsibility

Theme #2. Foundations of environmental education: Educators must have a basic understanding of the goals, theory, practice, and history of the field of environmental education.
2.1   Fundamental characteristics and goals of environmental education
2.2   How environmental education is implemented
2.3   The evolution of the field

Theme #3. Professional responsibilities of the environmental educator: Educators must understand and accept the responsibilities associated with practicing environmental education.
3.1   Exemplary environmental education practice
3.2   Emphasis on education, not advocacy
3.3   Ongoing learning and professional development

Theme #4. Planning and implementing environmental education: Educators must combine the fundamentals of high-quality education with the unique features of environmental education to design and implement effective instruction.
4.1   Knowledge of learners
4.2   Knowledge of instructional methodologies
4.3   Planning for instruction
4.4   Knowledge of environmental education materials and resources
4.5   Technologies that assist learning
4.6   Settings for instruction
4.7   Curriculum planning

Theme #5. Fostering learning: Educators must enable learners to engage in open inquiry and investigation, especially when considering environmental issues that are controversial and require students to seriously reflect on their own and others' perspectives.
5.1   A climate for learning about and exploring the environment
5.2   An inclusive and collaborative learning environment
5.3   Flexible and responsive instruction

Theme #6. Assessment and evaluation: Environmental educators must possess the knowledge, abilities, and commitment to make assessment and evaluation integral to instruction and programs.
6.1   Learners outcomes
6.2   Assessment that is part of instruction
6.3   Improving instruction
6.4   Evaluating programs

BOX 8

Using the Preparation and Professional Development Guidelines to Develop New Leaders in Environmental Education

Katie Navin, Executive Director, Colorado Alliance for Environmental Education, Golden, CO

Unlike many professions, there isn't always a clear pathway to becoming an environmental educator. Many youth and young adults may not even think of it as a possible career. However, many youth are interested in the environment and look for opportunities to get experience volunteering at nature centers, working summer camp jobs, and more. How can we develop those opportunities into career pathways, particularly for underrepresented individuals who may enter the environmental education field?

Beginning in 2009, the Colorado Alliance for Environmental Education (CAEE) (http://www.caee.org/) worked with the Greenway Foundation's South Platte River Environmental Education Program or SPREE (http://www.thegreenwayfoundation.org) to combine youth employment opportunities with environmental education certification. SPREE hired a crew of River Rangers, all high school and college students, to lead summer programs, facilitate boat tours on the Cherry Creek, and serve as counselors alongside the organization's staff at the program's summer day camp. CAEE designed a 20-hour environmental education training curriculum that was built into the River Ranger's regular work schedule and helped the ranger's start a portfolio demonstrating their knowledge and skills in environmental education. The training curriculum was based on the *Guidelines for the Preparation and Professional Development of Environmental Educators*. The work experience is a critical part of the program, ensuring that participants are able to practice and reflect on the skills that they learn through the training. After completing both the training and work experience, youth have the opportunity to submit their portfolio for peer review and environmental education certification. Six youth have achieved the status of Certified Environmental Educator through the experience and many more have received certificates of participation for completing the training and work experience.

The program has grown to include additional groups and continues to be strengthened and modified to meet the unique needs of youth participants, particularly those who are underrepresented in the field of environmental education, and ensure that they have the knowledge and skills to obtain entry-level positions in the field. CAEE members have expressed interest in a similar training curriculum for volunteers who conduct environmental education in other venues.

Use of the guidelines has expanded to include the development of state professional educator certification programs **(see Box 9)**. Modeled after certification programs in professions such as forestry, wetland ecology, and urban planning, these state initiatives, targeted primarily to nonformal educators, aim to improve practice and increase professional credibility.

Developing Comprehensive Environmental Education Programs

Although, much of environmental education takes place in schools, supporting the development of environmental literacy does not stop when individuals leave the school building. Environmental education also takes place in a variety of settings for youth and adults—such as at zoos, museums, and nature centers, at libraries, and in neighborhoods. Community-based groups, service organizations, religious groups **(see Box 10)**, Boys' and Girls' clubs, Elderhostel programs, sports organizations such as the NFL and NASCAR, and ecotourism operations may be involved in the development of environmental education programing.

A variety of institutions offer environmental education programs.

BOX 9

The Utah Project for Excellence in Environmental Education

Andree Walker Bravo, Executive Director Utah Society for Environmental Education, Salt Lake City, UT

The environmental education guidelines from the National Project for Excellence in Environmental Education are integral to the work we do at the Utah Society for Environmental Education (www.usee.org). Though we rely on all of the guidelines quite heavily, the *Guidelines for the Preparation and Professional Development of Environmental Educators* serve as a cornerstone of our Utah Environmental Education Certification Program. Participants work through assignments and readings correlated to each indicator in the guidelines to demonstrate competency and mastery. Upon successful completion, they become certified environmental educators in Utah. The guidelines give us a strong, nationally recognized basis for our program, which provides credibility both in Utah and beyond.

In addition to using the preparation and professional development guidelines, we also rely heavily on the *Environmental Education Materials: Guidelines for Excellence* and *Nonformal Environmental Education Programs: Guidelines for Excellence.* As a non-advocacy organization, we avoid placing judgment on materials, programs, and resources disseminated by other groups or agencies. Occasionally, we have been confronted with materials that seem anti-environment and are asked to speak out or take a stand. The guidelines have been invaluable. We have been able to assess these materials (or programs) using nationally recognized criteria and provide credible feedback. It allows USEE to protect our non-advocacy perspective and also ensure high quality environmental education is taking place in Utah. We look to the guidelines as a structure and "safety net" of sorts for our entire organization.

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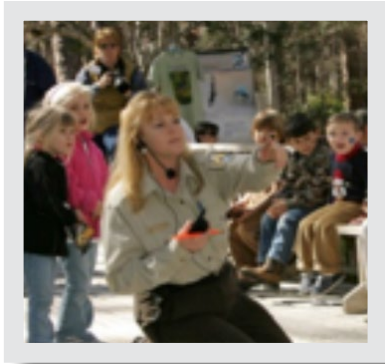
Learning about natural systems. Photo from US Fish and Wildlife Service

Nonformal Environmental Education Programs: Guidelines for Excellence (first published in 2004 and revised in 2010) points out six key characteristics of high quality nonformal environmental education programs, focusing on needs assessment, organizational needs and capacities, program scope and structure, program delivery resources, program quality and appropriateness, and evaluation **(see Box 11)**. Taken together, these guidelines provide a tool that can be used to ensure a firm foundation for new programs or to trigger improvements in existing ones. The term "environmental education program" is used in these guidelines to mean an integrated sequence of planned educational experiences and materials intended to reach a particular set of objectives. Programs, taken together, are the methods by which an organization's overall education goals are accomplished. Programs can be small or large and can range from one-time events to short-term programs or long-term, community capacity-building efforts.

Developing Programs for the Very Young: Early Childhood Environmental Education

Environmental education in early childhood is a holistic concept that encompasses experiences in the natural world that ultimately supports the development of understandings

as well as emotions, dispositions, and skills. *Early Childhood Environmental Education Programs: Guidelines for Excellence* (NAAEE 2010) contains a set of recommendations for developing and administering high-quality environmental education programs for young children from birth to age eight, with a focus on ages three to six. The overall goal of these guidelines is to chart an appropriate and positive process whereby educators can start young children on their journeys toward becoming environmentally responsive youth and adults.

Bringing the environment into the early childhood classroom. Photo by S. W. Ridge

Earth Care Congregations: National Presbyterian Initiative Takes Root in Carolina

William Seaman, Professor Emeritus, University of Florida
Jane Laping, University of North Carolina Charlotte
Katie Holmes, Environmental Ministries, Presbyterian Church (U.S.A.)

The national Earth Care Congregation program of the Presbyterian Church (U.S.A.) began in 2010, and certified 21 churches in 16 states in its first year, including three in North Carolina. Certification reflects an increased environmental literacy, commitment, and ability of the congregation to make informed choices concerning sustainability of natural resources. Emphasis is in four broad areas, namely, worship, education, outreach, and facilities. This purposefully makes for the engagement of most or all church committees in the activity. Each congregation has complete autonomy to undertake efforts that meet its identified needs and priorities and to build on strengths while creating new opportunities.

The Earth Care practices of the three North Carolina congregations were assessed, through review of their initial applications, to identify ways in which they reflect or incorporate fundamental practices of environmental education. These churches are First Presbyterian of Asheville, Davidson College Presbyterian of Davidson, and Montreat Presbyterian of Montreat.

The analysis concluded that the Earth Care process, content, and efforts highly conform to the *Guidelines for Excellence* of the North American Association for Environmental Education. Of the 65 indicators reviewed, 94 percent are embodied by one or more specific Earth Care practices of one or more congregations or the overall denomination. The assessment also indicated some items where future effort can be enhanced and ways that the guidelines assessment form could be adapted for use in planning and implementing Earth Care programs.

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BOX 11

Summary of *Nonformal Environmental Education Programs: Guidelines for Excellence*

Key Characteristic #1. Needs assessment: Nonformal environmental education programs are designed to address identified environmental, educational, and community needs and to produce responsive, responsible benefits that address those identified needs.
1.1   Environmental issue or condition
1.2   Inventory of existing programs and materials
1.3   Audience needs

Key Characteristic #2. Organizational needs and capacities: Nonformal environmental education programs support and complement their parent organization's mission, purpose, and goals.
2.1   Consistent with organizational priorities
2.2   Organization's need for the program identified
2.3   Organization's existing resources inventoried

Key Characteristic #3. Program scope and structure: Nonformal environmental education programs should be designed with well-articulated goals and objectives that state how the program will contribute to the development of environmental literacy.
3.1   Goals and objectives for the program
3.2   Fit with goals and objectives of environmental education
3.3   Program format and delivery
3.4   Partnerships and collaboration

Key Characteristic #4. Program delivery resources: Nonformal environmental education programs require careful planning to ensure that well-trained staff, facilities, and support materials are available to accomplish program goals and objectives.
4.1   Assessment of resources needs
4.2   Quality instructional staff
4.3   Facilities management
4.4   Provision of support materials
4.5   Emergency planning

Key Characteristic #5. Program quality and appropriateness: Nonformal environmental education programs are built on a foundation of quality instructional materials and thorough planning.
5.1   Quality instructional materials and techniques
5.2   Field testing
5.3   Promotion, marketing, and dissemination
5.4   Sustainability

Key Characteristic #6. Evaluation: Nonformal environmental education programs define and measure results in order to improve current programs, ensure accountability, and maximize the effects of future efforts.
6.1   Determination of evaluation strategies
6.2   Effective evaluation techniques and criteria
6.3   Use of evaluation results

The guidelines identify six key characteristics of high-quality early childhood environmental education programs, focusing on program philosophy, purpose, and development; developmentally appropriate practices; play and exploration; curriculum framework for environmental learning; places and space; and educator preparation **(see Box 12)**. The guidelines provide direction yet offer flexibility in shaping content, technique, and other aspects of program delivery.

These guidelines can be used to offer a way of judging the relative merit of different programs, provide standards and benchmarks for new programs, and supply a set of ideas about a well-rounded early childhood environmental education program. As with the *Nonformal Guidelines*, significant opportunity exists for using the guidelines for summative evaluation (where determinations of the impact of practice is sought) as well as for formative evaluation (where keeping track of the program's progress over time is desired). Administrators, educators, or researchers wishing to improve programming may design and conduct evaluation utilizing the guidelines, whether on a formative or summative basis, or both. To assist in this process, the *Early Childhood Environmental Education Rating Scale: A Formative Evaluation Tool to Help Programs Improve Nature Education for Young Children* (ECEERS) was developed. The ECEERS, which has been validated by subject matter experts and assessed for reliability, guides evaluators, step-by-step, through a detailed analysis of their programs using a seven-point Likert-type scale for each of the 32 guidelines. Using the ECEERS as a collaborative formative evaluation tool facilitates the development of strategic plans for specific and relevant program improvement **(see Box 13)**.

> Significant opportunities exist for using the guidelines for formative as well as summative program evaluation.

Early environmental investigations. Photo by S. W. Ridge

Dissemination and Evaluation

In addition to developing the various *Guidelines for Excellence* publications, a major effort has been made to disseminate them to practitioners around North America. *Guidelines for Excellence* workshops are offered to ensure that organizations

BOX 12

Summary of *Early Childhood Environmental Education Programs: Guidelines for Excellence*

Key Characteristic #1. Program Philosophy, Purpose, and Development

1.1   Focus on nature and the environment

1.2   Focus on education of young children

1.3   Culturally appropriate goals, objectives, and practices

1.4   Environmental literacy: board, staff, and providers

1.5   Health and safety

1.6   Ongoing evaluation and assessment

1.7   Partnerships

1.8   Interpersonal and intergenerational relationships

Key Characteristic #2. Developmentally Appropriate Practices

2.1   Based on research and theory

2.2   Authentic experiences

2.3   Child-directed and inquiry-based

2.4   The whole child

Key Characteristic #3. Play and Exploration

3.1   Use of natural world and natural materials

3.2   Play and the role of adults

Key Characteristic #4. Curriculum Framework for Environmental Learning

4.1   Social and emotional growth

4.2   Curiosity and questioning

4.3   Development of environmental understandings

4.4   Skills for understanding the environment

4.5   A personal sense of responsibility and caring

4.6   Physical health and development

Key Characteristic #5. Places and Spaces

5.1   Spaces and places to enhance development

5.2   Natural components

5.3   Comfortable for both children and adults

5.4   Maintenance and usability

5.5   Health, safety, and risk

5.6   Environmental sustainability

Key Characteristic #6. Educator Preparation

6.1   Foundations of early childhood environmental education

6.2   Professional responsibilities of the educator

6.3   Environmental literacy

6.4   Planning and implementing environmental education

6.5   Fostering learning

6.6   Assessment and evaluation

BOX 13

Strengthening Early Childhood Environmental Education through Formative Evaluation

Yash Bhagwanji, Associate Professor, Florida Atlantic University, Boca Raton, FL

At Faith Lutheran Preschool in North Palm Beach, Assistant Director Pilar Tucker initiated an evaluation of the organization's preschool curriculum and program utilizing the *Early Childhood Environmental Education Rating Scale* (ECEERS). She took the lead in approaching select members of the school community. Following their agreement to be involved, an evaluation team was formed that consisted of Tucker, another school administrator, a school board member, a parent, two toddler teachers, and two preschool teachers. Copies of ECEERS and school handbooks, as well as the link to NAAEE's *Early Childhood Environmental Education Programs: Guidelines for Excellence*, were distributed to all team members and a date was set for the first meeting.

The first three key characteristics were discussed in detail and scores were determined based on consensus at the first meeting. A second meeting was organized to discuss the next three key characteristics, with a third meeting organized to complete the profiles and determine action plans. Having the guidelines on-hand for consultation was "very helpful in providing clarifications," according to Mrs. Tucker. The team determined that the program's strengths clustered around Key Characteristic #4: Curriculum Framework for Environmental Learning, and that the areas requiring the most improvement included Key Characteristic #1 (Program Philosophy, Purpose and Development) and Key Characteristic #6 (Educator Preparation).

The team decided to address the philosophy issue first since that constituted "the backbone of the program." At a school meeting, the philosophy was discussed and recommendations for changes were made and approved by the entire teaching staff. The new philosophy statement was then forwarded to the church council and the board of education for scrutiny and approval. The statement was unanimously approved by both bodies. The issue of educating the teachers to become more environmentally literate, on the other hand, was assigned to the school directors. The directors decided on two approaches: (a) utilize existing in-service training opportunities that would also count as hours in the Quality Counts program, a Palm Beach County initiative to improve the quality of children's developmental and educational services; and (b) develop an in-house curriculum that "integrates the natural environment into everyday lessons and how to use nature and the outdoors as a learning tool."

Included in the in-house curriculum was a three-hour workshop training session on "Growing up Wild" delivered by an education staff from the Florida Fish and Wildlife Commission. Each participating teacher and administrator also received the "Growing up Wild" curriculum guide. Mrs. Tucker reported that it has taken two years to change preschool practices (curriculum and teaching) from a focus on the "polar region" and other faraway places to local South Florida natural environments. The teachers are now more aware of being environmental educators, she said, and have planned lessons more suitable to the environments relevant in the area. Altogether, they "have learned more about [the] surrounding area wildlife, and will continue to provide more environmental education opportunities for the children."

By taking the time to review the early childhood guidelines and use the rating scale as a formative evaluation tool, the Faith Lutheran Preschool was able to identify specific areas of needed improvement. The process allowed them to re-visit the school philosophy and focus their environmental education professional development efforts.

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and environmental education professionals are able to use the guidelines effectively to improve environmental education practice and ultimately, environmental quality. Many of these workshops are conducted through the highly successful Guidelines Trainers' Bureau. The Guidelines Trainers' Bureau, established in 2004, is comprised of a cadre of environmental educators who, after participating in intensive professional development, facilitate *Guidelines for Excellence* workshops and make presentations in their own states and regions.   In addition to workshops, the *Guidelines for Excellence* are disseminated through EElinked and through webinars.

As dissemination efforts have developed, evaluations have been conducted. To help focus evaluation efforts, a project logic model was used to develop an evaluation plan.   End-of-workshop evaluations have been positive and indicate that participants enjoy the workshops, find them useful, and plan to use the guidelines in their work. Most workshop participants (91 percent) were able to describe at least one example of how they planned to use the guidelines in the near future. In addition, interviews conducted with a random sample of participants 4 to 6 months after participation in a workshop found that most had used the guidelines to inform their practice.

Final Thoughts

In developing the guidelines, an effort was made to tap into the collective wisdom of thousands of researchers and practitioners from around the world. The guidelines provide guidance—they have always been envisioned as living documents that are meant to be adapted to the myriad of settings where environmental education takes place. They are tools to be used to help us all improve what we do and, ultimately, to foster strong environmental literacy. The *Guidelines for Excellence* not only help practitioners avoid the waste of re-inventing the wheel, but they have served as a mechanism for professionalizing the field of environmental education. They are being used to improve instructional materials and programs and as the backbone of professional certification programs. As research-based documents, vetted by thousands of educators, they shield the field against external criticisms by providing valid, credible evidence of quality environmental education practice.

Chapter 5 Endnotes

1   Information about the North American Association for Environmental Education (NAAEE) can be found at www.naaee.net.

2   General information about the National Project for Excellence for Environmental Education along with downloadable copies of each of publications and resources designed to help individuals use the guidelines is available at http://eelinked.net/n/guidelines.

3   North American Association for Environmental Education (NAAEE), *Environmental Education Materials: Guidelines for Excellence 6*, rev. (Washington, DC: NAAEE, 2009). Available for free download at http://eelinked.naaee.net/n/guidelines/posts/Environmental-Education-Materials-Guidelines-for-Excellence.

4   North American Association for Environmental Education (NAAEE). *Excellence in Environmental Education: Guidelines for Learning 4*, rev. Washington, DC: NAAEE, 2010), available for free download at http://eelinked.naaee.net/n/guidelines/posts/Excellence-in-Environmental-Education-Guidelines-for-Learning-K-12.

5   North American Association for Environmental Education (NAAEE), *Excellence in Environmental Education–Guidelines for Learning (K-12)–Executive Summary and Self-Assessment Tool 4*, rev. (Washington, DC: NAAEE, 2010), available for free download at http://eelinked.naaee.net/n/guidelines/posts/Executive-Summary-and-Self-Assessment-Tool.

6   North American Association for Environmental Education (NAAEE), *Guidelines for the Preparation and Professional Development of Environmental Educators 3* rev. (Washington, DC: NAAEE, 2010), available for free download at http://eelinked.naaee.net/n/guidelines/posts/Guidelines-for-the-Preparation-amp-Professional-Development-of-Environmental-Educators.

7   North American Association for Environmental Education (NAAEE), *Nonformal Environmental Education Programs: Guidelines for Excellence 2*, rev. (Washington, DC: NAAEE, 2009), available for free download at http://eelinked.naaee.net/n/guidelines/posts/Nonformal-Environmental-Education-Programs-Guidelines-for-Excellence.

8   North American Association for Environmental Education (NAAEE), *Early Childhood Environmental Education Programs: Guidelines for Excellence* (Washington, DC: NAAEE, 2010), available for free download at http://eelinked.naaee.net/n/guidelines/posts/Early-Childhood-Environmental-Education-Programs-Guidelines-for-Excellence.

9   Y. Bhagwanji, *Early Childhood Environmental Education Rating Scale* (Washington, DC: NAAEE, 2011), http://eelinked.naaee.net/n/guidelines/posts/Early-Childhood-Environmental-Education-Rating-Scale or http://www.naaee.net/publications.

10 The USDA Forest Service Conservation Education program developed, in partnership with NAAEE, a series of curriculum for use throughout the Job Corps network. These curriculum materials, developed using the guidelines, focus on topics such as climate change, sustainability, and green jobs. They are available for downloadable from the Forest Service website: go to the index at http://www.fs.usda.gov/help/conservationeducation.

11 Johnson Controls, an industry leader in automotive systems and facility environmental controls, created Sustainable Energy Education and Communications (SEEC). According to Johnson Controls, SEEC is a "10 module series of online lessons that show how employees can find financial, environmental and social benefits at work and at home. It shows them how saving energy and water, keeping indoor air clean and other sustainable strategies can save money, reduce emissions, and help them stay healthy…. The concept was developed in cooperation with the National Energy Foundation using the North American Association for Environmental Education (NAAEE)'s Environmental Education Materials: Guidelines for Excellence." More information about SEEC is available at http://www.Johnsoncontrols.com.

12 Earth Force is a national nonprofit youth organization that uses service learning and other educational strategies to empower youth to help solve local environmental problems. Learn more about Earth Force at www. earthforce.org.

13 The Minnesota based Will Steger Foundation "educates, inspires and empowers people to engage in solutions to climate change." Their education curriculum materials were developed using the guidelines as an environmental education framework. More information is available at http://www.willstegerfoundation.org/programs/education.

14 A number of national-level environmental education organizations use the guidelines as a framework in the development of curriculum activity guides and often provide crosswalks between lesson activities and guidelines strands. Two examples are Project Learning Tree (https://www.plt.org/naaee-excellence-in-ee---guidelines-for-learning) and Project WILD (http://projectwild.org/Correlations.htm).

15 The following teachers have been instrumental in writing the El Paso curriculum materials: Veronica Allen, Lorena Arriaga, Rosetta Baquera, Nancy Barraza, Lacey Bustamante, Francisco Casillas, Maribel Chavez, Dolores Contreras, Jeanette Cubillos-Dominguez, Sarah Escandon, Joann Estrada, Rita Farina, Jessica Favela-Casillas, Donna Gomez, Lizette Gutierrez, Ian Hanna, Adriana Herrera, Blanch Herrera, Ernesto Herrera, Sylvia Montoya, Katherine Mullane-Erlick, Teresa Pena, Eric Pichardo, Nate Selken, Tiffany Stringfield, John Thomas, and Theresa Turner.

16 At last count, 11 states have professional environmental education certification programs in place and another 14 states have such programs in development. For more information about certification, visit http://www.naaee.net/programs/certification.

17 This vignette was adapted from an article describing the Earth Care Congregation programs and the use of the guidelines as an assessment tool. For the complete article, please go to http://resources.spaces3.com/24124f1a-7c6d-4c5c-8dff-1c2faab66a54.pdf.

18 To learn more about members of the Guidelines Trainers' Bureau please visit http://eelinked.naaee.net/n/guidelines/topics/Guidelines-Trainers-Bureau.

19 EELinked is a service of North American Association for Environmental Education (NAAEE). EELinked is a participant-driven website that allows individuals and groups to upload content, comment on existing content, and search through postings. Networks can be created to help users access and share information focused on specific topics. For more information or to participate, go to http://eelinked.net.

20 A series of webinars have been offered and many of them have been recorded. For further information on how to access these webinars, go to http://eelinked.naaee.net/n/guidelines/topics/Webinar-Series.

21 A copy of the logic model and evaluation plan are reproduced and discussed in J. Ernst, M. Monroe, and B. Simmons, *Evaluating Your Environmental Education Programs: A Workbook for Practitioners*, (Washington, D.C.: NAAEE, 2009).

Evaluation Techniques that Improve Programs

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> A formative evaluation increases confidence that the program will be appropriate and effective.

Introduction

What is your reaction when an intern presents you with a recently completed draft brochure and suggests it is done? When do you know if the new field trip program is ready to promote to teachers? Or if you are developing a story for children, a handbook for homeowners, or an exhibit for your visitor center, how do you know if it is actually ready for production?

You need to evaluate that nearly ready product and see what others think! This type of evaluation is called *formative evaluation* and is typically done just prior to finalizing materials or launching a program. A formative evaluation increases confidence that the program will be appropriate and effective.

Evaluation in general helps educators communicate the value and worth of programs, answering the question: *How well does this program or material achieve its goal, with this audience, in this setting?* Evaluation is also the term used to broadly encompass any type of interaction with stakeholders and audiences that help one develop and improve educational programs. Most evaluation questions fall into one of these categories:
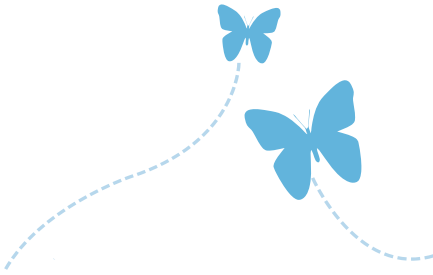
- **Front-end evaluation** (also called *needs assessment*, *audience analysis*, or *planning evaluation*) helps define the *situation, assumptions, resources, needs, and possibilities for a program.* This assessment helps you know and understand what your audience already knows and wants to learn before investing in the program's development.

- **Formative evaluation** (also called *implementation* or *process evaluation*) is done through data collection from a pilot test, a draft, or a trial run. A formative evaluation is useful when there are questions about which is a more effective strategy, and it is critical if you are investing a lot of money in a permanent project. You want to be confident that the program will be as effective as possible.

- **Summative evaluation** reveals what the program changes and answers the did-it-work question. When using this type of evaluation, evaluators typically go back to the program objectives to compare the intended outcomes with the actual audience responses to determine if the program has accomplished what it intended.

Many resources are available to help environmental educators evaluate programs. For instance, the North American Association of Environmental Educators (NAAEE) publishes a workbook   ; the University of Michigan hosts a website, MEERA   (My Environmental Education Evaluation Resource Assistant); the University of Wisconsin-Stevens Point offers an online class; and a variety of professional organizations offer workshops, classes, and consulting services. This chapter provides some tips and examples for formative evaluation—the sort of evaluation you should be able to do without hiring a consultant. A bit of careful thought and a modest amount of time can help any environmental educator reflect on the program process and progress, become aware of potential problems, and consider changes that might improve the program. In this way formative evaluation is a tool for reflection, professional development, and learning.

Some questions you can ask in a formative evaluation

One important purpose of a formative evaluation is to check the accuracy of your material. Ask experts to make sure that the details are factual so that the overall impression the audience will have reflects the core concepts. Environmental education programs cannot typically provide complex explanations and details that experts would understand, and the material is necessarily simplified, which often means leaving something out. What you choose to gloss over could be important, and an expert can tell you if a key idea is missing. In addition, a knowledgeable colleague who didn't work on the project can answer the question "Does this make sense?' It is helpful for someone who knows what you are trying to say to give you some feedback as well.

Perhaps the most important formative evaluation question, however, is "What does the audience think?" For instance, you need to know if the participants see themselves in your examples, if the vocabulary is understandable, if the sign is posted at the right height, if they would visit your site, and if they will become more knowledgeable and concerned about the topic. What are their intentions before and after exposure to your material? Are they willing to return for more? No armchair expert can answer these questions. You must ask the audience.

> Any environmental educator can reflect on the program process and progress, become aware of potential problems, and consider changes that might improve the program.

> Reviewers and sample participants can provide valuable feedback, but the most useful reviews have come from users.

You also may learn a great deal about the program from the people who did not finish the exercise or who dropped out of the course. For example, a program instructor for an online professional development program matched the date of the last contact with the course material with the assignment due dates for those who did not complete the program and gained insights into how to redesign the assignments to maintain interest.

Another key question is "Will this program accomplish our objectives?" You want to make sure you are on track to achieve your goal before you finalize the program. You can go back to your objectives, design survey items to measure knowledge or observation guidelines to assess skill, and determine if the program is optimally designed to be successful. And using the evaluation tools in a formative evaluation is an efficient way to test and improve them for a future summative evaluation.

The final question, when you have all the information as optimal as possible, is to find an editor to help you determine if the material is grammatically correct and appropriately conveyed. Editors can help simplify complicated sentences and focus wandering explanations. Every chapter in this e-book was reviewed by a professional editor, who helped make it the readable and useful document you are using!

By including reviewers and sample participants in the initial review of the materials, you will gain valuable feedback. For example, when developing the EE Toolbox for the National Consortium for Environmental Education and Training , the organizers sent draft copies of guidelines for workshop facilitators and red pens to about 20 people who led EE workshops for teachers. Participants were asked to mark out things they disagreed with, add new concepts that were missed, and make suggestions. The vast majority of their feedback, however, was about spelling and grammatical mistakes and not criticism of the content. The most useful content reviews were from two other individuals who received a small honorarium to use the materials in workshops. This experience suggests that even draft materials should first be professionally edited, if you have the time and funds, and that paying someone to use the materials will likely give you a far richer response than an armchair reviewer, even if that person is a potential user.

What will make a formative evaluation process most effective?

Few program developers have enough time and money for everything they want to do, but a formative evaluation should be included in the process. There are ways to make the process effective and efficient to make it more feasible to accomplish even if the project is a little behind schedule.

If you can assume that input from experts will not dramatically change the product and require a second pilot test with the audience, some aspects of a formative evaluation can happen concurrently. Identify two to four experts and ask if they are willing to review all or a portion of the draft material. Access to more experts could enable you to divide the material into smaller chunks, and get responses sooner. Expert reviewers will be more efficient if you provide them with an explanation of the program goals and objectives as well as how their piece fits into the larger activity. You should also guide them with a few key questions **(Box 1)**. At the same time, you can test out a portion of the program on a real audience and ask colleagues to observe or participants to complete a survey to give you feedback. Here, too, clarity on what you need to know from the audience will help you develop an effective evaluation tool.

> Expert reviewers will be more efficient if you provide them with an explanation of the program goals and objectives.

BOX 1

Sample questions to guide an expert review.

1. Is the content accurate, even though it is simplified?
2. Is material appropriately referenced? Do you have suggestions for better references?
3. Please review the glossary. Are the definitions accurate?
4. Do you have suggestions for resources that would be of interest to teachers or students?
5. Does the activity convey the important concepts appropriately?
6. Do you have any overall suggestions for improvement? back to text

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If you have sufficient time for the development of a program, initial feedback on an early draft can improve the development of additional components. For example, during the development of a four-module training guide , authors completed the first module and received feedback from the advisory board, asking, "Is this what you had in mind?" before the other modules were written. Based on the feedback, the authors revised the first module and passed it to the rest of the writing team as a model.

The scale and scope of a formative evaluation should be commensurate with the resources that are invested in the program. Exhibit designers, for example, should be able to ask visitors to comment on draft designs and experts should review the text before the exhibit goes into production, after which corrections can be costly. A nature center school program need not be reviewed by 50 teachers prior to launch, but feedback from 5 could give staff an idea of whether the concepts will be clearly conveyed.

A pilot test of the evaluation tools is another step that requires time. Before conducting the interview or distributing the survey, it is useful to know if your questions will be interpreted as you intend and answered in a way that will be useful to you. For example, when observing visitors at a zoo exhibit, we realized that few parents were reading the beautiful, informative signs, and so an evaluation of their knowledge of the material conveyed on the signs would not be meaningful. And when interviewing children about their zoo experiences, we realized that questions needed to be about the exhibit they were in and not an exhibit they experienced 10 minutes earlier. The initial test of our tools enabled us to return with better questions and a more helpful process for asking them.

Sometimes the information received during evaluations is conflicting or no clear direction can be discerned from the responses. When you receive conflicting advice on what to change, what is accurate, or what is meaningful, you can

- review the details and different sources of the information and return to those who gave you this information to ask what they were thinking, imagining, or desiring;

- provide a few experts or users with the conflicting evidence and see if they can make sense out of it; and

- make changes based on the initial feedback and then ask a few more people for feedback. Content reviewers, for example, may focus on different aspects of a statement so that apparently conflicting recommended changes may both be accommodated.

Although it is typical to use mean scores on a survey item to decide which component should be revised or improved, such a technique may not always be helpful. If you can review information from each respondent, for example, you may discover that one teacher didn't use the video, which might explain her

low score and comments about being confused. In other words, the activity may not require new activity directions, just more convincing text about the value of using the video.

Two Styles of Formative Evaluation

Formative evaluation can be a standard process of pilot testing a program or can involve additional parameters if it is meeting a specific purpose. Below are two specialized types of formative evaluations that may be helpful for environmental educators embarking on untested waters: (1) a participatory and collaborative process to engage stakeholders (Engaging Stakeholders) and (2) a reflective process to facilitate learning and adaptive development of a program (Development Evaluation).

Engaging Stakeholders

Formative evaluation can be a participatory and collaborative approach for capacity building for staff and stakeholders, which can increase the positive effects of evaluation use. Rather than staff deciding what should be asked of which audiences, a participatory approach employs dialogue in the process of evaluating and refining a program. Through this process evaluators select the stakeholders that are likely to use and be impacted by the evaluation and create an open process for reflection and information exchange. Staff could draft several evaluation questions, ask for feedback from the stakeholders, and discuss together which questions should be used.

The participatory approach has several advantages. It seeks to incorporate the views of all interested parties, including insiders and outsiders. The interviews and discussions with stakeholders promote the understanding of the evaluation results and could potentially increase the utility of evaluation results. The opportunity to shape the questions empowers respondents and makes it more likely they will answer honestly.

Developmental Evaluation

Formative evaluation is most helpful when the program designers have a sense of what the materials should accomplish and then reviewers and users evaluate whether the materials are appropriate. But what if the program or material is so innovative that the outcomes are not yet clear? Perhaps it is more important

> Participatory evaluation engages stakeholders in crafting the evaluation questions and promotes understanding of the evaluation results.
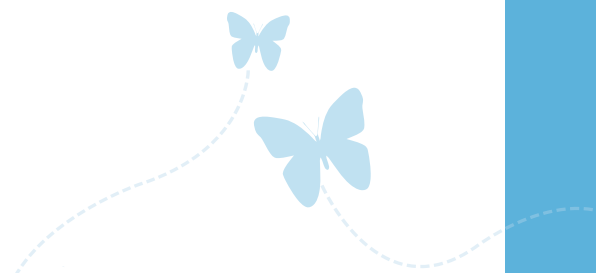
> Formative evaluation allows program designers to use feedback from users and photographs in the final product.

to pay attention to the process, to what happens! In these cases, more diligent and continued feedback may be valuable. Michael Quinn Patton, a leader in program evaluation from Minnesota, calls this Developmental Evaluation. He suggests that innovations in complex environments tend to respond to a number of interacting elements and may continue to change over time. It may be difficult to know what to track or even what question to ask, but it might be possible to pay attention. Developmental Evaluation can help create the model or framework that will allow program developers to continue with a formative evaluation. The McConnell Foundation has applied this type of evaluation and uses it to emphasize learning rather than judgment of the merit of programs that are typically associated with uncertain, long-term and complex efforts.

Two Case Studies

Formative evaluation is powerful and critical for curriculum development; it provides an opportunity for curriculum developers to work with users to pilot test an educational resource before the final product is printed. This type of evaluation has another benefit—you can obtain photographs and testimonials that can be used in the final product! Below are two ways we used formative evaluation to improve our educational materials.

Testing an activity. The development of a lesson about climate change raised the important question about whether student attitudes about this controversial topic would affect their interest in learning. If they do not believe that climate change is an important topic, they may ignore the information or react negatively. If they are interested in the topic or confused about it, they may appreciate the opportunity to learn more. We were able to answer this question with a cost-effective formative evaluation.

To answer this question, we created two versions of the lesson plans and taught each to a different group of high school students attending two different sessions of a summer science camp. The first group was introduced to a version that began by explaining that carbon is everywhere and is an important player in the climate change debate, which rests in large part on an increasing level of carbon dioxide (CO_2) in the atmosphere. The students learned about mitigating this potential issue by exploring how we can remove CO_2 from the atmosphere. The second group was introduced to a version that also began by stating that carbon is everywhere, but excluded mention of climate change. Instead these students were told that carbon is an important part of

Students discuss and illustrate the carbon cycle. Photo by J. Ireland

life on the earth, and they would spend the morning learning more about it. Observers helped the instructors keep the two lesson plans distinct and confirmed that climate was not mentioned to the second group until they finished the posttest.

Before each group began their program, they took a short 10-item quiz on the carbon cycle, and at the conclusion of the activities they answered the same questions again. The posttest also included some questions on climate change (even though one group did not receive instruction about climate change). After the posttest, the second group participated in a discussion about the relationship between carbon and climate change to give both groups the same exposure to content. At the conclusion of each program, students formed small groups to explain in a group interview what they liked and didn't like about the morning's activities.

Comparing the test scores enabled us to learn that only the first group significantly increased their knowledge of carbon, despite both groups experiencing the same basic activities. The group interviews allowed students to explain that most were interested in learning more about climate change. The introduction that the first group received provided a reason to pay attention and learn. One student explained that putting the two concepts together (carbon cycle and climate change) was important, and something biology teachers can't do when the information is offered in two different sections of the textbook and therefore taught at two different times of the year.

This feedback enabled us to select the version of the activities that we printed in the module that increased student knowledge by including climate change as the reason to learn about carbon
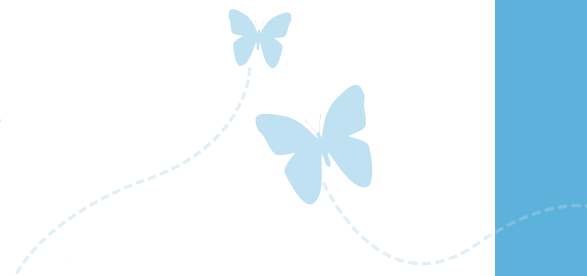
and also explain to teachers (both in the activity background and at teacher workshops) the findings of our pilot test so they can more confidently use the activity as written. Of course our findings are limited by the small group of students in this formative evaluation, but it does help educators realize that climate change can spark interest among some students.

Testing a curriculum. We designed a 14-activity module on climate change and forests for high school teachers   based on the expectations of the funder and input from teachers who responded to an audience assessment. The overall goals of the module are to help students

■ understand how climate change could impact forests in the southeastern U.S.;

■ understand how forests can be managed to address changing climate conditions and to reduce greenhouse gas emissions;

■ enhance decision-making skills to make informed choices as consumers to mitigate climate change;

■ develop systems thinking skills to understand connections between climate change, forests, and people;

■ recognize that individual and community actions can help mitigate and adapt to climate change; and

■ become part of future community conversations about climate change and potential solutions.

After we conducted the expert review for accuracy, we wondered how easy the materials were for teachers to use, if the explanations were clear, how long it took students to complete an assignment, and whether students found the exercises interesting. We designed a formative evaluation and learned from teachers' experience using four activities from the module. The formative evaluation helped us answer the following questions:

■ What are teachers' perceptions of the module? How can the activities be improved?

■ To what degree did students meet the activity objectives?

■ To what extent did these activities change students' knowledge, skills, and attitudes?

Teachers were asked to prioritize the activities they could teach (based on a description of the themes) and select whether they would teach two or four activities (based on the time they had

Educators working together to plan their climate unit. Photo by Martha Monroe

available). We selected participants to maximize diversity in the classrooms and cover the region and then assigned packages of four activities so that every activity was at least used by five classrooms. Although the module was designed for high school teachers, we also invited middle school teachers to use the activities and asked them to tell us how they adapted the activities for their students.

We pilot tested the online teacher survey and student pre- and posttest questions with teachers and high school students to improve the wording and understandability. The teacher questionnaires gave us valuable recommendations, insights, and quotes that the team incorporated into the revised material. Based on this evaluation, we made the following changes:

■ added a new introductory activity to the module to better link climate and forests;

■ incorporated teachers' comments into the final product as side notes;

■ revised some of the background information and instructional procedure for clarity;

■ added more discussion questions and more modification ideas for middle school or basic science class from pilot testers; and

■ added more additional resources and enrichments ideas for different subjects and grade level.

The second type of feedback came from the student pre- and posttests. By comparing mean scores we learned there was a significant increase in student knowledge of forest management, carbon cycle, and the role of forests in mitigating climate change. We also saw an increase in student scores on hopefulness about solving climate problems, which suggested that these activities conveyed climate change concepts without a doom and gloom form of helplessness.

In addition, the results from the formative evaluation gave us ideas about how to improve questions on teacher survey and student questionnaires for the summative evaluation. Teacher responses helped us realize whether the questions asked what we intended. By looking at the student pre-and posttest score, we were able to identify where student misconceptions might affect their learning.

A formative evaluation enabled us to improve the activities with feedback from teachers.
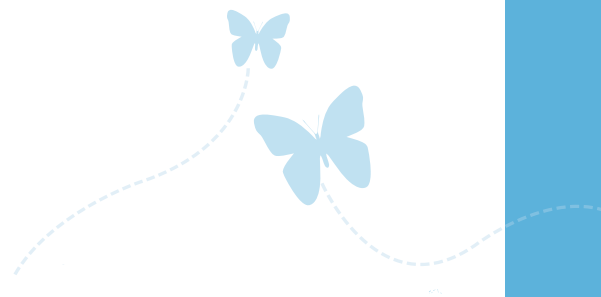
Formative evaluation can help meet key characteristics of excellent nonformal programs — program quality and appropriateness.

Educators experience a climate activity in a training workshop for the module Southeastern Forests and Climate Change. Photo by M. Monroe

Summary

The NAAEE Guidelines for Excellence in Environmental Education suggest a variety of strategies for creating useful and effective programs. In the guidelines for nonformal program development   the last two key characteristics are program quality and appropriateness, and evaluation. Formative evaluation can help meet these characteristics of excellence. Materials will be better if they have been reviewed and field tested; programs will be better if they are meeting objectives; and audiences will be more likely to participate if programs have previously achieved their goals. Formative evaluation is the first step toward high quality program development, and one that environmental educators cannot afford to miss.

Chapter 6 Endnotes

1   J. A.Ernst, M. C. Monroe, and B. Simmons, *Evaluating your Environmental Education Programs: A Workbook for Practitioners* (Washington, DC: North American Association for Environmental Education, 2009).

2   See note 1.

3   MEERA is available through the University of Michigan at http://meera.snre.umich.edu.

4   D. A. Schön, *The Reflective Practitioner: How Professionals Think in Actions* (London: Temple Smith1983). Reflection is a critical element of the experiential learning cycle and emphasized by educators as a necessary complement to hands-on education. Donald Schön continued this idea by suggested that one characteristic of professional practitioners is the ability to learn from their actions.

5   L. C. McConnell and M. C. Monroe. Making Online Professional Development Work for Florida Project Learning Tree, *Applied Environmental Education and Communication* 11, no. 3-4 (2012): 148-156.

6   Example is from the development of the Environmental Education Toolbox, National Consortium for Environmental Education and Training, Ann Arbor, MI: University of Michigan, 1994.

7   Example is from the development of *Changing Roles: Wildland-Urban Interface Professional Development Program* (Gainesville, FL: University of Florida, 2004).

8   A. L. Oxarart, M .C. Monroe, and R. R. Plate. From Play Areas to Natural Areas: The Role of Zoos in Getting Families Outdoors. *Visitor Studies* 16, no.1 (2013): 82-94.

9   M. C. Alkin, R. Daillak, and B. White. *Using Evaluation: Does Evaluation Make a Difference?* (Thousand Oaks, CA: Sage1979).

10   M. Q. Patton (2009). *Developmental Evaluation as Alternative To Formative Assessment.* [Web Video]. Retrieved from http://www.youtube.com/watch?feature=player_embedded&v=Wg3IL-XjmuM

11   Several guidebooks are available on the web: E. Dozois, M.Langlois, and N. Blanchet-Cohen, *A practitioner's guide to developmental evaluation* (The J. W. McConnell Family Foundation and the International Institute for Child Rights and Development, 2010). Retrieved from website: http://mcconnellfoundation.ca/assets/Media%20Library/Publications/DE%20201%20EN.pdf

12   Examples from the development of *Southeastern Forests and Climate Change: A Project Learning Tree Secondary Environmental Education Module* (Gainesville, FL: University of Florida, 2014).

13   Monroe, Hall, Li, in review (AEEC).

14   M. C. Monroe and A. Oxarart, *Southeastern Forests and Climate Change: A Project Learning Tree Secondary Environmental Education Module* (Gainesville FL: University of Florida, 2014) Available at http://sfrc.ufl.edu/extension/ee/climate.

15   Nonformal Environmental Education Programs: Guidelines for Excellence. Washington DC: NAAEE, available from http://www.naaee.org.

A Cognitive Approach to Environmental Education

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Overview

Despite best efforts, environmental education programs sometimes fail to fully achieve their goals. This chapter describes how environmental educators can improve their programs by using the Reasonable Person Model as they develop and evaluate programs. We share three examples of how this framework has been applied to environmental education programs and provide a checklist that educators can use for their programs. This model can make any program more effective and may provide insights that educators can use to improve brochures, exhibits, advertisements, presentations, and professional development.

Introduction

To advance the goals of environmental education, as defined in the Tbilisi Declaration, programs need to convey information in a way that builds understanding and motivates participants to take action.   For example, environmental educators may want program participants to become involved in the resolution of a local issue, to change their transportation method for commuting to work, or to integrate a new environmentally focused curriculum into the classroom. In these and other examples, environmental educators often consider what their audiences already know and care about regarding the topic and strive to provide meaningful and relevant information that encourages participants to take some type of action. However, programs often do not achieve their full expected outcomes. Despite their best efforts, educators may not recognize how people see the situation or may overwhelm learners with too much advice. Motivating action, of course, is particularly challenging, as behaviors are determined by several interrelating factors. Behavior change theorists from diverse fields of study (e.g., health, economics, law, psychology) have explored many determinants of behavior, including the role of information, motivations, values, perceived control, and social norms.   From a psychological perspective, there are several factors that may help learners better understand an issue and encourage them to take meaningful action; in addition, there are variations in environmental conditions that affect those factors. The Reasonable Person Model (RPM) incorporates these factors into a framework that can be applied to develop a supportive environment and improve environmental education program development and
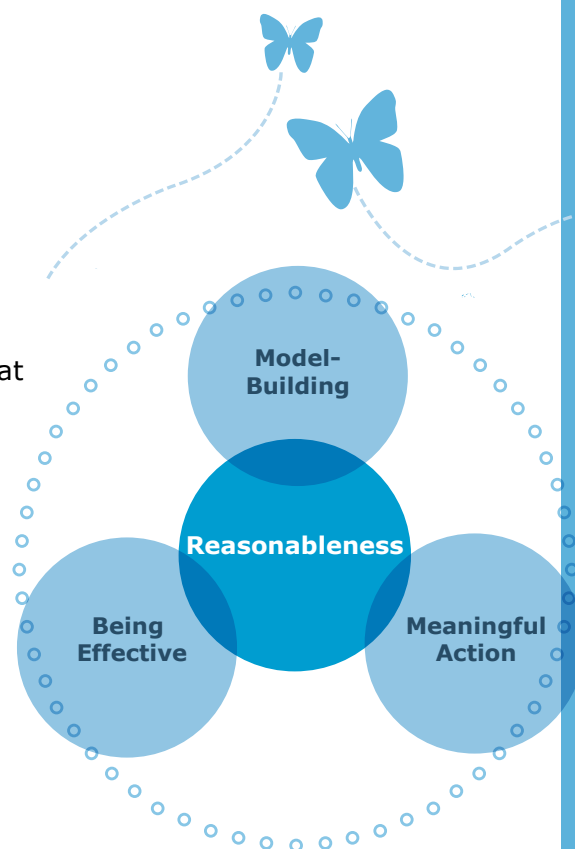
evaluation processes. The Reasonable Person Model has been used to explain the successes and challenges of diverse programs, projects, and situations—ranging from designing regional leadership programs to service learning exercises.

The Reasonable Person Model

The Reasonable Person Model is a framework that suggests that within any given situation or context, there are common characteristics that enable people to act in a "reasonable" manner. Reasonableness is when people act sensibly, responsibly, appropriately, or cooperatively, for example. Drawing on basic human information needs that have evolved over time to help people function within their environment, RPM contains three interconnected categories (1) building mental models, (2) being effective, and (3) meaningful action **(Figure 1)**.

FIGURE 1. The Reasonable Person Model contains three interconnected categories.

Building Mental Models

People have a need to understand and make sense of the world around them. To do this, we organize related information, or create mental models, in our mind based on our existing knowledge and experiences.   Mental models help us understand a concept, find our way in new places, respond appropriately in each situation, or connect tastes or smells with certain memories.   Helping learners build and modify their mental model of a particular concept is part and parcel of an educator's work. Concept maps are often used to help learners organize their thoughts before or after learning and are also used to help others "see" an individual's mental model of a particular concept. This type of activity may help educators decide what type of information to present. When information is not relevant or meaningful, or when the information is overwhelming or too confusing, people tend to ignore it. Alternatively, when information connects with existing mental models and is presented in a clear and understandable manner, it is more readily accepted. While presenting information is often necessary to make sure everyone is on the same page, creating opportunities for participants to explore and investigate the information is equally important. Such opportunities may include activities that help learners experience the information first hand, experiment and try alternatives, and evaluate different possibilities. Some educators recognize this is important for youth and are dedicated to providing

Individuals can build competence when given appropriate amounts of detail and realistic ideas for how individuals can make a difference.

hands-on experiential activities. Experience can help adults learn too. In particular, having a shared understanding of a concept or an issue allows educators and learners to communicate effectively with one another. This means that listening is as important for the educator as it is for the learner. The ways in which people build mental models are at the core of many familiar learning theories, including experiential learning, activity theory, inquiry learning, and constructivism.

Being Effective

In addition to a desire to know and understand, people like to feel competent and able to contribute to the resolution of a problem. Without the knowledge or skills necessary to solve a particular problem, people tend to become overwhelmed, stressed, or fatigued and thus are no longer effective. Similar results may occur when people are presented with too many details, too much information, or ideas that conflict with existing knowledge. This can lead to believing that they cannot do anything and to feelings of helplessness.   Given the complexity and broad nature of many environmental issues, it is easy to imagine how an individual might feel overwhelmed with details and find it challenging to understand how one person can help. Alternatively, individuals can build competence when given appropriate amounts of detail and realistic ideas for how individuals can make a difference. Thus, helping individuals to feel effective requires that educators provide the right information and create learning platforms that enable participants to manage and take ownership of the new information. Adequate time for rest and reflection can help participants be ready to incorporate new knowledge into existing mental models. Finally, learning how to perform necessary skills and practicing these skills in a safe environment can help build confidence and increase comfort—leading to higher levels of self-efficacy that one can achieve the new behavior at a later date.

Meaningful Action

Part of being reasonable is knowing how to help and believing that your actions will make a difference. This relates to the third RPM category—meaningful action. This area of the framework stems from people's need to make a difference, to be respected and have their voice heard, and to be part of a larger effort to create positive change. When determining the actions or solutions that a specific program will suggest, it is important to consider if these actions are realistic and accessible for the intended audience. Subdividing large

tasks into smaller, more manageable steps can make it easier for people to have early successes.   Asking participants for input and using that input to design program activities can help individuals feel needed and respected. It is also important to help learners understand how the actions, even those that seem insignificant, play a role in the larger picture and to offer feedback on outcomes so they know their actions made a difference. Additionally, educators can provide examples and success stories to help participants imagine how they can usefully participate and make a difference. Giving people a chance to be engaged and to contribute toward issue resolution often creates feelings of hopefulness, which can counteract the helpless feelings of being overwhelmed. In this way, being able to take meaningful action helps one be more effective.

Applying the Reasonable Person Model to Program Development

We suggest the aspects of RPM can be incorporated into each step of program development and that doing so will lead to improvements in program outcomes. Programs are typically developed through a series of steps that include both program development and evaluation **(Figure 2)**. First, program developers determine the need for the program, usually through conducting a needs assessment. From this information, appropriate and relevant program objectives are developed, which then guide the creation of activities to meet those objectives. The program is tested and improved through a formative evaluation or pilot test, and after feedback has been incorporated, the program is implemented and evaluated with a summative evaluation to determine success. Incorporating evaluation at each stage of the process helps ensure that the program is designed to meet a specific need and provides opportunities for end users to help decide what should be changed or improved before the program is finalized.

Aspects from each RPM category can be considered throughout the program development process and measured at each evaluation stage to determine if the program is likely to meet the informational needs of participants. Environmental
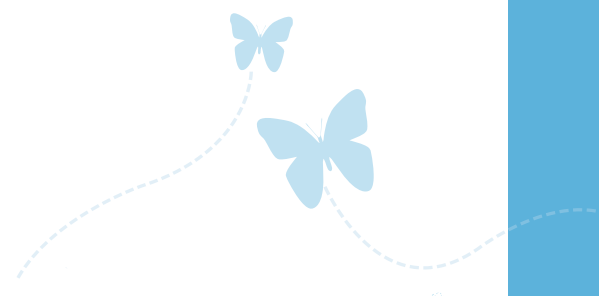
Subdividing large tasks into smaller, more manageable steps can make it easier for people to have early successes.

FIGURE 2. Program development process.
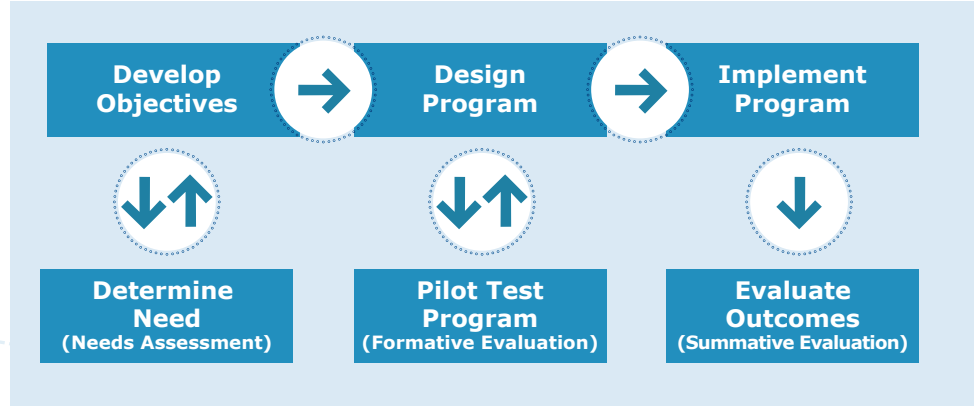
The checklist can help environmental educators consider their program's strengths and weaknesses in terms of RPM.

educators can use the list of questions in Box 1 to assess if their program is helping participants to

- develop a clear and shared understanding of the issue or concept (building models),

- increase competence and confidence so participants are able to help (being effective), and

- be engaged in making a difference or working toward solutions (meaningful action).

This RPM checklist **(see Box 1)** was initially developed in 2008 as part of an evaluation for a children's zoo exhibit. The checklist was modified and used for different purposes for the next few years and was significantly modified in fall 2011 at a symposium on RPM that was offered at the North American Association for Environmental Education 40th Annual Conference.

The list is not meant to be exhaustive; rather, it can help environmental educators consider their program's strengths and weaknesses in terms of RPM. The questions can be modified to help educators plan and critique exhibits, videos, meetings, presentations, activities, programs, and any number of educational platforms that seek to meet information needs to enable people to act reasonably. For example, educators can use these items when developing a needs assessment to explore what learners already know and what they are curious about learning, as well as what they might find easy to accomplish and what they might find challenging. Or when a program or resource is ready to be tested, these questions may help educators design formative and summative evaluation items to determine if the materials are indeed on target.

Checklist for applying Reasonable Person Model to environmental education programs.

MODEL BUILDING

Participant Background and Interest
- ❏ What knowledge do participants bring to the program? What assumptions and misconceptions do they bring?
- ❏ Does the program enable participants to teach each other what they already know?
- ❏ What motivates the audience to be interested in this program? How can I build on those interests?
- ❏ Does the program enable people to begin with what they already know, activating relevant mental models?

Program Design
- ❏ Does the program enable people to experience the main concept?
- ❏ Does the program use multiple strategies to engage learners?
- ❏ Does the program acknowledge different interpretations of the vocabulary and definitions being used?
- ❏ Can impartial facilitators be used to help create a common understanding in potentially contentious situations?
- ❏ Does the program expose learners to new but meaningful experiences, experts, information, and opportunities to share?
- ❏ Does the program provide sufficient time for people to build their understanding of the concept and test it, apply it, present it, critique it, fix it, and own it?

BEING EFFECTIVE

- ❏ Is the chosen communication method effective for the audience?
- ❏ Has a trusting and safe environment been created so that participant engagement and learning can occur? Are participants free to share their ideas, even those that conflict with others' ideas?
- ❏ Has enough time for mental rest and rejuvenation been included in the agenda?
- ❏ Does the information being presented contain enough details to enable understanding, but not so many details as too overwhelm participants?
- ❏ What are the potential barriers to understanding? Can they be reduced or removed?
- ❏ Are participants able to help create meaningful and achievable goals for their participation in the program? What are the environmental, physical, emotional, and temporal constraints that might prevent an audience from achieving its goals?
- ❏ Have there been ample opportunities for participants to build necessary skills? Was sufficient time provided to allow participants to practice the skills? Did participants get feedback from their practice session?

MEANINGFUL ACTION

- ❏ What barriers exist to action? What barriers are perceived to action? Can the process be easier or more accessible?
- ❏ Are the suggested actions doable and realistic for the audience?
- ❏ Has the audience received information about how actions will make a difference?
- ❏ Does the program share successful examples of how others are taking action?
- ❏ Is everyone on the same page for the outcome? Is there stakeholder buy-in?
- ❏ Can we reach consensus, or develop a way forward?
- ❏ Have all the questions and loose ends been addressed?

Reasonable Person Model in Action

We have used RPM in a variety of situations to develop or evaluate programs, including developing a children's zoo exhibit, assessing working groups designed to protect local water resources, and creating professional development for teachers on climate change. Through these short examples, we will explore the three components of RPM and how they affected program successes or shortcomings.

Children's Zoo Exhibit

Located along the eastern coast of Florida, the Indian River Lagoon is an environmentally and economically important estuary. The Brevard Zoo has focused several education programs on the lagoon, including the 2009 redesign of their children's exhibit, Paws On. The Paws On exhibit includes multiple free-play areas that are designed to look like nearby estuarine and upland habitats. In the exhibit, interpretive signs are directed at adults to help them learn about, care for, visit, and protect the lagoon. An early version of the RPM checklist helped exhibit developers assess and improve these interpretive messages and activities to better achieve the goals of providing information and motivating action. Exhibit designers commented that the checklist was very useful for them to reflect on goals and to check their work.

Families enjoy the Paws On lagoon at Brevard Zoo. Photo by V. Lamb

The exhibit helps visitors build mental models about the Indian River Lagoon by providing simplified information on exhibit signs that were designed to engage readers. About 80 percent of the zoo visitors live within 75 miles of the lagoon, so the information was locally relevant. By reading the signs, visitors have the opportunity to learn several reasons for caring about the lagoon (e.g., water quality, recreation, economic value, protection of local ecology); learn about different conservation behaviors they can take to protect the lagoon; and discover places to visit and explore the lagoon.

While in theory visitors can build mental models by receiving information through signage, this is only an effective method when visitors read and understand the signs. The exhibit evaluation found that 43 percent (n = 387) read 5 or more of the 80 signs at the exhibit.   The fact that most people did not read many signs may be related to the exhibit's focus on exploratory play and water play areas, which require parents' attention to monitor children. A parallel strategy that was very important in this exploratory play setting was staff and volunteer interaction with visitors. While time intensive, two-way communication allowed staff or volunteers to relate to the visitor's existing knowledge, provide tailored information, and answer questions.

Part of the exhibit's goal is to build parents' interest and confidence in nature exploration and encourage them to take children to nearby local areas. This is achieved by providing a safe and comfortable play environment that *simulates* nearby nature and by providing specific information about locations that are appropriate for families. A majority, 70 percent, of the adult visitors who participated in the evaluation felt that the exhibit increased their interest in visiting the lagoon some or very much.   RPM suggests practicing a behavior helps people gain a sense of effectiveness, so the exhibit provided opportunities for visitors to practice suggested conservation behaviors. For example, children were encouraged to pick up toys, chairs, and other items in the beach play area at the exhibit, as this is an important action on the real beach to remove physical obstacles for sea turtle hatchlings during nesting season.

Most of the suggested conservation actions at the exhibit require visitors to do something at home or at the lagoon. Of the respondents who participated in a six-month follow-up survey, 44 percent reported that information provided at Paws On encouraged them to participate in conservation activities some or very much.   When considering

> Two-way communication allowed staff or volunteers to relate to the visitor's existing knowledge, provide tailored information, and answer questions.
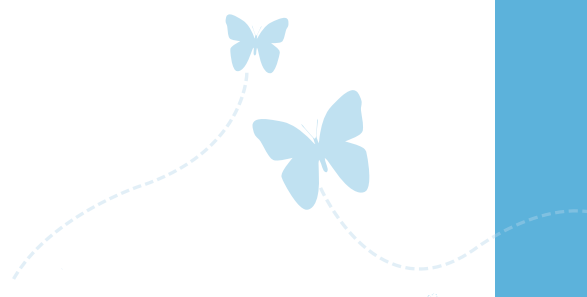
> The springs working groups are perceived as effectively creating change because they have helped develop a shared base of information over time, serve as a "hub" where interested people learn about opportunities to be involved, share the successes and impacts of actions that others are taking, and create a community of like-minded people who intend to protect the springs.

how to engage participants in meaningful action, the selection of suggested behaviors is important. While the actions suggested in the zoo's interpretive materials are doable and realistic, there are several factors (e.g., increases in cost or time, difficulty changing patterns of behavior) that may prevent visitors from taking action once they leave the zoo. For this reason, RPM suggests that it is important to offer opportunities that facilitate participation in making a difference. For example, the zoo regularly offers programs where volunteers can help create oyster restoration mats for the nearby lagoon. Or as part of a mangrove restoration project, visitors can take home young mangrove plants to "foster" until the seedlings are ready to be planted. Opportunities like this can help make the process of participation more accessible by providing concrete actions that can be easily achieved in cooperation with the zoo staff.

Springs Working Groups

In northern Florida, several freshwater springs dot the landscape and provide copious recreational, ecological, and economic benefits. Six of these springs are the focus of working groups made up of interested stakeholders, environmental advocates, and scientists who meet regularly to share information. Some of these working groups developed as grassroots efforts, while others were implemented through funding by the state's environmental protection department. We used the RPM framework to explore how these springs working groups created opportunities for shared understanding and meaningful action. After doing qualitative interviews with members from each group, an online survey was distributed to three working groups, with the survey questions relating to the three RPM components.

Survey results showed that participating in a working group helped participants know about and understand the springs system. Most respondents learned new scientific information and improved their understanding of actions necessary to restore the health of the springs ecosystem through attending the meetings. This is not a surprising result, since the meetings usually lasted one day and contained several presentations on springs-related topics. Participants were typically very interested in the information, since many lived nearby, worked in these ecosystems, or deeply cared for these areas. Participants also reported that the working groups encouraged them to learn more on their own about the springs ecosystem.

Despite the technical nature of many scientific presentations at the meetings, less than 20 percent of respondents reported feeling overwhelmed by the information presented. While we might see very different results with other audiences regarding the level of detail presented, many working group members have developed their understanding of the springs system over time through attending working group meetings or by working in hydrology, environmental science, or a related field. Perhaps most importantly, we learned from survey respondents that the working groups have helped participants feel effective and able to take action. Respondents reported having a broader understanding of how groups can create positive change and being able to work with others to help protect the springs.

Respondents also said they felt as if they were making a difference—that the working groups identified ways to improve the springs' health and could play a role in protecting the springs. This is interesting given that the workings groups are primarily venues for sharing information, not taking action. In fact, many of our interviewees were very quick to explain that the working groups were not "action" or "advocacy" groups. We suggest that the working groups are perceived as effectively creating change because they have helped develop a shared base of information over time (mental models), serve as a "hub" where interested people learn about opportunities to be involved (being effective), share the successes and impacts of actions that others are taking (meaningful action), and create a community of like-minded people who intend to protect the springs (meaningful action).

Working group members have developed their understanding of the springs system overtime through attending working group meetings. Photo by O. Wells

Climate Change Symposium

For secondary science teachers to incorporate the topic of climate change into their classroom, they have to understand and feel comfortable with current scientific information as well as know how to engage their students in learning about climate change. To increase comfort and competence in teaching about projected climate change impacts to Florida's ecosystems, we held a one-day symposium for middle and high school educators. We used the RPM checklist to design and evaluate this professional development event. The symposium was evaluated using a pre and post survey, which more than three-quarters of the participants completed (n = 43).

Symposium participants practiced using the tools that they will need when conducting the activity with their students. Photo by J. Ireland.

To determine interest and ensure inclusion of relevant and meaningful topics, we distributed an online survey to potential participants before the program was developed. Results from this survey helped to design the agenda, which included selecting research presentations and discussions related to marine, coastal, forest, and agricultural systems. We provided guidelines for presenters to help them create effective and engaging presentations. We also included extra time in the agenda for discussion and reflection, and access to outdoor areas to enjoy break periods and lunch so that participants could rejuvenate. These program development decisions were motivated by the building mental models and being effective aspects of RPM, and indeed, respondents reported that the symposium provided a respectful learning atmosphere, used credible experts for presentations, and presented information in a way that participants could understand.

Even though professional development for secondary science teachers often emphasizes new scientific research findings, we included hands-on activities in several of the presentations so participants could experience the information first-hand before using the activities later in their classrooms with students. Experiencing the activity allows teachers to gain a clear understanding of the steps involved, learn how to use required equipment or materials, and imagine how they can incorporate the activities into their curricula. Discussions among teachers helped them think about ways to adapt the activities for their students. Teachers reported that the symposium increased their confidence and helped prepare them to teach about climate change—both important factors related to the being effective aspect of RPM.

For professional development programs such as this, meaningful action is related to the program participant using the materials and skills obtained at the event. After the symposium, a majority of the respondents, 88 percent, said that they plan to expand their coverage of climate change in the upcoming year. Over three-quarters of the respondents reported that the symposium influenced their plans to expand climate change coverage very much or a fair amount. This positive response may be a result of tailoring our topics to meet the preferences of participants and providing access to classroom-ready activities and presentations. Finally, teachers reported that the symposium helped them feel

like they belonged to a community of educators interested in teaching about climate change. This is especially important for complex and controversial issues like climate change, where being part of a larger solution can help people feel more hopeful and useful. This is an important benefit of professional development programs that could be extended after the workshop through continued communication via email or telephone, discussion groups, or learning communities. For example, we created a webpage with all symposium materials and presentations. In addition, we sent follow-up emails to remind participants of the resources available to them and to provide a set of responses to all the questions that were asked by participants in the symposium survey.

Summary

Environmental education programs vary greatly by topic, audience, purpose, and format. However, there are common strategies that can be applied across programs to help educators better achieve their goals. We suggest that these strategies reflect the three components of the Reasonable Person Model framework, which can be used to help educators design programs to meet their participants' information needs. Learners should be able to *build mental models*, feel competent and confident to *be effective*, and participate in opportunities to *take meaningful action*. Common elements that we believe led to program successes for the examples described in this chapter included providing locally relevant and meaningful information, giving people ways to become comfortable and confident with their new information and skills, and creating environments where people can feel a sense of community and hopefulness for taking action on a particular issue. By using the RPM checklist, you can determine whether your program is sufficient or if it may be lacking in terms of the three components. For example, you might find that you are successfully helping participants build mental models, but you are not offering enough time for skill building to allow participants to achieve the program outcomes. The checklist can be used to create needs assessments, as a set of guidelines for agenda items, or to provide hindsight for program effectiveness. Environmental educators design and facilitate supportive environments to achieve programmatic goals every day. Using the RPM framework may help provide an added measure of success to what are likely quite good programs. It helps ground our intuitions with theoretical and practical sense, and could make our efforts more . . . reasonable!

Learners should be able to build mental models, feel competent and confident to be effective, and participate in opportunities to take meaningful action.
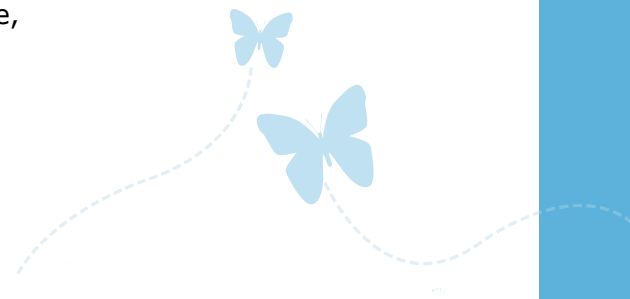
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Environmental Action and Positive Youth Development

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Overview

Environmental education (EE) can provide opportunities for positive youth development, which refers to an asset-based and integrated approach to promoting young people's well-being. This chapter focuses on youth environmental action, a participatory form of EE in which learners analyze the causes of environmental problems and take action with others to generate and implement solutions. Specifically, the chapter describes how the practices of educators facilitating youth environmental action also contribute to positive outcomes for young people's physical, intellectual, psychological, and social development.

Introduction

The state of New York is home to various programs that support youth environmental action. In Buffalo, for instance, young people guided by staff of the Massachusetts Avenue Project's Growing Green Program have transformed vacant residential lots into a vibrant urban farm where they grow, market, and distribute organic produce for communities, restaurants, and retail outlets in the city. Similarly, teens working with East New York Farms! in Brooklyn grow food for the community, manage a neighborhood farmers' market, and educate residents about healthy eating. Near Albany students at Farnsworth Middle School manage Butterfly Station. There, they raise native plants and butterflies to release into the wild as part of an ongoing collaboration to restore the region's pine bush habitat. And in Lansing, middle school students in an after school program offered by Cornell Cooperative Extension of Tompkins County's Rural Youth Services educate local residents through a "Green Homes" documentary that they produced, which explains ways to make homes more energy efficient and environmentally friendly. These are only a handful of examples in which youth—referring to adolescents who are in the period of life moving from childhood to adulthood —have engaged in action to improve their local environments.

Over time, as the contributions of each group of participating youth build upon those of earlier groups, these programs have made substantial improvements to natural and built environments. While impressive, the tangible environmental changes resulting

from such programs often are not the most important outcomes in the eyes of the educators facilitating them. Of greater value from an educational perspective are the ways in which *participating* in urban farming, habitat restoration, or environmental documentary production enables young people not only to learn about the environment but to learn about themselves and to develop their capacities. It is important to note that in this chapter the definition of "participation" extends beyond simply taking part in a project to having a part or share in the project. This notion of "participation" relates to empowerment, ownership, a sense of being taken seriously, and being able to make an impact.

This chapter focuses on youth environmental action, a participatory approach to environmental education in which youth and adults collectively design and implement projects to create positive environmental change. More specifically, the chapter discusses how youth environmental action can contribute to positive youth development (PYD). Positive youth development is an asset-based and integrated approach to promoting young people's well-being in physical (e.g., health habits), intellectual (e.g., critical thinking and decision-making skills), psychological (e.g., confidence in personal efficacy), and social (e.g., trust with others) realms. The first section expands on the meaning of PYD and then describes the educational approach of environmental action. Next, evidence that environmental action programs can result in PYD outcomes is reviewed. The final section covers the practices of educators who facilitate youth environmental action and the parallels apparent between their practices and PYD.

Understanding PYD can help environmental educators extend their impacts with youth by incorporating PYD principles in program planning, implementation, and evaluation. Furthermore, recognizing the link between PYD and EE can be useful for partnering with youth development organizations to design and implement programs that expand EE's reach. Indeed, several examples in this chapter come from youth development organizations that engage their participants in action to improve local environments, while concurrently advancing PYD goals.

> Understanding PYD can help environmental educators extend the benefits of their programs with youth, as well as partner with youth development organizations to expand EE's reach.

Students in an after-school program produced an educational documentary about green homes featuring local residents. Photo courtesy Cornell Cooperative Extension of Tompkins County

What Is Positive Youth Development?

A paradigm shift in the youth development field has occurred in recent decades from a problem-reduction orientation to a broader concept of positive youth development. What does this umbrella phrase—positive youth development or PYD—encompass?

This concept focuses on promoting youth's physical, intellectual, psychological, and social well-being. Whereas the problem-reduction approach viewed youth as recipients of services intended to decrease problems such as alcohol use, violence, or unintended pregnancy, PYD takes an assets-based approach that values young people's strengths and potential. Positive youth development acknowledges that youth can be "problem-free" and still not be well prepared for adulthood. Thus, PYD takes a more comprehensive approach, helping youth to build competencies and successfully negotiate the salient developmental tasks of adolescence.

Along with this paradigm shift from a focus on reducing problems to strengthening assets, the youth development field is moving from a silo approach that views youth development occurring in independent contexts (such as schools or organized youth programs) to a perspective that considers developmental experiences that occur throughout the daily lives of young people, including interactions with peers, family, and nonfamilial adults. From this perspective, PYD occurs not only in a school or specific youth program but also through the efforts of an entire community.

Assets That Promote Well-being

The process of PYD provides opportunities for youth to develop a variety of personal assets contributing to an individual's well-being. Researchers have used various frameworks to describe these assets, called PYD outcomes. Although these frameworks vary in how they categorize specific items, they demonstrate consistency in general content. The National Research Council and Institute of Medicine's Committee on Community-Level Programs for Youth conducted one of the most comprehensive reviews to date and published those results in the report *Community Programs to Promote Youth Development*. They organized key assets that promote an individual's well-being into four categories as shown in **Table 1**. It is important to note that these assets will manifest differently in different cultures.

TABLE 1. Assets That Promote Well-Being Identified by the Committee on Community-Level Programs for Youth (NRC 2002).

Physical development	• Good health habits • Good health risk management skills
Intellectual development	• Knowledge of essential life skills • Knowledge of essential vocational skills • School success • Rational habits of mind – critical thinking and reasoning skills • In-depth knowledge of more than one culture • Good decision-making skills • Knowledge of skills needed to navigate through multiple cultural contexts
Psychological and emotional development	• Good mental health including positive self-regard • Good emotional self-regulation skills • Good coping skills • Good conflict resolution skills • Mastery motivation and positive achievement motivation • Confidence in one's personal efficacy • "Planfulness" – planning for the future and future life events • Sense of personal autonomy/responsibility for self • Optimism coupled with realism • Coherent and positive personal and social identity • Prosocial and culturally sensitive values • Spirituality or a sense of a "larger" purpose in life • Strong moral character • A commitment to good use of time
Social development	• Connectedness – perceived good relationships and trust with parents, peers, and some other adults • Sense of social place/integration – being connected and valued by larger social networks • Attachment to prosocial/conventional institutions, such as school, church, nonschool youth programs • Ability to navigate in multiple cultural contexts • Commitment to civic engagement

Characteristics of Settings That Promote Positive Youth Development

In addition to identifying PYD outcomes, the National Research Council report describes characteristics of settings (e.g., families, schools, neighborhoods, community programs) that maximize PYD. They present this as a provisional list, subject to further study, "of the processes or 'active ingredients' that community programs could use in designing programs likely to facilitate positive youth development." Settings likely to contribute to PYD will have some of the following features:

- **Physical and psychological safety** (e.g., safe and health-promoting facilities; safe peer group interaction)
- **Appropriate structure** (e.g., clear and consistent expectations)
- **Supportive relationships** (e.g., warmth, connectedness, good communication, guidance)
- **Opportunities to belong** (e.g., meaningful inclusion, social engagement)
- **Positive social norms** (e.g., rules of behavior, values and morals)
- **Support for efficacy and mattering** (e.g., making a real difference in one's community, being taken seriously, responsibility granting, meaningful challenge)
- **Opportunities for skill building** (e.g., intentional learning experiences)
- **Integration of family, school, and community efforts** (e.g., coordination among family, school, and community)

The implementation of these features will vary across programs because each program has different participants, goals, resources, and constraints; however, the more of these features that are present in a given setting, the more likely it is that PYD outcomes will result.

With this overview of PYD in mind, let us now consider one approach to EE that has been shown to generate PYD outcomes for participants: youth environmental action.

What Is "Environmental Action"?

Increasingly occurring in youth development programs, community organizations, and science classes **(Box 1)**, environmental action provides inspiring examples of adolescents and adults working in

partnership to create local environmental change in arenas such as food systems, community gardens, habitat restoration, water quality, air pollution, urban development, and environmental justice. Environmental action is one pedagogical approach that falls within the "democratic" paradigm of EE and overlaps in some ways with other EE approaches, such as place-based education, community-based education, issues investigation, environmental project-based learning, and environmental service-learning. Rather than focusing on instrumental aims to modify learners' lifestyle behaviors (e.g., consume less, recycle more), environmental action reflects a participatory approach in which learners develop the abilities to analyze the causes of environmental problems and take action with others to generate and implement solutions. Environmental action involves deliberate decisions, planning, implementation, and reflection by an individual or group with the intention to achieve a specific environmental outcome. Examples include persuading local government officials to implement erosion control along a stream bank in response to water quality testing revealing high levels of sediment, or reclaiming a city lot for a vegetable garden and growing produce for a local community kitchen in response to a community survey documenting limited local access to fresh produce. Many EE approaches might contribute to PYD, for example, via science learning or mentoring relationships. However, environmental action is especially well suited to PYD because youth play significant decision making roles.

A study in the United States (U.S.) documented youth environmental action occurring in the following five forms:

- **physical environmental improvements** (e.g., restoring natural habitats);
- **community education** (e.g., organizing community festivals and information fairs; producing educational media like newsletters, brochures, or videos);
- **inquiry** (e.g., community assessments, surveys, and mapping; environmental monitoring; scientific experiments designed to inform or evaluate action);
- **public issue analysis and advocacy for policy change** (e.g., researching and analyzing the environmental impacts of on-site wastewater treatment regulations and presenting policy recommendations to a state legislative committee); and
- **products or services contributing to community development** (e.g., sustainably growing food for sale at a neighborhood farmers market).

> Rather than focusing on instrumental aims to modify learners' lifestyle behaviors (e.g., consume less, recycle more), environmental action reflects a participatory approach in which learners develop the abilities to analyze the causes of environmental problems and take action with others to generate and implement solutions.

Students from the Satellite Academy High School in the Bronx learn about composting in a community garden. Photo by A. Kudryavtsev

> Because environmental action involves young people's authentic participation in community issues, it can not only improve local environments but also help youth grow as citizens.

Any given project typically involves multiple forms of action. For example, a middle school teacher might guide students in research from which they conclude that habitat loss is the primary threat to an endangered butterfly species. The students then could choose to work with a local park to improve the physical environment by restoring native prairie habitat, and they also could organize an educational festival to teach younger children about these issues.

Researchers studying environmental action have identified several important characteristics that further define this educational approach. For instance, the action is intentional, or consciously undertaken with reference to motives and reasons, and ideally targeted at the root causes of a problem. It can contribute directly to solving that problem (people-environment relations) or indirectly influence others to do so (people-to-people relations). Typically, environmental action involves ecological and/or social inquiry to inform and evaluate action in an iterative, cyclical process; thus, both science and civic engagement are central in this approach. Action involves young people's genuine participation in the form of shared decision making with adults. In other words, youth take part in making meaning of a particular environmental problem by defining it, analyzing its causes, and envisioning and enacting possible solutions.

Environmental Action and Civic Engagement

Because environmental action involves young people's authentic participation in community issues, it can not only improve local environments but also help youth grow as citizens. This is an important educational aim, because, as Danish EE scholars Jensen and Schnack explain,

> …environmental problems are structurally anchored in society and our ways of living. For this reason it is necessary to find solutions to these problems at both the societal and individual level. This is why the aim of environmental education must be to make present and future citizens capable of acting on a societal as well as a personal level.

Books, curricula, and websites on youth environmental action

Books

- Driskell, David. *Creating Better Cities with Children and Youth: A Manual for Participation*. London: Earthscan. 2002.

- Hart, Roger. *Children' Participation: The Theory and Practice of Involving Young Citizens in Community Development and Environmental Care*. London: Earthscan. 1997.

- Urban Places Project. *The YouthPower Guide: How to Make Your Community Better*. Amherst, MA: University of Massachusetts Extension. 2000. http://annforsyth.net/wp-content/uploads/2012/05/YouthPower_20001.pdf

Programs and Curricula

- Earth Force http://www.earthforce.org/

- The Food Project http://thefoodproject.org/food-project-toolbox

- Garden Mosaics http://www.gardenmosaics.org

- Give Water a Hand http://www.uwex.edu/erc/gwah/

- Give Forests a Hand http://www.sfrc.ufl.edu/gfah/

- Health and Environment Activities Research Tool http://depts.washington.edu/ceeh/downloads/HEART_Manual.pdf

- Project Learning Tree's GreenWorks! http://www.plt.org/greenworks

- Project Wild's Science and Civics: Sustaining Wildlife http://www.projectwild.org/ScienceandCivics.htm

Stories of Youth Environmental Action

- President's Environmental Youth Awards http://www2.epa.gov/education/presidents-environmental-youth-award

- What Kids Can Do - Feature Stories - Science, Environment, and Technology http://www.whatkidscando.org/featurestories/index.html#science

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Indeed, educators facilitating youth participation in local environmental action have described developing youth as citizens and change agents as a primary educational aim. Interestingly, many practitioners' deem their efforts successful whether youth continue participating in environmental action or choose to engage as citizens in other ways, as explained by the director of a youth urban agriculture program:

> *I'm very passionate about creating opportunities for youth to really look at themselves and identify their own strengths. And then, I mean it's probably twofold, my other passion is food and really getting kids to look at where their food comes from and the importance of food in their lives and in the lives of the community as a whole… And so I think the rewards of my work come from seeing kids kind of get that piece but also learn about themselves and learn what their strengths are and seeing them use those strengths. Whether they're gonna garden or not or whether they go on to be farmers or not isn't so important to me. If they move forward and in a way where they're more confident and they really can see themselves as leaders then I feel like I've made a [difference].*

The reflection of another educator sums up this sentiment:

> *There's a whole different dimension to it in terms of how you're helping shape their understanding of the world and their sense of being able to act in it and I think in some ways that is more important than the … projects that we get out of it at the end.*

Given this emphasis on developing youth as citizens, another way to think about environmental action is as a form of "youth civic engagement." This refers to "young citizens developing civic skills and habits as they actively shape democratic society in collaboration with others." Youth environmental action involves feedback loops by which youth contribute to environmental action, which in turn enables youth to develop civic skills and habits and a host of other PYD assets. As youth develop these assets, they become increasingly able to participate effectively in environmental or other community action **(Figure 1)**. In this way, environmental action and PYD may reinforce each other.

Several researchers have documented ways in which youth environmental action improves environmental management, neighborhood planning, and community development. One excellent resource is Roger Hart's book *Children's Participation: The Theory and Practice of Involving Young Citizens in Community Development and Environmental Care*. Of course, not all environmental action projects succeed in creating the change intended. Indeed, poorly guided projects can lead youth to feel disempowered, overwhelmed by environmental problems, and incapable of making a difference.   Thus, it is essential that educators are able to (1) offer guidance to youth in designing a project that is feasible and (2) transform project failures into opportunities to reflect upon and learn about the challenges of creating societal change.

Having described the concepts of PYD and environmental action, we now turn to the relationships between them. First, what PYD *outcomes* result from young people's participation in environmental action? Second, what *practices* of environmental educators provide opportunities for PYD?

Youth Environmental Action Contributes to Positive Youth Development

Researchers have documented PYD outcomes resulting from environmental action programs. For example, Hawaiian students working together to select, investigate, and act on a local environmental issue improved their critical thinking skills; reading, writing, and oral communication skills; familiarity with technology; self-confidence; and citizenship competence.   An evaluation of Earth Force, an environmental action program implemented in multiple locations across the U.S., found that participants learned to collaborate, conduct research, and express their views, while also developing increased confidence, efficacy, and understanding of diverse viewpoints.

Developing Youth, Citizens, and Change Agents

Environmental Action

Positive Environmental and Social Change

FIGURE 1. Youth participate in environmental action, which in turn provides opportunity for positive youth development. As youth develop assets they increase their capabilities to participate in action on environmental or other issues important to them.

> Young people's reports of developing assets that promote well-being through participation in environmental action are consistent with a growing body of evidence from other contexts that youth civic engagement contributes to positive developmental outcomes.

A study of nine youth environmental action projects in New York State **(Table 2)** involved group interviews with 46 youth. When asked what they had learned through their specific programs, the young people enthusiastically described a variety of outcomes related to PYD, as shown in **Table 3**. It is important to note that interviews were conducted with a subset of youth in each program, often those most actively engaged; thus, it cannot be assumed that the experience led to the development of assets for all participants. Nonetheless, young people's reports of developing assets that promote well-being through participation in environmental action are consistent with a growing body of evidence from other contexts that youth civic engagement contributes to positive developmental outcomes. How does this come about? Specifically, what are educators doing in their facilitation of youth environmental action projects that creates opportunities for youth to develop intellectually, physically, psychologically, and/or socially? The answer to this question, which will be discussed next, suggests recommendations for EE practitioners who also are interested in fostering PYD.

Educator Practices That Promote Positive Youth Development

A study of youth environmental action in the U.S. involved interviews with 33 practitioners—people working in community-based organizations, nature centers, science museums, extension associations, and after-school programs as well as middle and high school teachers. Each interview focused on the story of a specific action project, including how was it initiated; who was involved; what interactions occurred between youth, the educator, and other community members; in what ways the project was successful; and what challenges arose. From these stories, nine common themes in educators' practices emerged **(Table 4)**. No single individual's story includes all nine themes; rather, across this set of 33 stories, the many different strategies and techniques used by educators can be grouped into these overarching practices:

- creating safe spaces;
- building respectful, trusting relationships;
- providing structure;
- providing opportunities for meaningful contribution;
- bridging differences and creating opportunities for all learners to contribute;
- expanding horizons through novel experiences;
- supporting youth as they encounter new challenges;
- setting clear, rigorous expectations; and
- connecting youth with their community.

Many of these practices closely overlap with the attributes of PYD settings identified in the National Research Council report discussed earlier **(Table 4)**. That report describes these features as characteristics of an adolescent's *interaction* with the setting.   In the "setting" of environmental action, educators facilitate young people's interactions with physical and social environments. Thus, we might view the features of PYD settings as principles for educational practice. These practices can be realized through diverse tools and techniques, which educators can adapt to participants' capabilities and their own pedagogical styles.

Illustration: PYD in practice

Perhaps the best way to understand these practices is through an educator's story. The following excerpt comes from a story about Caroline Youth Services (Caroline, New York), a youth development program taking place in a rural community after school and during summers (pers. comm). In this program, high school students are employed to guide middle school students in planning and implementing community events and service projects. One of these projects involved designing and building a perennial garden in front of the Caroline Town Hall. The story begins with the impetus for this project:

> *The project for the raised flower bed in front of the Town Hall, [the youth] designed it. The town board came to us with, 'We want this to change in front. How do you want to change it?' So that's how this project came up. And that's where it went through the [youth] group. We've been asked, 'How do we want to change it?'*
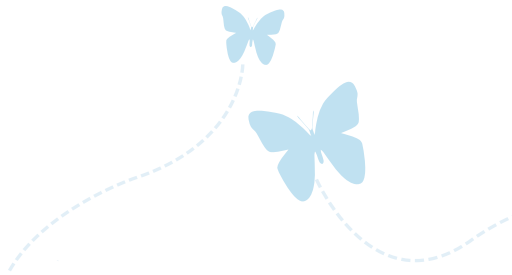
We might view the features of PYD settings as principles for educational practice. These practices can be realized through diverse tools and techniques, which educators can adapt to participants' capabilities and their own pedagogical styles.

TABLE 2. Youth Environmental Action Projects Studied in New York State.

Name	Educational Setting (New York State)	Projects of Focus for this Study	Forms of Action	# Youth Inter-viewed
Program A	Youth development program, urban	Youth maintained a community garden plot and contributed data to a citizen science program on urban weed management.	. Physical improvements . Inquiry	7
East New York Farms!	Community development organization, urban	Youth employed as interns participated in agricultural and leadership training, growing food for the community, managing a farmers' market, and educating residents about healthy food.	. Physical improvements . Community education . Community development	3
Growing Green	Community development organization, urban	Youth employed during the growing season built, planted, maintained, and harvested gardens; marketed and sold their produce; developed business plans; and organized community outreach.	. Physical improvements . Community education . Community development	3
TRUCE Nutrition and Fitness Center	Youth development program, urban	Youth employed by the program documented through a neighborhood survey the lack of availability of fresh fruits and vegetables. To fill this need, youth reclaimed an abandoned, city-owned lot; developed a vegetable garden; and donated the produce to a community kitchen.	. Physical improvements . Inquiry	4
Caroline Youth Services	Youth development program, rural	High school students employed through the program guided middle school students in organizing community events and service projects. In a community beautification project, youth designed and installed raised garden beds in front of the town hall.	. Physical improvements . Community development	3
Lansing Youth Services	Youth development program, rural	Middle school students produced a "Green Homes" documentary featuring local residents.	. Community education	5
Pine Bush Project, Farn-sworth Middle School	Middle school, suburban	Middle school science students conducted scientific inquiry in conjunction with ecological restoration. Students in an after-school and summer program managed a butterfly house, gardens for native plant propagation, and public outreach programs, including tours and day camps for younger children.	. Physical improvements . Community Education . Inquiry	5
Sustain-ability Initiatives, Lehman Alternative Communi-ty School	High school, small city	Students in a high school ecology class conducted individual and collective action projects in conjunction with course work. The projects included advocating for the school district to install a solar electric system, designing and building a raised garden bed at a home for adults with disabilities, assessing the quality of woods adjacent to the school for wildlife habitat, and developing and teaching a sustainability curriculum to elementary school students.	. Physical improvements . Community education . Inquiry . Advocacy	10

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TABLE 2. *continued ...*

Roof Garden Project, School of the Future	High school, urban	High school science class and after school club designed and built a wheelchair accessible roof garden. Students also conducted scientific experiments on the effectiveness of green roof modules with varying design parameters (e.g., plant types, soil medium and depths) for controlling building temperature and reducing stormwater runoff.	. Physical improvements . Inquiry	6

TABLE 3. Positive Youth Development Outcomes Described by Young People Participating in Environmental Action Projects in New York State.

PYD Assets		Illustrative Quotes
Physical development	. Healthy habits (e.g., nutrition, fitness) . Health risk management	. …the most important thing that I've learned is how to eat healthy. Because before this McDonald's was my best friend and now I actually eat fruits and vegetables. (East New York Farms!)
Intellectual development	. Content knowledge (e.g., energy efficiency, plant science, earth science, butterfly metamorphosis) . Job preparation, value of hard work . Knowledge of vocational skills (e.g., video production, conducting scientific experiments, public speaking)	. I have learned that green homes doesn't mean that they're actually [the color] green. It means that they are environmentally friendly homes; it means that they're good to nature and that there are many different ways of making a green home, like [masonry] stoves and using different recycled material to build your house… (Lansing Youth Services)
Psychological and emotional development	. Mental health including positive self-regard (e.g., self-confidence, open-mindedness) . Emotional self-regulation (e.g., patience, persistence, paying attention) . Coping skills (e.g., adaptability) . Mastery and achievement motivation (e.g, initiative, intrinsic reward) . Confidence in personal efficacy (e.g., how to enact change) . "Planfulness" (e.g., vision, thinking ahead) . Sense of personal autonomy and responsibility . Optimism coupled with realism . Good use of time (e.g., balancing work load)	. I've gained self-confidence and my self-esteem is higher than what it used to be and I contribute my positive thinking and my constructive feedback. (TRUCE Nutrition and Fitness Center) . It teaches responsibility because…if you join this club you learn how to take care of plants and how to tend to a garden… (Pine Bush Project) . Learning how to balance a completely independent project; how to find time and balance it with a paper due tomorrow and not to get discouraged… (Lehman Alternative Community School)
Social development	. Connectedness (e.g., teamwork) . Ability to navigate in multiple cultural contexts (e.g., when to "talk street and [when to] talk correctly") . Commitment to civic engagement	. It changed me because I'm happy every time I walk down the street and I see one of Growing Green's gardens, I feel happy that I helped. (Growing Green) . Before I would have thought being a good community member is just like staying out of trouble, but now I realize that is kind of expected. If you actually want to be a good, good community member you have to be proactive and find things that you need to address. (Caroline Youth Services)

TABLE 4. Practices of Educators Facilitating Youth Environmental Action Match Well with the Features of PYD Settings.

Practice Themes and Related Techniques	Features of PYD Settings (NRC 2002)
Creating safe spaces - Physical safety; calming environment of green space; inclusive, respectful social environments where youth can take risks and express themselves.	Physical and psychological safety
Providing structure - Providing process framework for youth decision making; guiding youth in decision making by helping youth consider options, assess feasibility; setting overall goals within which youth decide routes to achieve them.	Appropriate structure
Building respectful, trusting relationships - Focus on youth first, then project activities; sensitivity to what youth are going through in other parts of their lives; mentoring; open communication; keeping confidences; honesty, transparency, authenticity; team building activities; hanging out, recreating, sharing meals, having fun together.	Supportive relationships
Bridging differences and creating opportunities for all learners to contribute - Involving diverse youth and community members who would not usually interact; matching youths' interests and talents with specific project tasks; encouraging youth to play their strengths.	Opportunities to belong
Setting clear, rigorous expectations - Clarity about youth and adult roles; clear behavioral expectations; expectation of quality and professionalism in products of youths' work; physically rigorous activity; individual learning plans, self-evaluation, de-briefing sessions, reflection on individual and group performance.	Positive social norms
Providing opportunities for meaningful contribution - Sharing decision-making power; encouraging youth ownership; making a real difference in communities; valuing youth as experts; recognizing accomplishments; providing nested leadership opportunities.	Support for efficacy and mattering
Supporting youth as they encounter new challenges - Responsibility granting; encouragement and guidance in rising to new challenges; formal and informal training; scaffolding; emotional regulation; conflict management.	Opportunities for skill building
Connecting youth with their community – Facilitating service learning; drawing on local experts; garnering community support; participating in public forums; conducting media outreach; engaging community through the arts; using intergenerational programming.	Integration of family, school, and community efforts
Expanding horizons through novel experiences - Exposing youth to new experiences and ways of thinking about the world and their relationship to it through field trips, conferences, films, workshops (e.g., identity, diversity, social movements); encouraging reflection through dialogue, journaling.	

We can immediately appreciate that young people were provided with an *opportunity for meaningful contribution*; the impact of their efforts would extend to others in their community. The story continues:

> *The [youth] called all local businesses. A local landscaper came in and they said, 'Well here's the area, and this is our idea, what do we need to do?' They called the local mill, to get lumber. They called a greenhouse. They would practice the phone calls. It is just amazing. You know they can be on the phone with friends really easily, but get on a phone with an adult, it varies on who feels comfortable.*

Here it becomes clear that youth did not complete this project on their own; rather, they requested guidance from adults in the community. In this way, the project not only served the community, but also gave youth opportunity to *connect with the community* through direct interactions. Many youth have limited experience communicating in a professional way with adults; thus, the educator also *supported youth as they encountered challenges*, in this case the challenge of phoning and requesting assistance from a local expert. The educator described the next steps:

> *They got on the computer, they designed things. They showed different phases of the project. They had a display in the town hall. They looked at, environmentally, just what was going to work… We didn't want to use pressure treated wood. They figured out that the Larch would be really good, because it's not going to decay. We mixed soils and figured out, what is the pH, and how is this going to drain? And what's going to happen, is this going to be a problem because we have an artesian well? Just figuring out, you know, 'Is this far enough away?' 'Looks pretty good here.' And you know, 'I think we're fine. What do you think?' 'Well who should we ask?' So getting that awareness of you're going to change something here, how can you change it for the better?*

Here again the opportunity for meaningful contribution comes through. Neither youth nor adults are the sole decision makers; rather, at various steps in the project, youth and adults jointly determined how the project would proceed. This shared decision

Neither youth nor adults are the sole decision makers; rather, at various steps in the project, youth and adults jointly determined how the project would proceed. This shared decision making was an essential ingredient of the youth participation in environmental action.
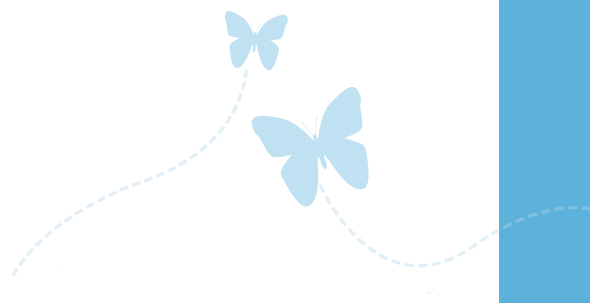
> The project was not solely about the tasks at hand but also about forming friendships and becoming a team.

making was an essential ingredient of the youth participation in environmental action. The educator added the following:

It was fun. It's not just all work. You get to play too. And work can be play. …that's why probably taking a longer time to do something and allowing them to become a group, a team, understand the dynamics… when you finally get to hammering 12 inch spikes, you can take turns, and you can let somebody take turns and not always the biggest kid is the one to hammer it in.

Here the importance of allowing time for fun and *building respectful, trusting relationships* becomes apparent. The project was not solely about the tasks at hand but also about forming friendships and becoming a team.

Most challenging was probably walking two miles [from school to town hall] with the tools. For some walking can be a challenge. There were probably three kids that it was physically a challenge. The challenge was they agreed that we would stay together as we walked. The leader in the beginning and the end of the line would be the beginning and the end. And we would stay together. That was hard, because basically the walking happened in the summer, and it was pretty hot. Walking next to Route 79, nice shoulder. But, it's asphalt. And hot. And that I think for this project was hard, you know being patient. Some people just got to walk! Got to go! Got some speedies for sure. 'Hey! You're going to stay together!' That probably was the biggest challenge.

The agreement to stay together while walking illustrates *bridging differences*, while the educator's reminder held the youth accountable to their agreement and demonstrated the value of *setting clear, rigorous expectations*.

From this story of a community beautification project, we gain insight into how this educator used multiple practices promoting PYD. While each educator's story of environmental action differs, all illustrate some of the PYD practices listed in **Table 4**. Environmental educators who want to promote PYD

The entrance to the Caroline Town Hall, as improved by local youth. Photo by T. Schusler

through their programs would do well to implement as many of these practices as possible given their specific context.

Tensions in Shared Decision Making with Youth
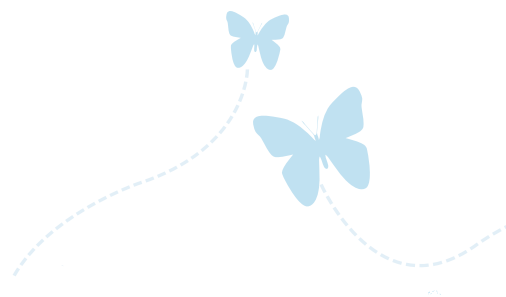
Educators facilitating youth environmental action describe many rewards but also a key challenge. In encouraging young people's genuine participation, which involves sharing decision-making power, educators sometimes experience tensions, such as when stepping back to let youth lead and stepping in to keep a project on track, balancing youth freedom with adult-provided structure, integrating youth interests with curriculum or organizational goals, managing power dynamics, or communicating openly and transparently.   The following are examples:

> There's a fine line to get yourself situated where you're allowing kids to take as much leadership as they want, encouraging what is needed yet not making decisions necessarily for them.
>
> The kids are the head of the project [but] I need it to be meaningful in terms of the class…
>
> …there's a huge power dynamic at play, me as a [professional], as an experienced person in this project, as a 42-year old, just carries a weight with it that a 12-year old kid in the neighborhood doesn't have. So how you balance that…

Managing such tensions is complex because youth are limited in their capabilities to initiate and carry out a collective project without appropriate guidance and support. When youth hold sole responsibility, their work can stall or become disorganized, which can undermine their motivation and the success of the project.   This leaves educators with a paradox: taking over control diminishes youth participation, but giving youth too much control can take a project off track and jeopardize its environmental benefits. Educators must find a middle ground between being too directive and too *laissez faire*.

In encouraging young people's genuine participation, which involves sharing decision-making power, educators sometimes experience tensions.

Several practices of educators facilitating youth environmental action parallel attributes of settings that promote PYD. These are: creating safe spaces, building relationships, providing structure, providing opportunities for meaningful contribution, bridging differences, expanding horizons, supporting youth, setting rigorous expectations, and connecting youth with community.

Summary

Environmental action is a form of EE in the democratic tradition that involves deliberate decision making, planning, implementation, and reflection to create positive environmental outcomes and can also result in other valued outcomes, including positive youth development. Environmental action can take the form of physical environmental improvements, education, scientific inquiry, advocacy, or products and services contributing to community development. It typically involves ecological and/or social inquiry to inform and evaluate action in an iterative process. Youth environmental action is characterized by shared decision making between youth and adults. Because young people genuinely participate in decision making and action for meaningful change in their communities, this approach to EE not only improves local environments but also develops youths' capacities as citizens. Other PYD outcomes—from improved eating habits, scientific knowledge, and job skills to patience, persistence and teamwork—have been documented in environmental action programs. As youth develop physical, intellectual, psychological, and social assets that promote well-being, they become more capable of participating effectively in environmental or other community action they deem important.

Several practices of educators facilitating youth environmental action parallel attributes of settings that promote PYD. These are creating safe spaces, building relationships, providing structure, providing opportunities for meaningful contribution, bridging differences, expanding horizons, supporting youth, setting rigorous expectations, and connecting youth with community. Understanding PYD can help environmental educators extend the benefits of their programs with youth, as well as partner with youth development organizations in programs that expand EE's reach while advancing youth development goals. Further research is needed to understand better the range of outcomes for participants, how these outcomes come about, and the synergies and tensions that arise in educational programs that simultaneously aim to achieve environmental and positive youth development goals.

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Connecting with Parents to Connect Children to Nature

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Introduction

Due to increasing pressures on natural resources, environmental concerns remain an important issue. Environmental educators and institutions, such as nature centers, zoos, botanical gardens, and city parks, can play a key role in creating environmental connections with children by addressing the needs of families that may not naturally gravitate toward the outdoors. The purpose of this chapter is to explain what constitutes a connection to nature and its importance in children, as well as explore some barriers to children's connection to nature based on parental concerns. We end by providing recommendations to community educators in tackling these barriers.

What Is a Connection to Nature?

The human connection to nature has long been a subject in environmental literature, and notable early ecological writers discussed the importance of people's attitudes toward nature. Aldo Leopold reminds us in *A Sand County Almanac* "When we see land as a community to which we belong, we may begin to use it with love and respect." Several previous studies found that cognitive interventions that are focused only on increasing knowledge about nature might not be sufficient to instill long-term changes in adult environmental behavior.   Feelings and emotions, that is, affective elements such as connection to nature, are therefore important to include in environmental education and outreach.

The connection between children and nature should be of particular interest to environmental educators due to widespread concerns that children are becoming significantly separated from the nature. Richard Louv   coined the phrase "nature deficit disorder" to describe the negative impacts of lack of outdoor engagement on children, such as behavioral and health problems. Studies have shown that exposure to nature can decrease these and other problems and increase academic performance. In addition, childhood experiences in nature can affect adults' interest in environmental issues and their environmental behavior.   The early childhood years may be particularly important in developing a connection and sense of responsibility with regard to the environment.   Therefore,

increasing young children's interests and participation in nature is of high priority to environmental educators.

In a 2010 survey of 1,432 fourth grade students, J. Chen-Hsuan Cheng and Martha Monroe found that children's connection to nature affected their desire to participate in future nature-based activities.   This work identified four primary dimensions that comprised a connection to nature for children: enjoyment of nature, empathy for creatures, sense of oneness, and sense of responsibility. The authors used these four areas to create an index measuring children's connection to nature. The Royal Society for the Protection of Birds (RSPB)   later surveyed more than 1,000 British children between the ages of eight and twelve years old using this index. Based on an assessment and criteria by the RSPB, only 20 percent of British children surveyed possessed an acceptable connection to nature.

Cheng and Monroe noted significant positive correlations between four factors (near-home nature, perceived family values, previous experiences with nature, and knowledge of nature) and children's connection to nature index scores. Potentially, parental values and parental connection to nature influenced each of these factors. This may indicate that parents who identify positively with nature may be more likely to purchase homes near nature and/or prioritize their children's experience and knowledge of nature. In another study, Amy McFarland   found that parents with positive attitudes of nature were more likely to value outdoor recreation for their young children. Ultimately, parental-attitude scores correlated positively with the amount of outdoor playtime for young children, including free play and organized activities, which could influence children's affective attitudes toward nature.
The results of these two studies demonstrate the significant impact that parents can have on their children's connection to nature. Parents can play a large role in connecting their children to nature by validating the importance of nature, demonstrating environmentally aware behavior, and providing and supporting children's access to the outdoors.

Parents can play a large role in connecting their children to nature.

Photo by K. Grace courtesy of Florida Museum of Natural History

Parental Support of Nature

Research suggests that parents generally accept the importance of outdoor play and value their children's nature experiences. Rhonda Clements conducted an online survey of 830 mothers from around the United States and found that parents from both rural and urban areas largely understood the importance of outdoor play in their children's development.   Almost all participants responded that outdoor play was important for a child's physical and motor development, and 75 percent indicated that it had a positive impact on children's social skills. A large percentage also recognized the role outdoor play could have on creativity, stress reduction, and self-esteem of children. Another survey of more than 2,000 adult Americans by John Fraser and colleagues found a general cultural acceptance that nature experiences benefit children.   Such experiences were considered particularly important for physical development, socialization, and appreciation for nature. Amy McFarland had similar results in a study of parents of children ages three through five.   These two studies also found that parents prefer outdoor settings to indoor settings when selecting places they feel are appropriate for their children to play.

Despite the cultural consensus that nature is good for children, Fraser and co-authors found variations in the support of children's nature experiences among parents of different demographic groups. Females were more likely to encourage outdoor experiences for children. Individuals with higher income and higher education levels were also more likely to encourage their children to play outside, potentially due to resource and time availability. Communities of color, with the exception of American Indians, gave children's nature experiences less value than Caucasians, although income was not considered in these results. American Indians rated the importance of these experiences the highest.

While parents appear to understand the importance of children's exposure to nature for well-being and development, they also report that their children spend relatively little time outdoors. Of mothers with children ages 3 through 12 surveyed in the Clements study, a large majority noted that their children played less outdoors than they did as children, and only a third reported that their children played outside on a daily basis.   Not only has the amount of outdoor time changed over a generation,

but the type of outdoor play has shifted as well. In the same study, mothers reported that fewer children engage in outdoor creative and imaginative play, while only a third of mothers reported that their children participated in previously popular kid-led outdoor games like hopscotch and jump rope. In the 1970s, Roger Hart recorded that New England children spent most of their playtime away from adults with play locations becoming farther away as children aged.   Children spent a large time observing and dabbling in nature and building places for themselves. Time spent outdoors now centers largely around supervised and structured activities like outdoor sports, which follows the general pattern of a shift away from outdoor free play.

Parental Barriers to Outdoor Play

As parents generally recognize the value of outdoor and nature play, the question of interest shifts to the cause of the decline in outdoor playtime. Some causes are cultural. Clements identified children's "screen" time as the number one barrier to outdoor play.   Almost all surveyed mothers reported that their children regularly watched TV while 81 percent regularly participated in video games. However, the causes for decreased outdoor time expand beyond modern indoor activities. Of the mothers interviewed, more than 80 percent cited concerns over crime and safety as obstacles to their children's time outdoors. Parental lack of time and a lack of supervision outdoors were also noted as major barriers. Participants in the survey study conducted by Fraser and colleagues also stated that safety concerns might limit how much they would let children play outdoors.   Surveyed individuals were generally less likely to support unsupervised play outdoors compared to indoors despite their own childhood experiences. Adults were particularly wary of letting children play unsupervised in "wild" nature settings such as woods, creeks, rivers, ponds, and open fields. Other potential parental safety concerns include weather, exposure to ultraviolet rays, insect-borne disease, and pollution.

> Surveyed individuals were generally less likely to support unsupervised play outdoors compared to indoors despite their own childhood experiences.

> Parents need to know that travel to a national park or state forest is not necessary for their children to reap the benefits of nature play.

Cheng and Monroe identified nearby nature as an important factor influencing children's connection to nature. McFarland found that due to personal definitions of nature American adults might not understand the importance of backyard nature play for children, potentially creating additional barriers for their children. Additionally, parental perception of personal perceived distance to nature correlated with encouragement of children's nature play. More than half of the respondents felt that nature was at least 15 minutes from their homes. Those who felt nature was just outside their door reported greater support for children's nature experiences.

Role of Educators

One of the many roles of an environmental educator is to connect with parents so their children will be encouraged to explore and connect with nature **(Box 1)**. Part of that role is fostering communication directly with families. A recent report based on parent education classes at the Forest Lake Family Center Nature Explore Classroom in Minnesota suggested that environmental educators can have profound impacts on parents and their views on nature play for their children at home. For parents who already highly valued outdoor contact for their children, hearing the information from educators helped reinforce and validate their beliefs. Some parents changed their behaviors due to the information received, and they adopted a more positive

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BOX 1

Recommendations for Environmental Educators
- Target outreach and programming to your audience.
- Involve parents in programming development and implementation.
- Conduct short programming on nights and weekends.
- Promote backyard nature.
- Host events in small urban green spaces.
- Create controlled and accessible outdoor play areas.

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attitude toward inconveniences that might prevent children's outdoor playtime. Parents also started to share learned information with other parents.

As most parents recognize the importance of allowing children to play in nature, an overall shift in current cultural parenting norms is not necessary. However, Fraser and his colleagues found that some demographic groups, such as most communities of color, low-income families, parents with low education levels, and fathers, did not value outdoor play as highly as others did in the study.   Therefore, environmental groups and educators should focus programming and outreach that promotes the importance of nature play specifically toward groups that statistically have less inclination and less access to outdoor play. The goal of these efforts is to increase the willingness of parents to encourage their children's engagement in the outdoors. As many parents work outside the home during the day, Ruth Wilson recommends that educators consider scheduling programming on evenings and weekends.   Parents consistently report that time is a barrier, so programming should be kept reasonably short to encourage participation. The use of storytelling and mentoring are other ways to help parents and children connect. These approaches allow parents to play an active participatory role in environmental programming and to integrate their cultural values and childhood experiences regarding nature.

Another primary barrier to increasing children's connections to nature is the dilemma of perceived proximity to nature. While research has repeatedly shown benefits to playing in simple green spaces and backyards, some parents do not recognize the value of these settings and may not encourage outdoor play in these readily accessible environments. Campaigns or information exchange promoting the benefits and adequacy of nearby nature can be useful. Parents need to know that travel to a national park or state forest is not necessary for their children to reap the benefits of nature play. To help parents locate and utilize locally available resources, environmental

Some parents might not recognize that backyards are valuable green spaces for outdoor play.

Photo by K. Grace courtesy of Florida Museum of Natural History

Play Lagoon at Paws On Play. Photo Courtesy of the Brevard Zoo

groups can promote backyard activities or conduct programming in simple green spaces in urban environments. Institutions that have access to wild or wild-like habitats can provide supervised play or learning opportunities. Transportation can be included, if possible, to allow more children access to these areas.

In areas where usable outdoor spaces are not available, the opportunity to build nature-inspired play areas should become a priority. Controlled and supervised outdoor nature settings, particularly in urban environments or low-income areas where accessibility is a major concern, can reduce parental concerns about the safety and well-being of their children during outdoor play.   To encourage nature play, environmental educators can develop outdoor settings that address these parental concerns and promote the use of planned natural areas. Parents of young children show a preference for outdoor settings that possess natural elements such as trees, but also benches and fencing. Other important considerations identified by parents include scenery, shading, adequate lighting, and access to restroom and water facilities.

Case Study (Paws On)

The Paws On Children's Exhibit at the Brevard Zoo (Melbourne, Florida) is a strategically built area designed to encourage nature-inspired free play for children ages 2 through 10, and environmental stewardship in all its visitors. The exhibit, which reopened in 2009, is a popular part of the zoo for families. Interpretive signs throughout the exhibit and an associated website promote local knowledge, caring, and stewardship of the Indian River Lagoon (IRL) and encourage visits to the area (see Chapter 5). The IRL is an ecologically, cultural, and environmentally important estuary on Florida's east coast. The exhibit is comprised of five main play areas:

■ Indian River Play Lagoon with an aquarium and touch tank of IRL species,

■ Upland Acre, including a two-story Gopher Tortoise tunnel play area,

■ Seaside Cove with boats, whales, and a sea turtle nesting beach,

■ a petting zoo, and

■ a wildlife-detective training area.

Photo Courtesy of the Brevard Zoo

Adults were comfortable enough with the exhibit that they supervised children from a distance.

Researchers from the University of Florida worked directly with the Brevard Zoo to evaluate how well the renovated exhibit met the expectations of adult and children visitors, and the zoo. The evaluation was designed to explore the quality of play in the exhibit, as well as the exhibit's effectiveness in encouraging parents and children to visit natural areas and become stewards of the local environment. Results indicated that adults liked the area primarily because of the amount and variety of play activities, the education value, and the quality of play. However, they also cited the exhibit's layout, cleanliness, and convenience as reasons they enjoyed the exhibit.   Adults were comfortable enough with the exhibit that they supervised children from a distance, allowing children to participate in free nature play. Parental recommendations to improve the exhibit included the suggestion to increase shaded areas for use during Florida's hot seasons.

While the exhibit clearly had play value, it was also effective in promoting interest in the IRL and environmental stewardship among parents. About half of surveyed adults learned about the IRL and its wildlife during their visit despite the fact that more than half of adult visitors read fewer than five interpretive signs. A third of adults learned about stewardship actions. Even more promising, most adults who learned about actions said they were "likely" or "very likely" to take some sort of environmental action

in the following six months, and approximately 90 percent thought their actions would make a difference. After one week, a majority of surveyed adults said the exhibit increased how much they cared about IRL. Of adults surveyed, 85 percent reported that the exhibit encouraged them to visit the IRL and 79 percent stated that they were "fairly" or "very likely" to visit IRL sites they learned about at the exhibit, thus increasing the likelihood that their children will play in nearby nature areas. Six months after visiting the exhibit, about a third of respondents said the Paws On Exhibit encouraged them to participate in other IRL activities. Interestingly, most of the children surveyed were previously knowledgeable of the IRL and of stewardship actions; therefore, the success of this exhibit relates to its influence on parents.

This example demonstrates that place-based strategically designed nature play areas encourage parents to let their children participate in nature-oriented outdoor free play. In addition, such controlled play areas can inspire future nature interactions and stewardship for families. However, some barriers remain. During the six-month follow-up survey, nearly all the adults reported that they wanted their kids to play more in natural environments; however, they cited time, weather, lack of access to natural areas and programming, and safety as barriers to achieving this goal.

Nature Playscapes

While addressing parental concerns is an important part of engaging children in nature, play areas should also be attractive and developmentally useful for the intended audience. The Paws On exhibit has several key characteristics that make it successful. Children often choose nature-inspired play settings over traditional playground equipment and asphalt   , matching parental preferences measured at Brevard Zoo. In their overview of nature playscapes, Randy White and Vicki Stoecklin mention that for young children, sensory play and the opportunity for free exploration of nature are vitally important for personal development and a connection to nature.   Nature playscapes combine the controlled outdoor settings that parents desire with the preferences and needs of young children, while also providing the physical and mental benefits of nature exposure.

The Gopher Tortoise Inn at the Brevard Zoo. Photo courtesy of the Brevard Zoo

The Oxford Dictionary defines a playscape as "a designed and integrated set of playground equipment, often made of wood." As White and Stoecklin mention, these outdoor play spaces are sometimes called discovery play gardens or naturalized playgrounds. Such landscapes typically do not use traditional metal playground materials and are not built on asphalt. Play areas can be further naturalized by mimicking natural environments, as seen in the Brevard Zoo example; and by utilizing natural materials such as logs, branches, and other plant materials. Natural playscapes are essentially "planted, not built." These types of natural play settings are exciting for children because the materials can be manipulated and therefore have immense sensory value.   Children may actually increase their variety of play in these more natural landscapes.   Ideally, playscapes should be integrative, changing, and diverse, while also inspiring creativity, and thus are often composed of a combination of components **(Box 2)**.

Planning successful natural playscapes requires skill and careful thought. The landscape should blend in with its surroundings and flow easily from the inside to outside play settings, and elements within the landscape should integrate well together.   In addition, because the needs of the community must be considered, an adaptive design approach may be helpful. Involving parents and children in the planning process helps alleviate parental barriers, including safety and accessibility concerns,

> Ideally, playscapes should be integrative, changing, and diverse, while also inspiring creativity.

BOX 2

Components typically found in nature playscapes

- A water feature such as a pond, stream, or even a simple watering can.
- Indigenous vegetation.
- Animals, such as pollinators.
- Sand.
- Sensory materials, including a variety of textures and colors.
- Ways of experiencing seasonal changes.
- Natural structures for climbing and sitting.
- Places to hide such as nooks and crannies.
- Multiple levels.
- Loose parts and mutable items to inspire creativity.

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and ensures that children and the community will want to utilize the provided play opportunity. Through preplanning, environmental educators can increase the likelihood that the play area will improve local children's connection to nature.

In Guatemala City, for example, individuals from the University of Washington Design and Build Lab were able to create a successful and multi-use space for Mayan refugees who had resettled near a decommissioned dumpsite. Mothers interviewed in the community desired a safe location to socialize and remind them of their homeland in addition to a place for their children to learn and play. Children desired a variety of landscape types, flowers and plants, and animals. To accommodate these needs, a wall and gates were added to the Children's Garden of Hope for security, and developers planted trees and hedgerows to mitigate pollution. The enclosed area houses a school, an outdoor classroom, gardens, an adventure playground, and an exploratory area for small children. The developed space addresses the community's needs and accommodates a variety of activities including sports and community celebrations, and it has been well received.

A variety of resources are available to help plan and implement outdoor play areas. Nature Explore, an initiative of the Arbor Day Foundation and the Dimensions Educational Research Foundation, has collaborated with a number of organizations to offer consultation services, as well as workshop and webinar training, classroom certifications, product sales, and family toolkits.   The Natural Learning Initiative provides research, design assistance, professional development, and dissemination of knowledge.   Look for examples and additional information on the planning and development of naturalized playscapes on their websites.

Conclusions

Nonformal environmental educators have an opportunity to increase the number of children connecting to nature by simply listening to parents. Young children can connect to nature by exploring the outdoors with their own families. Parents help their children connect to nature by providing access and encouraging play and exploration. Educators can increase the willingness of parents to let their kids play in nature by developing targeted programming that fills specific community needs and by creating safe, supervised outdoor spaces for children.

Nonformal environmental educators have an opportunity to increase the number of children connecting to nature by simply listening to parents.

Children connect to nature through free play. Photo courtesy of the Brevard Zoo

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Aged to Perfection: Environmental Education for Adults

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Introduction

Imagine the following scenarios: A rural community group forms to learn about a regional wind energy proposal. A new neighborhood resident tries to figure out local recycling and composting regulations. A coastal community comes together to restore lives and landscapes after a devastating hurricane. A recent immigrant family seeks out a community garden program that honors plant knowledge and cultural wisdom. A twenty-something discovers a passion for urban ecology while working as a science center docent. A retired couple tests water quality through a citizen lake-monitoring program. A war veteran finds solace in mountaineering and time spent in nature.

Whether navigating a new neighborhood, making food choices at a local pantry, visiting a museum or park with family, reading online news on the bus, or doing any of the thousands of activities we do during our days, we are inundated with intentional and unintentional opportunities to learn about the world around us. Adults exposed to these learning opportunities are also voters, change agents, elected officials, workers, parents, teachers, leaders, and community stakeholders. This chapter focuses on adult environmental education in the United States (U.S.) and outlines its importance and where it happens. Additionally, the chapter defines adulthood and offers suggestions for practitioners interested in effective, inclusive adult teaching strategies. We discuss adult motivations to learn, potential barriers and how to make learning relevant to adults. A deeper understanding of adults and their lived experiences can help environmental educators develop programming throughout the human lifespan.

Why Engage Adults in Environmental Education?

As outlined in the Tbilisi Declaration, environmental education is a continual *lifelong* process.   While schools are essential to children's learning, these institutions only deliver about 3 to 7% of an average person's learning over a lifespan **(Box 1)**. More than 90% of lifelong learning occurs outside of schools and focuses on topics that matter most to people as they seek personally relevant learning opportunities.

The urgent need for environmental solutions, combined with an aging population, makes effective environmental education for adults essential.

What Constitutes Adulthood?

Adults are not a single audience or monolithic group. The population we call "adult learners" encompasses every possible aspect of human diversity and cultural background. An "adult" can be defined by legal roles (e.g., voting age); biological age (i.e., ability to reproduce); social roles (e.g. worker, partner); and/or psychological perceptions. These conceptions of adulthood can be complicated and may lack clear demarcation   "Emerging adulthood" is a uniquely Western, generally American concept, of 18 to 22 year olds growing up in countries with extended periods of independence.   Within this cultural context, young adults have different opportunities to explore roles, experiences and identity formation. In contrast to adults, "children" are defined by the United Nations as anyone under 18 and individuals between ages 15 and 24 are "young people" or "youth."

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It is possible that the next generation will be better informed about environmental issues, but we cannot wait to address today's pressing environmental challenges. The fields of environmental and adult education can move us toward greater civic participation to address environmental issues. Environmental education for adults is under-represented, and yet the adult education field offers relevant theoretical, empirical, and practical ideas to engage adults in creating a more sustainable, just future.   The philosophical traditions of adult education, along with its roots in social justice, popular education, and community development, can inform environmental education.   At the same time, environmental educators' program design skills and abilities to serve as impartial facilitators also support effective stakeholder engagement and decision-making processes, especially among adult citizens.

In addition to civic involvement, environmental educators should consider the challenges and opportunities that exist among a burgeoning older (i.e., aged 60 years and above) population of adults. In the next 10 years or so, it is estimated that older people worldwide will outnumber children for the first time.   The U.S. adult population over age 65 also continues to grow, commanding attention of business people, educators,

> The philosophical traditions of adult education, along with its roots in social justice, popular education, and community development, can inform environmental education.

and policymakers in unprecedented ways. By 2050, Americans age 65 and older is projected to be 83.7 million, nearly double the estimated 2012 population of 43.1 million. As with adults more generally, this older population will be more culturally and ethnically diverse than ever before.   Additionally, adults aged 50 and above make up a large proportion of the voting public and impact decision-making through other avenues such as purchasing power. By 2017, it's estimated that nearly half of the US population will be 50 and older and control 70% of the disposable income.

The overall aging of America and worldwide offers tremendous opportunities for environmental educators to engage these learners to positive effect. Older adults' active participation in environmental volunteerism and other forms of environmental learning can enhance social interaction and overall health and wellbeing.   Their insights, life experience, leadership and talents also can enhance environmental efforts. For instance, older adults serve as volunteers, civic leaders, caregivers and learners who contribute to community well-being, particularly when framed from a social capital perspective.   The idea of "legacy thinking" (p.1) suggests that older generations hold promise in raising awareness and addressing complex issues such as climate change, sustainability, and biodiversity. Additionally, environmental and social challenges most likely will disproportionately impact older people. Older adults may view learning as an opportunity to right environmental wrongs and engage in social reform.

BOX 2

The Fallacy of Chronological Age & Tips to Engage Older Adults

Over time, adults experience more and more ageist messaging and oftentimes are marginalized, particularly after age 65.   The World Health Organization (WHO) has worked to deconstruct myths about older adults like all old people are all the same, are frail, have nothing to contribute to society, and are an economic burden, among other myths.   Such stereotypes only add to widespread pessimism about an ageing society.   Environmental educators must work to counter these negative trends, which affect learner confidence and willingness to engage. Building a sense of community, leveraging life experiences, and imparting hopefulness and growth can counter ageist stereotypes.   While more research is needed, following are some basic tips for presenting environmental messaging:

- Do not mistake slower processing for inability to learn. Older adults retain and apply new knowledge, though they may need more time to learn than younger adults.
- Realize environmental, medical, cognitive and/or psychological factors can impact learning—and are often different for people over 65.
- Acknowledge older adults' vast knowledge gained through previous education and life experiences.
- Leverage assets of older adults. For instance, older adults can be better at solving emotionally charged situations and become more invested in what matters to them.
- Emphasize self-paced and self-directed learning opportunities.
- Become familiar with the WHO'S Age-Friendly Environments Programme for cities and communities, which addresses environmental and social contributors to active, healthy aging.
- Consider accessibility, lighting (e.g., low glare), and general comfort (e.g., limit distractions and noise) of learning spaces.
- When using handouts or PowerPoint, use larger fonts and appropriate contrasting colors to accommodate visual impairments.
- Recognize that lifelong learning is a basic human right.   Isolated older adults and/or those living in institutionalized care facilities are particularly at risk of inadequately accessing lifelong learning, whether environmental or otherwise.

Sample programs engaging older adults in environmental education activities include the following:

- Gray is Green: http://grayisgreen.org/home/
- Northwest Earth Institute: http://www.nwei.org/our-model-for-change/
- Suzuki Elders Program (Canada): http://www.suzukielders.org/
- Road Scholars: http://www.roadscholar.org

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Where Do Adults Learn?

Learning is not the opposite side of teaching; it is a different activity. Since we are looking at adults from a "learning" perspective, it is important to share a common definition. Humans constantly take data in through our senses and organize, capture, or solidify those data in ways that are meaningful to our lives. We take in information and look for patterns that confirm or contradict what we expect, believe, value, or know; however, learning occurs when the information is then *used* or *externalized.* Adult learning occurs in formal settings such as schools and universities and in nonformal settings such as homes and community-based organizations. Coombs, Prosser and Ahmed categorized learning settings into formal, nonformal and informal, while Mocker and Spear added incidental learning.   Nonformal contexts differ from formal ones in that the learning activities tend to be shorter, voluntary, and in public places. Although flexible, there typically is some sort of curriculum and a facilitator. Taylor describes nonformal learning happening in cultural institutions this way:

> *"...each year more than 287 million people visit the 391 units of parks, monuments, national recreation areas, battlefields, wild and scenic rivers, and seashores of the national parks in the United States (National Park Service, 2007). During these visits, many adults often meet a park interpreter and participate in local nonformal education programs, such as a trail tour of park vegetation and wildlife, a discussion on land management practices, or a hands-on exploration of the geology in the park." (p.5)*

Such nonformal learning pales in comparison to the day-to-day informal learning that occurs as we navigate the world around us.   Activities such as reading a newspaper, having conversations with neighbors or a child, watching TV, visiting a farmer's market, and searching the Internet result in informal learning opportunities. While Coombs proposed such informal learning as the third in his typology, Illeris describes "everyday learning" as learning that "takes place in all the private and non-organized contexts of everyday life" (p.151).   Such informal learning is expanding exponentially in the digital world

as well as in workplaces.   Falk and Dierking called all nonschool learning "free choice learning," but others argue there are nuances and differences in the labels.   In contrast, indigenous cultures across the globe tend not to have this stark distinction between formal school-based learning and less formal adult learning. Rather, learning across the lifespan is rooted in everyday life in holistic ways.   The remainder of this chapter focuses primarily on the classically defined nonformal, *organized* adult learning opportunities in the U.S. and what to consider in these contexts for environmental programs.

Adults as Learners

Historically, adult education has been committed to the practical application of learning, to personal transformation, and to empowerment of learners to improve quality of life and communities. Adult education is grounded in understanding that the nature of the learners, the nature of the context, and the nature of the content interact to define the nature of the learning opportunity.   **Andragogy** is a term that, in referring to adult learners, goes back to the 1920s. (The better known term of **pedagogy** generally focuses on the teaching, instructional methods, and learning for youth.) Andragogy was popularized by Malcolm Knowles who offered five assumptions about adult learners that have been explored and tested and continue to summarize central aspects of working with adults.   These assumptions do not indicate that adults suddenly learn differently than children. Rather, adults change, over time, in terms of how and what information is viewed. Knowles' assumptions suggest that adults

- move from having a self-concept of being a dependent personality toward one of being a self-directed human being;
- accumulate growing reservoirs of experience that become an increasing resource for learning;
- increasingly connect readiness to learn to developmental tasks of the learner's social roles (e.g., parent, worker, community member);
- shift the time perspective from one of postponed application of knowledge to immediate application and from subject-centeredness to problem-centeredness; and
- internalize the motivation to learn.
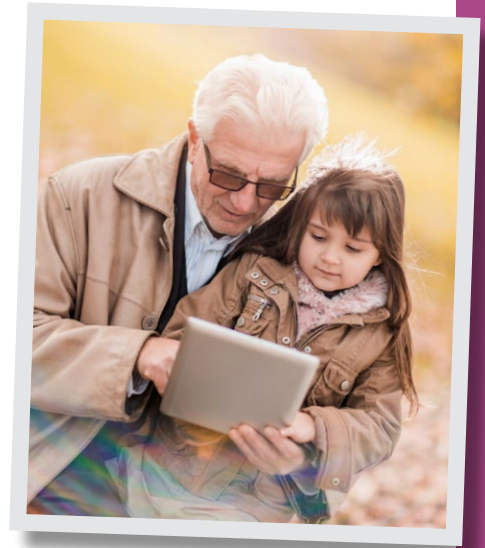
Pedagogy tends to be seen as being future-oriented, with externally determined content and curriculum with the ultimate purpose being for the good of society. One component of this societal good, although far from the totality, is that of workforce development which is considered formal education even in adult learning. In general, pedagogy is about the transmittal or transfer of knowledge from the teacher to the learner whereas andragogy focuses on incorporation of the knowledge brought by the learner to the learning setting.

Educators must be aware of the cultural and personal relevance of the context and content to a given adult learner. Knowles' assumptions tell us that the adult educator should be aware of what the adult learner enters feeling they need, and use teaching strategies that work to meet those needs *early* in the instructional process. While andragogy is not without critics (e.g. it fails to fully acknowledge or explore aspects of power and privilege), it is an appropriate starting point for understanding adults as learners. In adult education, this philosophy provides insights into how educators can better reach this vast pool of learners outside of the formal schooling system and beyond the age of 22 **(Box 3)**.

Concurrent with characteristics of adults as learners are conditions of the instruction—*why* is this program being taught? Adult education programs generally have one (or more) of five purposes:

1. Continuous growth and development of individuals.
2. Assist people in responding to practical problems and issues of adult life.
3. Prepare people for current and future work opportunities.
4. Assist organizations in achieving desired results and adapting to change.
5. Provide opportunities to examine community and societal issues, foster change for the common good, and promote a civil society.

All five of these purposes implicitly express change as an outcome or result of conducting education and training programs for adults. Change can be individual, organizational or societal. In addition to adult learner characteristics and a given program's purpose, educators must take social roles and identity into account when working with adults. The following section outlines elements of these social considerations, which have implications for educational design.

Some Teaching Ideas Informed by Andragogy

- Involve adults in the planning and evaluation of instruction.
- Experiential learning applies. Experiences, including mistakes, provide the basis for learning.
- Adults are particularly interested in learning about things that have immediate relevance to their personal or work lives.
- Oftentimes, the best adult learning is problem centered rather than content oriented.
- Allow for choice and flexibility as adults tend to be self-directed and in charge of their development and learning processes.
- Acknowledge and build upon adults' rich background of experiences and knowledge.
- Adults generally want to share with peers; create opportunities to do so in various configurations (pairs, large group, small group settings).
- Offer rich, timely, usable feedback coupled with occasions for reflection and active involvement in real-world tasks.

Consideration of Social Roles in Adult Learning

Learning is a personal process shaped by the context of the adult's life and the society in which one lives.   One factor shaping how adults engage and learn at any particular point in time is that of social role: the way of thinking and acting related to the identity the individual is holding at the moment. Adults typically have multiple roles; for example, an individual can be a parent, a professional, a conservationist, a baseball lover, a fan of a particular band, a good friend, and a colleague. We all play or enact different social roles which some people call "identities" and others call "facets of identity".   The role that is dominant at any given moment will inform how a person reacts, to what they give attention, what will be prioritized, and what will motivate them. Social roles are fluid components of an individual's identity.

> Adults continually make decisions about programs, activities, recreational opportunities, and cultural experiences that lend themselves to learning.

In respect to learning, the dominant social role for a specific situation determines the type of information to be taken from the experience. Think about visiting a zoo: if you are there as caretaker of a child, your visit is likely focused on the child and their experience. What you take away from the experience will be focused on what happens with the child. If you visit the same zoo with a group of friends, your experience will be different, and you will likely remember what you do and get from the social interaction with friends. And if you went as an environmental education professional to critically look at the ways the zoo conveys its messages, you would leave with still different experiences and insights. Adults continually make decisions about programs, activities, recreational opportunities, and cultural experiences that lend themselves to learning. Creating accessible and effective learning opportunities for adults is the focus of the following section.

Motivating Adults, Reducing Barriers, and Employing Effective Teaching Strategies

For adult education to be successful, educators need to know who is likely to participate, why these adults choose to engage, and what barriers must be overcome before they can effectively participate. Because adults learn best when they feel the need to do so, the motivation to learn is often related to a personal or professional life change (e.g., divorce, marriage, birth of a child, loss of significant other, change in health, vacation or new interest job loss or change, promotion, retraining). Adults are typically life-centered and want to know how learning fits in with their goals and objectives.

Adults are largely intrinsically motivated: the primary unsatisfied needs they have relate to self-esteem, competence, achievement, self-confidence and personal growth. Wlodkowski outlines a framework and related instructional strategies for motivating adults. The primary motivational conditions that occur within a given instructional experience are inclusion (e.g., climate of respect), attitude (e.g., positivity toward subject; relevancy), deepening meaning and engagement (e.g., sustain interest, enhance learning and decision making) and engendering competence (e.g. demonstrate or gain new knowledge and skills).

As we enhance motivational conditions, we must also work to reduce barriers to accessing learning opportunities. Time, money, competing demands, and responsibilities impact adults' access and motivation and are often cited as primary barriers. If you have children or hold down multiple jobs, it is unlikely that you will make time for an afternoon workshop, no matter how relevant the topic. Other barriers relate to prior experiences: consider how a program held on a university campus may be intimidating to someone without the life experience of having gone to college. Sensitivity to where and when adult programs are held, easing financial burdens, and/or offering resources, such as childcare, are value-added considerations and may help adults participate.

In all education settings, there are basic principles considered to be "good teaching." These principles, however, are even more pronounced in adult learning. For example, an authoritative teaching approach, or excessive direction by the educator, may cause a loss of ownership by the learner and result in an apathetic or defiant approach to learning. Similarly, a lack of reflection on the learning activity and how it contributes to an individual's existing repertoire of knowledge, skills, and dispositions can hinder learning. And lack of critical thinking can lead to seeking "answers" rather than knowledge, and, because of constraints on their time, adults often seek answers and mistake information for knowledge.

There is no "one size fits all" with adult learners, and there are a multitude of influences on learning experiences. What, how and where adults learn is impacted by gender, ethnicity, background, socioeconomics, and the individual's many life roles. Educators should be wary of making generalities about learners based on preferred learning modalities, gender identity, age, or any other singular characteristic. Realize that cultural, political, economic, social and historical forces that, when combined in the individual, influence learning and teaching in unique ways. We generally tend to understand the world in terms of the way we understand ourselves and as Johansen and McLean write, "…cultural background, assumptions, and view of the world influence an understanding of adult learning" (p. 321). As educators and learners, we cannot isolate ourselves from social forces influencing our thinking, values, and priorities in life.

> Effective adult educators realize that worldviews are a mix of cultural influences.... Intercultural competency is essential to creating inclusive adult learning opportunities in environmental education and elsewhere.

To embrace a diversity of adult learners, educators must challenge their assumptions, approach learning in holistic ways, and acknowledge other ways of knowing beyond cognition (e.g., emotional, spiritual, social, kinesthetic/physical understanding). Learners have wildly different worldviews and (Western) concepts like andragogy may not be fully compatible with other notions of understanding the world. Effective adult educators realize that worldviews are a mix of cultural influences, including family, age, religion, sexual orientation, gender identity, class, geography, ability, employment, ethnicity, among many others. Intercultural competency is essential to creating inclusive adult learning opportunities in environmental education and elsewhere.

No one model captures all the intricacies of learning in adulthood. For instance, much has been written about the cultural and social context of learning, expertise versus novice approaches to problem solving in adulthood, social learning through communities of practice, perspective transformation, and double-loop learning needed for transformation of deeply held mental models. Even with the variety of perspectives about effective adult education, there are some common findings about preferred practices for working with adult learners. Knowledge and understanding are fundamentally rooted in experience, which suggest that learning takes place through active participation of the learner. Additionally, instructors who display expertise, enthusiasm, clarity, and cultural responsiveness are most effective in motivating learning. Flexible approaches to teaching and use of a wide array of teaching strategies facilitate relevance and honor adult learners' life experiences.

There are also challenges to teaching adults. For example, the varied experiences, needs, skills, interests, knowledge, similarities, and differences of opinion among adult learners require the educator to be vigilant about how information is conveyed. An educator needs to note, for instance, what voices are dominant, the power dynamics of the group, if there is movement too quickly toward agreement on complex topics, or if there is reluctance to engage fully. These and other indicators demonstrate differences among participants within a given group. Assuming too much "alikeness" in an adult learning group is a common mistake.

Another challenge is inherent in the goal of providing a supportive, comfortable, and collaborative learning climate. Respect is at the core of engaging adults in the learning process so that they become invested in the outcomes as they relate to their own lives. Even though such an atmosphere can lend itself to social learning and exchange of ideas among adult learners, keep in mind that cultural, personal,

and intergroup experiences can make creating such a climate extremely difficult. Balancing individual needs within a group setting requires nuanced understanding of group dynamics and strong facilitation skills to do well.

A common consideration when working with adults is that the educator needs to build relationships with the learners. In adult learning settings, this is essential but often difficult. Sometimes it is possible to develop relationships with participants ahead of time through sending out a questionnaire, telling them about yourself and your plans for a given program or workshop, and/or conducting assessment interviews with each participant. More common is the practice of asking questions before or during a program related to what jobs/roles participants have, what are their skills, what do they know about the subject matter and how do they know what they know? Encouraging sharing of attitudes and beliefs relevant to the educational program and their reasons for being there are important. Figuring out what would make the learning experience worthwhile to them is vital. The challenge to asking such questions is in the *using* of the answers to continually reshape the learning exchange.

Adult environmental education is crucial for making the changes in the world that we envision and that are so urgently needed.

Conclusion

Environmental education is a lifelong process. How adults approach learning has tremendous bearing on natural and built environments, particularly through varied life roles and identities: family members, citizens, voters, volunteers, consumers, leaders, among many others. This chapter has outlined key characteristics of adult learners, distinguished andragogy from pedagogy, and provided some considerations for inclusive, relevant teaching strategies. Environmental educators have endless opportunities to authentically engage a broad range of adults in environmental education for empowerment, health and well-being, and community improvement. Adult environmental education is crucial for making the changes in the world that we envision and that are so urgently needed. This chapter is a starting point for understanding the complex realities of adult learners. We encourage readers go deeper into adult learning theory and practice to identify additional areas of interest. Doing so will help us become effective environmental educators, leaders and learners across the lifespan.
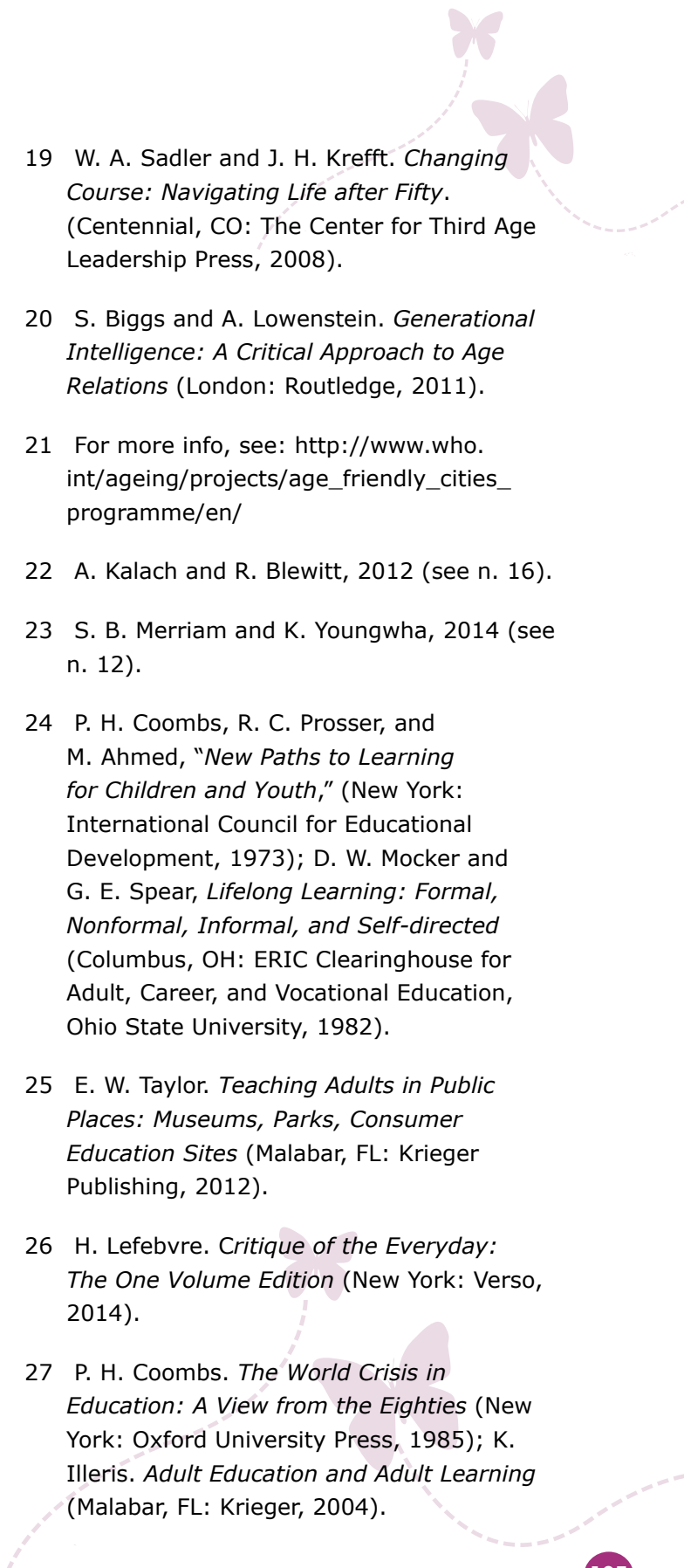
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Misconceptions and Psychological Mechanisms of Climate Change Communication

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Overview

The enhancement of environmental literacy has become an area of interest for United States (U.S.) government agencies, professional organizations, education institutions, and corporations. This interest holds great potential for increasing the amount and types of climate literacy materials and programs available for environmental education developers and practitioners. Surveys of secondary science teachers in the United States (U.S.) suggest that they are interested in and willing to teach about climate change despite the challenges associated with state standards and opposing perspectives. However, climate education encompasses a plethora of complex issues—many of which have become increasingly political and value-laden in the minds of the general public. In order for climate education to reach broader audiences in wider geographic ranges, it is essential that environmental education (EE) providers understand how to effectively communicate to people with diverse perspectives, facilitate productive interactions among these differing viewpoints, and encourage audiences to seek avenues for solutions.

Highly politicized issues such as climate change become increasingly frustrating topics for environmental educators as value-laden perceptions stand in the way of meaningful communication about complex environmental issues. Research in social psychology suggests that focusing on "climate change literacy," or increasing awareness about the importance of societal actions to mitigate or adapt to climate change, will do little to budge pre-established social and politically driven climate change perceptions. Social psychology studies demonstrate the difficulties that individuals and groups have in processing and responding effectively to the information surrounding long-term and complex societal changes. This chapter details some of the theories about biases in information processing and barriers to effective climate change communication and offers avenues for EE practitioners to disentangle facts from cultural meanings. Based on psychosocial theories, the findings outlined in this chapter may help practitioners develop and implement climate education programs that integrate information content and pedagogy to effectively mitigate skepticism and backlash. By assessing the psychosocial mechanisms that drive public perceptions of climate change and the strategies to address these cultural and political

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predispositions, environmental educators could play a significant role in creating community education programs that foster citizen engagement. At the end of the chapter are guidelines for EE practitioners to enhance communication efforts about climate change to diverse audiences.

Introduction

To best create an effective environment for citizen engagement in climate change, community educators must engage in the progression of contemporary communication strategies. In efforts to attract and motivate the public to participate in critical thinking and to seek avenues for solutions, it is easy for educators to fall into patterns of poor communication that have proven to be ineffective or even counterproductive. To address and help overcome these patterns, this chapter describes the challenges of climate change communication and the basic theories that explain the perpetual disconnect between empirical evidence and public perception of climate science. Discussion of the psychological and cultural foundations of the American public's diverse climate change perspectives is also included. Understanding these foundations lays the groundwork for critically evaluating ineffective communication tactics and strategizing how to effectively foster citizen engagement in climate change.

Challenges of Communicating about Climate Change

Despite the progression and accumulation of empirical evidence, the American public remains divided over the scientific consensus of climate change.   A 2010 study from the Yale Project on Climate Change Communication revealed that the public is divided into six distinct categories of perceptions about climate change. These responses range across a spectrum of concern and engagement and demonstrate the relationships that exist among different political ideologies, cultural values, and policy preferences.   As such, climate change remains a divisive issue among Americans, and reports indicate that comprehensive scientific evidence and increased public education have done little to mitigate established opposing views.   Further, individuals who identify as politically moderate (self-identifying as merely

To best create an effective environment for citizen engagement in climate change, community educators must engage in the progression of contemporary communication strategies.

"leaning" liberal or conservative) are as polarized over climate change as the much smaller number of people who have strong partisan leanings.   Researchers studying the psychology of climate change communication suggest that the public's profound disagreement over the scientific consensus of climate change can be explained by various social and psychological tendencies.

In 2011, the American Psychological Association published a basic overview of the psychology of climate change consensus. The evidence suggests that the public tends to dismiss the presence or urgency of climate change in the absence of its immediate and visible impacts.   While the report indicates that the American public feels relatively apathetic about climate change, it assesses their concern about one of the commonly accepted consequences of climate change: extreme weather events. Individuals do not tend to be concerned about extreme weather events, in part because natural disasters have always happened. However, as soon as these individuals are affected by a severe weather event such as a hurricane or drought, they become overly concerned about climate change. Similarly, temporally and spatially disconnected climate change impacts (predicted in the long-term future or affecting distant places such as mountaintop glaciers) are often outweighed by the concern and immediacy felt by an individual's professional demands, social obligations, or physical needs.   As an array of socioeconomic issues remain at the forefront of American public policy and conversation, the absence of immediate and visible climate change impacts may cause individuals to believe that the issue lacks salience and relevance.

Research indicates that the complexity of climate change complicates efforts to effectively communicate the science behind it, rendering public engagement in the issue particularly difficult. Contributing to the public's apathy or dismissal of climate change is the fact that many past environmental crises have been associated with striking visuals.   For instance, devastating video footage of oil pumping into the oceans and iconic satellite images of the ozone hole have effectively triggered collective concern about the long-term and large-scale impacts of these environmental issues. The complex and gradual timeline of climate change impacts, however, does not offer any single visual image or news headline that will catalyze this kind of widespread concern. The lack of tangible impacts is compounded by the fact that the primary cause of climate change (greenhouse gas emissions from burning

fossil fuels) does not lead directly to immediate or noticeable environmental or human health impacts.

Communicating climate change presents additional challenges due to the consequences of increasing fragmentation among the U.S. media. Acting as information bridges between scientists and the public, the media have had a decisive role in shaping public understanding of climate change.   A 2007 case study analyzing journalistic norms in the U.S. concluded that a range of politicized environments and complex social dynamics among scientists, policy actors, and the public influence mass media coverage of climate change.   Whether consulting newspapers, cable television, or the Internet, an individual can easily avoid coverage about climate change, pay attention to entertainment-oriented news media, or tune in to his or her preferred ideological source for commentary. Unfortunately, many media outlets across these various genres have presented climate change as a political issue, engaging in the same type of distorted balance that is common in election coverage. As a result, the public has become misguided because they have mistakenly accepted politically influenced reports as unbiased facts.

By presenting substantial coverage of conflicting opinions on climate science, journalists have created the erroneous impression that there is limited scientific consensus on the nature and causes of climate change.   One such incident of biased media portrayal occurred when conservative think tanks and members of Congress sought to reject major policy proposals resulting from the Kyoto Protocol, a treaty that called for all nations to cut greenhouse gas emissions. In 1997, the U.S. Congress refused to ratify the Kyoto Protocol despite the fact that a strong majority of Americans supported it. Studies investigating this puzzling scenario found that the U.S. failed to pass this policy in large part because key conservative think tanks created a powerful countermovement that challenged the environmental community's definition of human-caused climate change as an issue of social and economic concern. Careful content analyses of reports published on the websites of 14 prominent conservative think tanks revealed a strategized effort to downplay climate change as a legitimate environmental or social issue.   As evidenced by this particular scenario, conservative Internet-based media sources have further contributed to the circulation of climate change misinformation.

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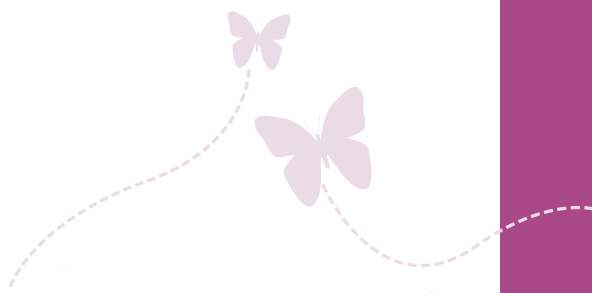
> Increasing climate change education is unlikely to make a significant contribution to public consensus on the issue.

As individuals tend to apply knowledge of other environmental issues, factors of cultural identity, social norms, and media representations when processing new climate change information, responses can range from absolute denial to feelings of powerlessness in the presence of threatening messages.   As such, some communication strategies may not be appropriate for the social and psychological processes of public engagement in climate change. As a result, many communication efforts use strategies that prompt public disinterest in the issue or reinforce established climate change misconceptions.   For example, scare tactics that rely on depictions of climate impact catastrophes have unintentionally reinforced partisan divisions over climate change, as this communication strategy tends to be dismissed as "liberal alarmism."   Studies investigating the barriers that limit participation in the climate change conversation have primarily concentrated on explaining the division among the public. However, psychology and communication experts are working to comprehensively understand these complex communication problems and how environmental educators and science communicators can overcome them.

Basic Theories at Work

As social scientists continue to learn more about the psychological tendencies that limit effective communication, new concepts and theories have emerged to explain how individuals process information. These ideas have progressed from the **Science Comprehension Thesis**, which defines communication as simply a process of transferring information, to two theories that recognize that a range of social cues and psychological tendencies underpin different communication strategies (**Identity Protective Cognition** and **Motivated Reasoning**). Such social and psychological factors are particularly important to consider when communicating about climate change, as the issue remains strongly connected to politics and opposing value systems in the United States. This section will briefly describe how considering social and psychological factors (such as **mental models**, **misconceptions**, and **confirmation bias**), improved and refined science communication theories. Understanding these theories and the psychological factors associated with them can define avenues for more effective climate change communication.

Recent research in the field of science communication suggests that increasing climate change education is unlikely to make

a significant contribution to public consensus on the issue. Rather, the specific psychological barriers to effective information acceptance must be considered and overcome. The perseverance of public conflict over climate change has led social scientists to consider several theories that may explain why science-based information has not significantly contributed to consensus on the issue. These theories cite individual and group psychological tendencies that lead people to disengage from or even resist acceptance of climate change information. Historically, climate scientists and educators, following the **Science Comprehension Thesis**, expected that wider public dissemination of the empirical evidence of climate change would motivate the public to regard it as an urgent issue. Within this theory, communication is considered to be a basic process of transmission. That is, scientific facts are assumed to speak for themselves, and their relevance and policy significance are interpreted by all audiences in similar ways. With this definition of communication, disagreement over the nature and causes of climate change is the result of a scientifically uneducated public that lacks the capacity to comprehend the widely accessible scientific evidence that would typically resolve these conflicts.

However, emerging theories within the psychology of climate change suggest that increasing climate literacy may not increase acceptance of the issue. Individuals show strong preferences for their existing **mental models**. A mental model is an explanation of an individual's thought process or perception of the surrounding world. Because individuals must fit new information into their existing mental models, they may process climate science by configuring the new information into a familiar cognitive framework. Because of these subconscious information preferences, people tend to dismiss, misunderstand, or discredit scientific evidence that will require them to alter their mental model. Although mental models can serve as filters that lead people to use selective knowledge, this may work to the advantage of climate educators, as they can use this knowledge to create strategies for making new connections within their audiences' existing mental models. Educators can ask participants questions that may reveal incomplete facts, past experiences, or even intuitive perceptions that may exist among the audience. The answers to these questions can be used as frameworks for guiding the development of appropriate communication strategies. Deciding how to best present climate science begins with discovering the perceptions that exist among audiences and using this information to engage people in concepts that enable them to build a more adequate understanding.

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> The complexity of the science, the distant and often undetectable impacts of a gradually changing climate, and the continuous presentation of politicized climate change reports are just several examples of the factors that contribute to persistent climate change misconceptions.

Misconceptions are a common part of the learning process and often begin when individuals form perceptions based on their mental models or everyday experiences. Simply put, a misconception is an opinion that is incorrect because it is based on faulty thinking or understanding. Extensive surveys of a wide variety of American voters have illustrated that individuals tend to apply concepts drawn from their understanding of other environmental problems (such as pollution and ozone depletion) to their fundamental understanding of climate change. This inappropriate application of information based on the individual's conceptual awareness of other environmental issues provides one explanation for how misconceptions about the nature and causes of climate change develop. Further, studies indicate that individuals tend to apply general concepts about the environment (such as observations about weather patterns) to form their perception of the existence and severity of climate change. While misconceptions may be a common part of the learning process, studies indicate that several psychosocial factors create a framework for the progression and perpetuation of climate change misconceptions. The complexity of the science, the distant and often undetectable impacts of a gradually changing climate, and the continuous presentation of politicized climate change reports are just several examples of the factors that contribute to persistent climate change misconceptions.

While social scientists previously accepted communication as simply a process of transferring information from one person to another (as described in the once commonly accepted Science Comprehension Thesis), contemporary theories in climate change communication suggest that subconscious psychological factors affect an individual's information acceptance. **Identity Protective Cognition** (IPC), which explains one such psychological tendency, is defined as the inclination of individuals to accept or dismiss climate change evidence based on their self-defining values. This theory states that different audiences interpret scientific evidence in different ways. IPC suggests that communication exists within two channels. "Channel one" consists of content information, and "channel two" consists of cultural meanings. Within this framework, individuals will assign meaning to messages based on their prior beliefs, attitudes, and values. This two-channel communication process may contribute to the acceptance and endurance of climate change misinformation and the challenges of effectively communicating climate science with the public.

Further, the Identity Protective Cognition theory splits the public into two general groups, hierarchical-individualists and egalitarian-communitarians. Hierarchical-individualists value commerce and industry and do not tend to believe that these activities may lead to large-scale environmental risks such as climate change. Egalitarian-communitarians tend to emphasize the faults of industry and commerce practices. As such, they are more likely to attribute climate change to these environmental risks.   Thus, the IPC theory suggests that efforts to publicly disseminate climate change information are missing target stakeholders because those who are communicating this information neglect to consider how these audiences interpret, comprehend, or reject their messages.

As previously mentioned, past science communication theories such as the Science Comprehension Thesis (SCT) neglected the psychological mechanisms that affect climate change information acceptance by stating that individuals simply lack the information or processing skills to accept climate science. Based on the effects of Identity Protective Cognition, science communication has further progressed to explain public acceptance of climate change through the **Motivated Reasoning Thesis** (MRT). This concept accounts for the psychological tendency of individuals to conform their assessment of information (whether empirical data, logical arguments, or the credibility of information sources) to an extrinsic interest that prevents them from forming an accurate perception.   This tendency of individuals to interpret information that conforms to one's preconceptions is known as "**confirmation bias**." Arguments among fans at a football game about the accuracy of referee calls are just one example of how the same evidence can be seen differently based on what the individuals expect or want to see.

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When people recognize that they are not in a position to assess empirical evidence about a topic or situation on their own, they tend to seek credible expert opinion. However, studies have demonstrated that identity protective cognition and motivated reasoning play a role in the evaluation of *trustworthy and credible experts.* Experts that individuals regard as credible are often ones that are perceived to share their values. Similarly, individuals tend to deny the trustworthiness of information sources whose
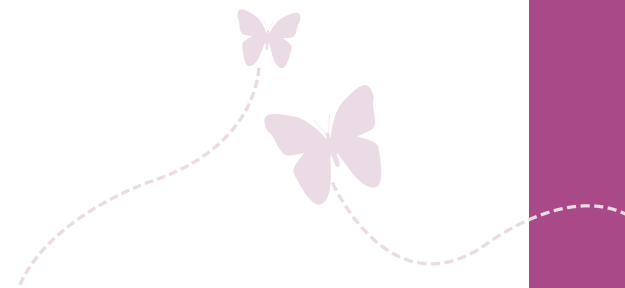
> Groups with conflicting worldviews tend to become more polarized, not less, when provided with empirical evidence about climate change.

worldviews oppose theirs. Since public media is the prevailing source that presently informs climate change opinion, the increasingly partisan nature of these sources is one explanation for the perpetual disconnect between objective reality and public perception of climate change. As different trusted media sources have presented the nature and causes of climate change for political groups in conflicting ways, the confirmation bias effect reinforces public division on the issue. As a result, groups with conflicting worldviews tend to become more polarized, not less, when provided with empirical evidence about climate change.

As long as learners are dedicated to a cultural group that has a strong opinion about climate change, additional information can fuel polarization rather than foster common understanding. Thus, science communication fails to bridge the divide between empirical evidence and public acceptance if it ignores the existing mental models of learners and the strength with which their models conform to their cultural group. These psychological, individual, and group tendencies rooted in personal and social investments and motivations contribute to the perpetuation of misconceptions and build barriers to effective climate change communication. Understanding how external and internal psychosocial factors contribute to the progression and perpetuation of climate change misconceptions is integral to the process of creating effective communication strategies that challenge and overcome these barriers.

Social scientists continue to study the relationship between numerous cognitive functions and climate change perceptions. Science communicators are beginning to recognize that social and psychological factors are important to consider when communicating climate change. However, merely understanding psychosocial theories is not sufficient to mitigate political debate and facilitate effective communication. Practitioners can establish and advance communication techniques that apply these theories through a better understanding of their audience; by identifying common ground among potentially opposing perspectives; by avoiding communication tactics that may hinder their efforts; and by crafting messages that foster information acceptance, interest, and motivation. The following sections outline how practitioners can use these strategies to foster more effective climate change communication.

Cultural factors help maintain these varying perceptions and communicating climate change and its solutions requires an interdisciplinary approach.

Climate Change Perceptions in the United States

Repeated national research studies conducted by Yale and George Mason universities suggest that the American public forms six coherent categories of climate change perceptions, each of which responds to the issue from different perspectives. The six categories, known as the Six Americas, range from "alarmed" to "dismissive." The conclusions suggest that cultural factors help maintain these varying perceptions and that communicating climate change and its solutions requires an interdisciplinary approach. A 2012 study sought to build on this research by surveying Extension professionals in the Southeast. The survey included items developed in the study conducted by Yale and George Mason universities to identify audience segments based on global warming beliefs. Interestingly, the Extension professionals, whose work involves science-based communication and education, mirrored the general public in their distribution of climate change perceptions.   In a free-response portion of the survey, respondents were invited to comment about climate issues in general. Representative themes that emerged from the range of respondent categories provide examples of how these perceptions vary **(Table 1)**.

Comments from all six categories suggest that the Six Americas model identifies distinct climate change perceptions. Similar to the Six Americas studies, the Identity Protective
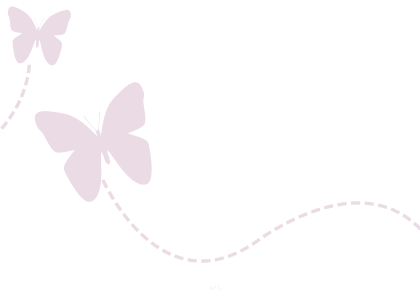
TABLE 1. **The Six Americas Categories**

1. ALARMED	"I feel the issues are huge and depressing."	*Highest belief; Most concerned and motivated*
2. CONCERNED	"Regardless of cause (natural, manmade, or a combination) I believe the focus needs to be on adapting to climate change."	
3. CAUTIOUS	"It is unclear to me what research-based information says about whether or not global warming is real."	
4. DISENGAGED	"Let's spend our time and energy dealing with the 'here and now' challenges we face living in the world…I don't have time to waste on this foolishness."	
5. DOUBTFUL	"I personally think it is arrogant to believe that we as humans are significant enough to be able to change the world's atmosphere and climate."	
6. DISMISSIVE	"Global warming is a hoax concocted to further the political and social agendas of powerful groups behind the politicians."	*Lowest belief; Least concerned and motivated to change policies to mitigate climate change*

Cognition theory splits the public into two general groups as previously described in this chapter (hierarchical-individualists and egalitarian-communitarians). These broad groups are reflected in the Six Americas categories. According to IPC theory, hierarchical- individualists, who value commerce and industry, are disinclined to believe that these human activities contribute to large-scale environmental risks such as climate change. Egalitarian-communitarians, as described within IPC theory, tend to be skeptical of industry and commerce and more readily credit these environmental risks.   Studies investigating these identity groups in relationship to environmental-risk perceptions have

demonstrated that these classifications "explain disagreements . . . more completely than differences in gender, race, income, education level, political ideology, personality type, or any other individual characteristics."   The Identity Protective Cognition theory suggests that cultural assumptions may help to maintain perception differences. However, despite these differences, general agreements among all these climate change perceptions do exist. **Table 2** outlines seven universal beliefs identified among these groups that may help practitioners to build upon this existing common ground. These areas of agreement were identified in a 2012 study among a group of Extension professionals that reflected a full spectrum of climate change beliefs.

TABLE 2. COMMON GROUND

Universal Themes
1. The economy plays a major role in addressing climate change.
2. Climate change is a global issue.
3. It is important to be a good steward of the earth.
4. Climate education is tricky.
5. There is confusion surrounding the issue of climate change.
6. Adapting to climate change is important.
7. Agriculture is impacted by climate change.

Developing a program that speaks to everyone is a challenge, since information that some people seek will cause others to stop listening. For example, presenting empirical evidence will not be well-received by those who believe scientists have untrustworthy agendas, but it will benefit those who are looking for science-based facts. Environmental education practitioners should assume that most groups are likely to include the full range of opinions and develop audience-based programs that are better able to attract, motivate, inform, and support diverse citizen identities. Regardless of the audience or the material presented, it is important to remind people of the effective actions they can take and the many ways people are adapting to climate change.

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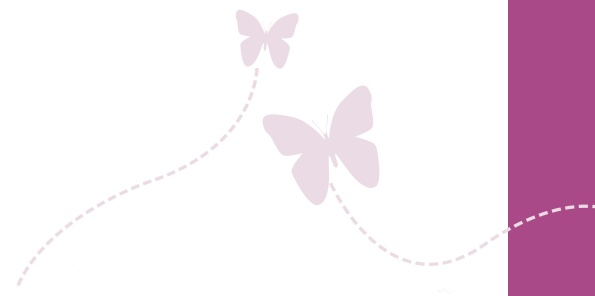
Failed Climate Change Communication Tactics

A range of complex factors contributes to climate change skepticism and the subsequent evolution of misconceptions among the public. Evaluating communication efforts that have failed to improve public climate change consensus provides valuable insight for the development of innovative and effective communication strategies. Studies indicate that increasing climate change news coverage is one such effort that has failed in the past. The U.S. government has not yet developed substantial public climate change education programs, and mass media and advocacy groups have become the public's primary source of climate change information.   As in other debates, such as the partisan conflicts on gun control, stem cell research, or abortion, the majority of the public tends to either ignore news coverage that conflicts with their preconceived opinion or interpret the claims as biased or rooted in self-interest.   It is not illogical for the public to feel this way, as the media often chooses to feature the messages of advocacy groups and political organizations who frame climate change to their target audiences.

Further, in an effort to pique interest and motivate action, educators may engage in climate change communication strategies that have proven to be ineffective in fostering citizen engagement. For instance, overloading people with information and data can provoke "protective backlash," according to IPC theory, which can cause certain groups to deny that environmental risks, such as climate change, are real or serious threats.   Moreover, flooding individuals with facts that threaten their cultural identity reduces their acceptance of the new information.

Enticing fear and alarm through visual and dramatic effects (for instance, as depicted in Al Gore's *Inconvenient Truth*) has also been proven to be an ineffective and potentially counterproductive communication strategy.   Critics effectively interpret these communications as "liberal over dramatization," further reinforcing partisan division over the issue.   Additionally, the alarmism strategy tends to engender negative feelings that lead to public disengagement. In essence, the public has translated these fear-induced appeals into feelings of powerlessness, hopelessness, or apathy. Ultimately, communication efforts that follow this framework have perpetuated climate change complacency among the public.   Similarly, communications that have focused on

public accountability have largely failed to rally acceptance and concern about climate change. Some scientists and environmental advocates that are concerned about climate change have focused on public accountability. These advocates accuse the George W. Bush administration of putting politics ahead of the environment. Others have reported critical accounts of the nation's conscious environmental negligence. These "blame tactics" tend to perpetuate the public perception of climate change as an issue rooted in politics and partisanship rather than empirical evidence.   As partisan media tend to make politicized statements about climate change that interfere with public engagement in the issue, effective educators and communicators become increasingly valuable and important assets for initiating change.

Ideal Communication

Examining the theories that explain misconceptions about climate change can provide insight into the division between the public's diverse identities and their engagement in the climate change conversation. Various strategies for framing climate science in ways that ameliorate some of these challenges have been developed (for instance, see the guidebook The Psychology of Climate Change Communication).   Understanding the challenges of engaging the public in nonbiased climate change conversations is a way for EE practitioners to apply plausible strategies and methods that counteract these psychosocial barriers. For example, assessments of effective science communication have concluded that considering the values and perspectives of the audience is as important as the content of the message itself.   In addition, communicating the nature and causes of climate change to the public in ways that identify with group or individual values can ensure that people feel more positive about their ability to contribute to solutions.   People tend to feel more efficacious and motivated to change their behavior when they recognize how their individual values and group identities are connected to the environment and society. By understanding these relationships, individuals or groups are better equipped to work toward goals that they believe are important to their own personal and/or social identities and values.

To overcome communication barriers that may exist among diverse climate change perspectives, messages must be framed to demonstrate how the information is relevant to specific audiences. Message framing uses carefully researched metaphors, allusions,

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and examples to design an interpretive storyline that helps the audience make sense of and discuss an issue. All messages are framed in one way or another; there is no such thing as unframed information.   However, successful communicators are adept at using frames intentionally and intuitively to convey a meaningful message. Climate change can be consciously framed in a way that resonates with a target audience. Studies indicate that an audience will likely understand and accept new information about climate change if they perceive it to be legitimate, salient, and relevant.   A researcher at NASA's Goddard Institute for Space Studies, Gavin Schmidt, Ph.D., explains that individuals have "a desire to explain everything that [they] see in terms of something [they] think [they] understand."   The strategy of framing can make credible climate science more accessible to the public and can help practitioners organize central ideas and present the issue with greater apparent relevance. Several climate change frames that research has demonstrated to be particularly effective are described next.

Science communicators highlight two key frames—one that speaks to an individual's mental model (that is relevant and meaningful) and one that speaks to an individual's cultural identity (e.g., individual rights or collective rights). For example, describing the effects of climate change at a local level and explaining how climate change impacts will likely affect everyday lives brings greater meaning and personal relevance to the issue. People are more likely to care about climate change and change their behavior if they believe they can contribute to solutions. Creating a sense of agency is a key factor to effectively engaging people in complex problems, and solution-based frames have been found to be powerful climate change communication techniques. Further, explicitly discussing how individuals can contribute to solutions, the responsibility of other actors, and the connections between individual and collective action can help individuals understand their roles and agency in initiating change. Recalling the effects of Identity Protective Cognition and the psychological importance of self-interest reminds us that effective environmental education and interpretation relies on understanding the audience's values, attitudes, and beliefs.   Though there may be no such thing as a "general public," tapping into values that are largely shared by humanity as a whole, such as personal and community health, well-being, and prosperity, allows communicators to craft novel, accessible, and relevant climate change narratives.

Climate science communication researchers are developing strategies aimed at increasing people's motivation to engage in

climate education by reframing the relevance of climate change in ways that connect to a broader coalition of Americans; applying research from science communication and other disciplines to tailor messages to existing attitudes, values, and perceptions of different audiences; and making complex science and policy discussions understandable, relevant, and personally important.   Effective climate change communication strategies address the psychological tendencies that cause individuals to selectively accept or reject climate change information regardless of what the scientific evidence suggests. The Identity Protective Cognition thesis suggests that individuals may identify with numerous roles and identities, each of which has its own set of values and goals.   Thus, even when goals of diversified identities conflict with one another, individuals can resolve that conflict by deciding which identity is most relevant in the given situation.   Based on these notions, environmental educators can develop methods for engaging the public in unbiased climate change communication by tapping into identities and affiliations associated with and shared by their target audiences.

Conclusion

In recent years, climate change has been increasingly discussed nationally and internationally. One of the drivers of this discourse is an attempt by the environmental education community to develop the public knowledge and skills necessary for addressing the issue. Effective communication strategies that recognize and address common misconceptions in a way that affirms rather than threatens psychosocial values is the first step to achieving this goal. Similar to fans at a football game, people deal with evidence selectively in order to promote their emotional interests in a group. On any number of issues ranging from climate science to genetically modified organisms, individuals rely on self-identifying social cues and the "cheers and boos of their home crowd" to assess what they believe.   However, unlike fans watching a football game, citizens who have conflicting cultural perceptions are arguably rooting for the same objective goal: the health, safety, and economic well-being of society. To overcome barriers to effective communication, the field of environmental education must identify strategies for presenting climate change information through meaningful cultural narratives that emphasize solutions rather than problems and that promote feelings of personal efficacy and tap into self-identities.

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Suggestions for Practitioners

Practitioners who want to create cultural narratives might consider the following steps in communication efforts:

1. Know your audience. We understand that mental models shape individuals' perceptions, actions, and behaviors—they influence how people assess information about complex topics and define how people approach and solve problems. Investigating what an audience already thinks or feels about climate change may help you identify misconceptions. Strategies can then be applied to disconnect inaccurate climate change information and insert new building blocks into existing mental models. Some practitioners believe that changing attitudes is the best way to effectively communicate climate change; others think that appealing to an individual's self-interest is more useful. As you are unlikely to have a homogenous audience, it is important to understand the multiple reasons that people in your audience might care about climate change and provide multiple frames to communicate to these diverse values.

2. Try framing. Once you have a sense of your audience's existing mental models, use a frame to situate climate change within an appropriate context. This will improve how the audience perceives new information. When using frames, consider the audience's membership in specific identity groups and select frames that will resonate with them. Presenting multiple frames helps to ensure that you speak to a variety of audience perspectives (climate change as an economic, environmental, and/or social issue.) Framing climate change through examples of local impacts, action-based solution seeking, and effects on specific social or economic impacts on individuals can also be effective frames. Remember that your audience members can tap into multiple identities (e.g., parent, CEO, homeowner), even when the goals of the various identities may conflict with each other. Individuals can decide which identity is most relevant in a given situation.

3. Avoid overusing emotional appeals. Though emotional appeals may increase interest in the short run, they can produce negative consequences that are often difficult to reverse; for instance, fear-based denial or feelings of powerlessness can lead to public disengagement. Provide the audience with additional reasons to remain engaged. For example, explain how efforts to reduce greenhouse gas emissions can improve overall social welfare through collective actions. Certain emotional appeals (such as images of a polar bear appearing lost on a floating iceberg) can trigger affiliations with social or political identities that may cause certain individuals to reject or dismiss climate change information.

4. Make behavior change easier. Provide specific and immediate actions so your audience can gain a sense of agency and thus improve the likeliness that members will act. Encourage participation in the decision-making process. Stakeholders who feel included in the processes are more likely

to support the outcome. Leave ample time for discussion and assure participants that even small changes can help mitigate the effects of climate change. You may wish to emphasize that environmental policies tend to be incremental in nature—policies that require a significant number of people to change their behavior are not typically passed into law all at once. By making socially beneficial decisions that mitigate climate change in their own lives and encouraging others to do the same, participants can help make behavioral changes a social norm. Once these behavioral patterns are more common, policymakers are more likely to pass laws that facilitate these positive changes throughout society as a whole.

5. Tap into self-identities. As we understand from the Identity Protective Cognition theory, individuals tend to associate with similar individuals (e.g., in age, gender, class, values, education). Considering the shared characteristics among an audience can improve your ability to appeal to the group commonalities. Individuals who feel an affiliation with a group are more likely to cooperate in environmental decisions. Appealing to group identity can foster group goals, participation, and cooperation among the audience. Further, increasing understanding and a sense of community among the audience may encourage group acceptance and motivation to change.

6. Go local. Focusing on local evidence or projects illustrates the relevance and salience of climate change to individuals' lives and communities. Some audiences might perceive climate change as a threat to other parts of the world or to plants and animals but not to people and society. As such, presenting examples connected with the local area, such as projected impacts on local water resources or changes in local habitats, can help make audiences feel connected. Similarly, illustrating climate change solutions on a local level will improve audience members' sense of agency and motivation to act.

7. Provide other reasons to care. Environmental impacts are perhaps the most frequently discussed consequences of climate change. But what other aspects of local and global society will be affected by climate change? Providing a holistic picture of climate change impacts by discussing its economic, social, and/or political implications will help the audience to perceive the long-term and wide-ranging issues that we may face in a changing climate. Incentives to act vary across cultural groups and value systems. Individuals with diverse identities are concerned with diverse issues. Providing multiple reasons to care about climate change and multiple examples of how to address the issue will make your communication efforts receptive to a greater diversity of audiences. Further, communicating the potential impacts of climate change within different sectors of society may improve the audience's practical understanding of climate science and increase their motivation to seek innovative solutions.

Chapter 11 Endnotes

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The Development of Children's Environmental Identity

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Formative experiences *in* nature are significant in children's early development   and to the development of an environmental identity. Childhood experiences in nature have also been found to influence adolescents and adults' willingness to engage in environmental action,   which is the primary goal of environmental education.   Because a strong environmental identity is a predictor of willingness to act for the environment, it is important to understand how such identity develops.

Susan Clayton and Susan Opotow defined environmental identity as an aspect of self-identity that considers an individual's self-concept in relation to the natural world. As Clayton explained,

> *Environmental identity is one part of the way in which people form their self-concept: a sense of connection to some part of the nonhuman natural environment, based on history, emotional attachment, and/or similarity, that affects the way 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.*

Environmental identity is important because it reflects how an individual's sense of self directs his/her actions and behaviors for the environment.   Further, because identity theories recognize larger social structures, they are better suited for *predicting* environmental behaviors across situations than theories on *how* attitudes towards the environment affect behaviors. Identity considers values and attitudes along with emotive, moral, and social cognitions related to an individual's sense of self; these cognitions influence the way an individual acts and behaves across various contexts and situations.

A person's environmental identity can range on a scale from low to high, with a stronger identity resulting in stronger motivations and commitments towards "personal, social, and political behaviors"   and a low-level identity indicating a disinterested relationship with the environment. Recently, scholars have begun to examine how environmental education can shape one's environmental identity.   Notably, action-oriented dispositions do not automatically appear over night; rather they are gained and supported through sustained and meaningful experiences *in* and

with nature. So what kinds of environmental experiences and what attributes are important in the development of a strong and healthy environmental identity? And how can caregivers and educators support children's environmental identity development?

Environmental Identity Development

In this chapter, I present a framework for Environmental Identity Development (EID) that considers the progression of children's identity development in an environmental education context. The EID model draws from environmental education research as well as traditional theories of child development (i.e., Erik Erikson) and contemporary sociological understandings of childhood.   It recognizes children's autonomy and agency in constructing their own relationships and understandings of the natural world. The EID model surfaced from my research on young children's special places,

which provided an understanding of how Spatial Autonomy and Environmental Competency are important aspects of young children's identity development. Furthermore, the stages of the model and examples shared in this paper are informed by preliminary findings from a recent research project aimed at engaging children as active researchers in a forest setting.

The EID model draws from Erik Erikson's "life cycle" development model,   with a particular focus on the first four stages of identity development, which occur between birth and the middle childhood years. Erikson recognized both biological and environmental implications of children's development, as well as children's own initiative to learn. He proposed that children progress through a series of psychosocial dilemmas (i.e., Trust vs. Mistrust, Autonomy vs. Shame and Doubt, Initiative vs. Guilt, and Industry vs. Inferiority) as they refine their personal identity. Progression through each stage, or psychosocial dilemma, is determined by children's success in overcoming outer conflicts, those that exist in the environment, and inner conflicts, those of a personal and psychological nature. Erikson also recognized that positive support from caregivers and adults is essential in promoting a healthy sense of self.

> Children progress through a series of psychological stages in the development of their environmental identity.

In the same way, I propose that children progress through a series of psychosocial stages in the development of their environmental identity. Progression through each stage is thus determined by a child's success in navigating challenges and potential dangers in nature as well as the ability to discover who she/he is in relation to the natural world. Healthy and supportive interactions with peers and adults, including those facilitated through environmental education, are important to the promotion of a strong and healthy environmental identity.

Each of Erikson's stages of psychosocial development can be related to environmental identity attributes that can be promoted through environmental education **(Table 1)**. It is important to note that although general timeframes are suggested, the progression of children's EID is fluid, meaning that attributes may be revisited, refined, and/ or reestablished with new encounters and experiences in nature throughout one's life. Additionally, while Erikson emphasized important milestones of development in the early years, I argue that EID can occur across a lifetime, although meaningful early childhood experiences in nature are extremely significant and can have a lasting impact on the development of one's environmental identity. Furthermore, it is important to understand that the development of each child's environmental identity is different and is influenced not only by experiences but also family, sociocultural, and geographical contexts.

TABLE 1. Erikson's Stages of Psychosocial Development in an Environmental Education Context

Stages of Erikson's Psychosocial Development Model	Extensions for Environmental Education
First Stage	**Foundation**
Trust vs. Mistrust (Birth to 18 months) During this stage, infants learn to trust adult caregiver(s) to provide for their needs. This includes basic physical needs such as satisfying hunger and changing an uncomfortable diaper as well as socio-emotional needs such as consistent comfort and affection. When care from adult(s) is inconsistent, inattentive, and abusive, infants develop mistrust and begin to perceive their world as an unsafe and unpredictable place.	**Trust in Nature vs. Mistrust in Nature (Birth to Adult)** Through positive interactions in the natural environment, infants begin to see themselves as part of the environment. Educators should strive to provide children with consistent encounters with nature by taking children outside, talking about natural surroundings, and providing opportunities to see, smell, hear, and touch nature. Lacking, inconsistent, or anxious encounters in nature may lead children to develop mistrust or a fear of nature. Educators should ensure that nature experiences are positive and frequent.
Second Stage	**First Progression**
Autonomy vs. Shame and Doubt (1 to 3 years) As toddlers become more coordinated in motor skills, they gain competencies in their abilities to move their bodies and manipulate objects in their environments. With this independent mobility, toddlers start to recognize themselves as autonomous individuals and become more capable of satisfying their own needs (e.g., dressing themselves and learning how to use the toilet). When caregivers encourage toddlers to practice these self-sufficient skills, toddlers develop an ability to tackle tasks and problems on their own. On the other hand, when support is lacking or caregivers become impatient, toddlers may experience feelings of shame and doubt and become discouraged in approaching tasks independently.	**Spatial Autonomy vs. Environmental Shame (1 year to Adult)** Children start to form an understanding of the natural world through exploring and claiming their own places. In this way, children develop a sense of *Spatial Autonomy*. Educators play a significant role in supporting children in their exploration through providing access to various landscapes and "loose parts," or natural objects, for play and manipulation. Although such play promotes autonomy and independence, children often remain in close proximity to adults. Thus, adults must encourage and allow children space to explore and develop their own understandings of place. Discouragement from adults may lead children to associate feelings of shame or doubt with the natural environment.
Third Stage	**Second Progression**
Initiative vs. Guilt (3 to 5 years) In the preschool years, children's growing sense of autonomy evolves into initiative, the undertaking and planning of tasks. Here a child may exercise his or her own ideas through play and other activities. For instance, young children may role-play real or imagined scenarios in discovering who they are as individuals. When caregivers foster and support children's creative ideas, children gain a sense of excitement and initiative to try new things. On the other hand, if they are made to feel incompetent about their ideas or initiatives, children may develop a sense of shame and guilt about their abilities.	**Environmental Competency vs. Environmental Disdain (3 years to Adult)** Through positive experiences in nature, children gain a sense of *Environmental Competency* to further manipulate natural objects for use in personal or social situations. Fantasy play and experimentation provides children with opportunities to exercise their creativity, and emerging critical thinking and problem-solving skills to symbolically represent objects or scenarios (e.g., using a stick as a spoon, creating a "house" in a bush, building a bird's nest). By limiting opportunities for open-ended play in nature, children may develop feelings of *Environmental Disdain*, leading to contempt or a separation between the human "self" and living and nonliving aspects of nature.
Fourth Stage	**Third Progression**
Industry vs. Inferiority (6 to 10 years) As children transition into primary school, their initiative shapes into a sense of industry driven by academic achievement, pleasing peers, teachers, and adult authority figures. With support and encouragement, children attempt and achieve tasks set before them and pursue new interests and challenges. On the other hand, when children are overly critiqued and made to feel that their abilities do not measure up, they may develop a sense of inferiority coupled with feelings of doubt in their abilities to conquer challenging tasks on their own.	**Environmental Action vs. Environmental Harm (4 years to Adult)** In building upon *Environmental Competency* developed in previous stages, children's play can be turned toward developing skills and tools (industry) that can be applied to real-world scenarios. Thus, educators play an essential role in modeling and helping children consider ecological values and behaviors, while also promoting inquiry and action in response to environmental challenges. Failure to promote positive actions in the environment may result in behaviors that promulgate *Environmental Harm* or neglect (e.g., littering or environmental defacement).

> It is important that educators and caregivers ensure children's physical and psychological comfort.

In the sections that follow, I present each progression of EID in more detail. I also provide examples from published studies and preliminary findings from a recent forest research project with young children. However, before discussing the progressions of EID, let us revisit Arthur Lucas' framework of education *in, about*, and *for* the environment in order to consider how the various contexts of this framework might become the focal point for nurturing children's EID. Specifically, education *in* the environment is primarily concerned with facilitating environmental education experiences in nature, thus, inspiring children to develop relationships with the nature world. Education *about* the environment focuses on building environmental knowledge, understandings, and awareness of ecological processes. Education *for* the environment is mainly directed towards promoting positive conservation behaviors and environmental actions. These areas of emphasis will be revisited later in this chapter, but for now let's explore the attributes associated with children's EID.

Trust in Nature vs. Mistrust in Nature

Beginning with *Trust in Nature,* feelings of assurance and comfort in nature, versus *Mistrust in Nature,* feelings of anxiety and discomfort, are fundamental to a child's ability to progress along the continuum of healthy EID. In facilitating nature experiences, it is important that educators and caregivers ensure children's physical and psychological comfort (i.e., proper attire and support when encountering new things). Educators should also promote sensory-rich and consistent encounters with natural surroundings. Primitive places with native habitats often yield richer and more complex encounters with nature than human-built natural landscapes. While both are beneficial, the former may prompt children to develop a relationship with their local ecology that supports children in gaining an appreciation for the diverse flora and fauna of their local biosphere. Additionally, more often than not, wild, ungroomed places present challenges for children to overcome; overcoming such challenges strengthens their identity development. It is also critical that adults facilitate a healthy respect for nature's inherent challenges and dangers. This, in turn, guides young children in gaining a sense of comfort in nature while recognizing that there are certain aspects of nature that pose risks and potential danger. For

instance in our forest research project, prickly rosebushes presented an "outer" dilemma for children during their first exploration of the forest. From a child's height, the towering rosebushes at or above eye level appeared overwhelming. At first sight of the "prickly bushes," one child nearly ran into a divider that blocked motorized traffic from entering into the forest. "There's prickly bushes everywhere!" he exclaimed and continued to call out over and over again throughout his exploration. Additionally, instead of wandering out on their own, many of the children clustered together moving slowly between and around the bushes. More confident peers paused to help their friends when their clothes got caught or snagged in the spikey branches. One child paced back and forth, talking to himself, "I am not scared of the bushes." Several teachers asked him if he needed assistance; it seemed, however, that he was engaged in an inner debate to gain a sense of trust in this new environment. Eventually he mustered up the confidence to venture farther into the forest. Teachers also guided children who became overwhelmed by the bushes. I observed more confident peers teaching their friends who were stalled or delayed by the bushes. One teacher calmly showed a child, who was not sure what to do, how to navigate through, over, or around the rosebushes. With support from their peers and teachers, the children developed a sense of trust in their own abilities to "stomp" over or use a stick to push through the prickly rosebushes. Instead of becoming anxious or fearful of the aspects of nature (i.e., rosebushes) that presented challenges, they gained a sense of trust in their new environment, propelling them in the progression of their EID.

Spatial Autonomy vs. Environmental Shame

A trusting bond secures a developing relationship with nature that allows children to venture out, independently or collectively with others in order to achieve *Spatial Autonomy.* Children achieve *Spatial Autonomy* through gaining control over particular spaces and objects.   Contrary to gaining *Spatial Autonomy* are feelings of doubt or *Environmental Shame* associated with nature experiences. Such negative cognitions occur when adults discourage or prohibit children's

Children achieve Spatial Autonomy through gaining control over particular spaces and objects.

independent exploration in nature or when repeated anxious encounters with nature cause children to feel inadequate in the natural environment. Initially, young children may discover nature in close proximity to adults, but as their level of comfort matures they venture farther on their own. For instance, in our forest research many of the younger children stayed on the trail and close by the teachers. They looked to the teachers for encouragement to play and explore. The teachers, sensitive to the children's needs, prompted them to take notice of different aspects of nature (e.g., growths on trees, caterpillars, colors on trees). Overtime, the children began to point out aspects of nature that they noticed as well. In this way, the children gained a sense of autonomy in their surroundings. After a few visits to the forest, most of the reluctant children ventured off the trail, exploring on their own and with peers.

Additionally, in my study of young children's special places, I found that 3-to-5-year olds claimed spaces in their home environments to call their very own (e.g., under tables, behind couches). In these spaces, they gained autonomy to choose what they wanted to play and who they wanted to share the space with. Although the children showed or told me about their places, I was never invited to join them in these spaces. Similarly, in our forest research, I observed children claiming forts under trees, castles on high branches, and houses where they could share leaf cookies and flower cakes. I observed children return to the same spaces over and over with each visit to the forest.

What is the adult's role in supporting children in their development of *Spatial Autonomy*? Educators should allow for a certain level of risk taking behaviors in children's engagement with nature. They should also provide them with the space to claim these places alone or with their peers. These claimed spaces provide psychological benefits for children by allowing them to partake in real and imaginary roles and socially engage with peers and animate and inanimate objects. Through these personal and shared interactions, children establish a sense of place and construct their own identity in nature. While caregivers or teachers may be hesitant to allow children to climb on tree branches high above the ground, it is through such risk and independent experiences that children gain *Spatial Autonomy* and confidence in securing *Environmental Competency*.

Environmental Competency vs. Environmental Disdain

Healthy cognitions connected with discovering a sense of *Spatial Autonomy* provide children with opportunities to acquire *Environmental Competency*   gained through experimentation and creative innovations, which enrich children's connections and experiences in nature. The opposite, a lack of opportunities to take initiative in nature, could lead to *Environmental Disdain*, or cognitions of contempt that separate children from the natural world. Disdain, applied here, refers to children's development of environmental disinterest or the belief that nature is unworthy of respect. Fantasy play and experimentation afford children opportunities to exercise their creativity, critical thinking, and problem-solving skills to symbolically represent objects or scenarios (e.g., transforming a stick into a sword, imagining peeled bark to be binoculars).

A caregiver or educator's role is to provide a balance between child-initiated and adult-supported activities. By encouraging open-ended exploration in nature, educators can build on children's interests by asking questions and helping to facilitate new insights about their environments. For instance, in our forest research a child became very excited when he spotted a stinkbug crawling on the trunk of a tree. The teacher, taking note of the child's excitement, promoted inquiry by asking, "How big?" and "Does it smell stinky?" In modeling excitement and careful observation, the teacher not only encouraged the child to further explore, she also prompted him to verbally articulate his understanding. Thus, beginning with open-ended interactions with nature supports children in exercising their own initiative; likewise, modeling and discussion serve to expand children's *Environmental Competency* through connecting their discoveries with shared understandings about the natural world.

Environmental Action vs. Environmental Harm

As Trust in Nature provides the foundation of children's environmental identity development, a strong sense of *Spatial Autonomy* and *Environmental Competency* promote children's engagement in *Environmental Action*, which is manifested by their exercise of agency to sustain, conserve, and protect nature. On the other hand, lack of progression in any one of the preceding environmental identity attributes

> Adults can provide a balance between child-initiated and adult-supported activities.
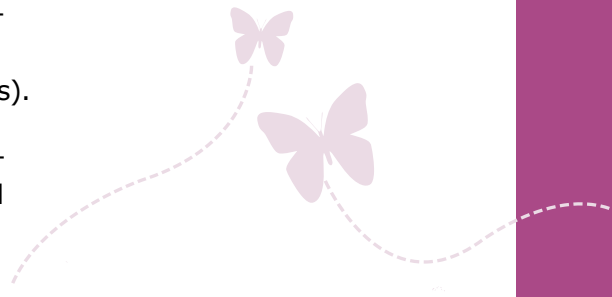
(*Trust in Nature, Spatial Autonomy,* or *Environmental Competency*) may lead children to engage in behaviors or develop dispositions of *Environmental Harm* leading to ignorance of or a disregard for the natural world (such as littering or smashing a bug). Engagement in *Environmental Action* is an indicator of a strong and healthy environmental identity. Once again, adult caregivers and educators as well as peers and families play an essential role in modeling and helping children consider ecological values and behaviors, while also promoting inquiry and action in response to environmental dilemmas.

For example, on the way back to school from the forest some of the children noticed a caterpillar displaced on the concrete sidewalk. Many gathered around to consider the situation. After some deliberation and negotiation the children took into account the needs of the caterpillar and the elements it needed to survive. Carefully placing a leaf on the ground for the caterpillar to crawl onto, a child gently picked it up and moved it to the grass near a tree. Thus, in this example, feelings of *Trust in Nature* (not being afraid to pick the caterpillar up) as well as *Environmental Competency* (knowing what the caterpillar needed) provided the impetus for the children's engagement in *Environmental Action.*

Refining Environmental Identity Development: A Continuous Process

A Model of Environmental Identity Development positions children as active in the construction of their EID **(Figure 1)**. Adults and peers also are depicted in the model as they play an essential role in supporting and encouraging children's EID. The model depicts the four psychosocial dilemmas that refine children's Environmental Identity Development through experiences *in, about,* and *for* the environment, revealing an interdependent system of ever-broadening circles that build from one progression to the next.

FIGURE 1. Model of Environmental Identity Development.

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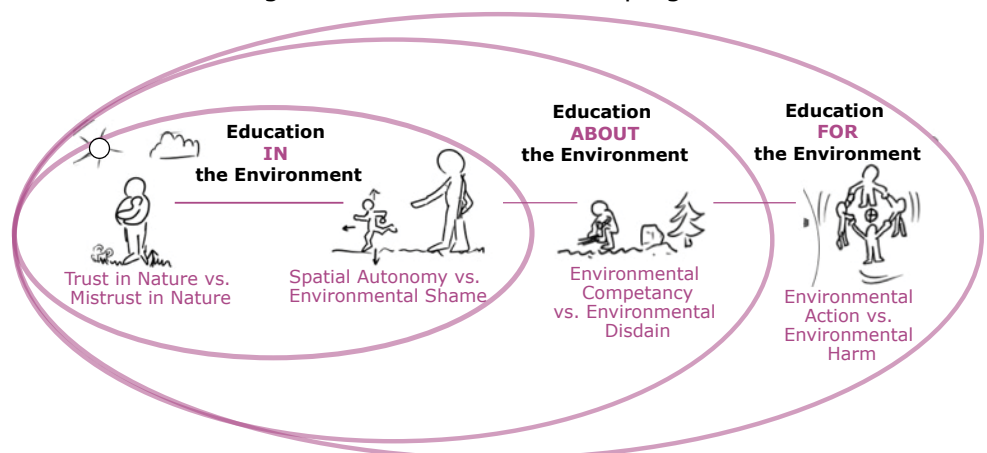
Progression of EID is fluid; that is, exposure to new or unfamiliar aspects of nature may require children to reestablish, revisit, or renew attributes associated with the various progressions of EID. For instance, children may feel secure enough to tap a stick on a tree or venture ahead during a daytime hike. However, experiencing the same trail in the dark may cause children to clam up and invoke feelings of fear, anxiety, or insecurity (*Mistrust in Nature*). While this, in essence, is an expected response to an unfamiliar setting or new aspect of nature, adults should reassure children and help them negotiate their fears so that they may regain a sense of comfort and security. For instance, adults may initially hold a child's hands as they venture into the forest, invite them to shine a flashlight into the dark shadows of the trees, and encourage them to pause and listen to the sound of an owl or other nocturnal creatures that stir in the night. As children begin to recognize and grow familiar with nighttime forest life, they will regain a sense of trust and security, venture out to gain autonomy and confidence, and build competency and assurance that will contribute to their EID. With each new encounter with nature, children will refine attributes of the various EID progressions; this progression may occur slowly or rather quickly depending on a child's previous experiences *in*, *about*, and *for* the natural world.

> Children's EID is strengthened through the negotiation of tensions posed during their engagement with the natural world.

Conclusion

Children are active agents in the construction of their environmental identities and their growing sense of self in relation to the natural world. The EID model provides a framework for educators to consider as children develop environmental identity (e.g., *Trust in Nature Vs. Mistrust in Nature, Spatial Autonomy vs. Environmental Shame, Environmental Competency vs. Environmental Disdain,* and *Environmental Action vs. Environmental Harm*). Children's EID is strengthened though the negotiation of tensions posed during their engagement with the natural world: outer (e.g., a prickly rosebush) or inner (e.g., negative emotions). Through positive, supportive, and frequent experiences in nature (i.e., open-ended play, exploration, and experimentation) as well as interactions with peers, caregivers, and educators, children grow in their dispositions and attributes, which promote relationships with and care for the natural world.

Chapter 12 Endnotes

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

2. Chawla, 1999 (see note 1); also see J. A. Palmer, and J. Suggate, "Influences and Experiences Affecting the Pro-environmental Behaviour of Educators," *Environmental Education Research* 2, no. 1, 1996:109-121, and N. Wells and K. Lekies, 2006. "Nature and the Life Course," *Children, Youth and Environments,* 16, (1), 1-24. Retrieved from www.colorado.edu/journals/cye

3. The Belgrade Charter states the goal of EE as "to develop a world population that is aware of, and concerned about, the environment and its associated problems, and which has the knowledge, skills, attitudes, motivations and commitment to work individually and collectively toward solutions to current problems and prevention of new ones, see also UNESCO 1976. *International Workshop on Environmental Education, Belgrade (Yugoslavia), October 13-22 1975*. *Final Report*. Paris: Author. The Tsilisi Declaration further emphasized action as the primary goal of environmental education, see also UNESCO. 1978. *Intergovernmental Conference on Environmental Education: Tsilisi (USSR), October 14-26 1977 Final Report*.

4. For both theoretical and empirical arguments supporting environmental identity, see S. Clayton and S. Opotow. *Identity and the Natural Environment* (Cambridge, MA: MIT Press, 2003).

5. Susan Clayton proposed a definition for environmental identity, see S. Clayton and S. Opotow, "Environmental Identity: A Conceptual and Operational Definition" in *Identity and the Natural Environment,* 45-46 (Cambridge, MA: MIT Press, 2003).

6. For an extended argument about why environmental educators should consider environmental identity, see: P. Payne, "Identity and Environmental Education, *Environmental Education Research* 7, no.1 (2001):67-88.

7. Environmental sociologists have also argued the importance of environmental identity, see J. E. Stets and C. F. Biga, "Bridging Identity Theory into Environmental Sociology," *Sociological Theory* 21, no. 4 (2003): 398-423.

8. Clayton, 2003, p. 46 (see note 9).

9. See S. Stapleton, "Environmental Identity Development through Social Interactions, Actions, and Recognition," *The Journal of Environmental Education,* 46, no.2, (2015): 94-113; E. Evans, C. C. Ching, and H. L. Ballard, "Volunteer Guides in Nature Reserves: Exploring Environmental Educators' Perceptions of Teaching, Learning, Place and Self," *Environmental Education Research* 18, no.3, (2012): 391-402; E. Blatt, "Uncovering Students' Environmental Identity: An Exploration of Activities in an Environmental Science Course," *The Journal of Environmental Education* 45, no. 3 (2014): 194-216.

10. For thorough coverage of theory and research on the sociology of childhood, see W.A. Corsaro, *The Sociology of Childhood*, 5th ed. (Thousand Oaks, CA: Sage, 2015).

11. See C. Green, "A Place of My Own: Exploring Preschool Children's Special Places in the Home Environment," *Children, Youth, and Environments* 21, no. 2 (2011): 118-144; C. Green, "A Sense of Autonomy in Young Children's Special Places," *International Journal of Early Childhood Environmental Education* 1, no.1 (2013): 8-33.

12. The overarching goal of the research project, facilitated in summer 2015, was to explore methods for engaging children as active researchers in a forest setting. Thirty 3-to-6-year-old children wore Go-pros, took photos with iPads, created art, built models, and engaged in role-playing to explore their own and their peers' experiences of the forest. The children analyzed and interpreted their findings through video discussion and book-making activities and presented their findings to parents and the larger community.

The research provided insight on children's environmental identity development as it highlighted their perspectives, feelings, thoughts, beliefs, and actions in relation to their forest experiences. The project was supported by Undergraduate Research and Scholarly Activity (URSA) funds at the University of Alaska Fairbanks as well as support from Alaska EPSCoR NSF award #OIA-1208927 and the state of Alaska.

13 Erikson proposed eight life cycle stages of identity development, with the first four focusing on development during early and middle childhood; see E. H. Erikson,. *Identity and the Life Cycle* (New York, NY: Norton & Company, 1980).

14 This table is adapted in part from Table 1 in an article published in En*vironmental Education Research, August 14, 2015, available online*: HTTP://WWW.TANDFONLINE.COM/DOI/FULL/10.1080/13504622.2015.1072136, DOI: 10.1080/13504622.2015.1072136.

15 See A. M. Lucas, *Environment and Environmental Education: Conceptual Issues and Curriculum Implications* (Melbourne, Australia: Australia International Press and Publications, 1979).

16 For a discussion of how Lucas' framework can be applied to an early childhood education context, see J. Davis, *Young Children and the Environment: Early Education for Sustainability* (New York, NY: Cambridge University Press, 2010).

17 For a more detailed exploration of the benefits of wildness in children's lives, see P. H. Kahn and P. H. Hasbach, *The Rediscovery of the Wild* (Cambridge, MA: MIT Press, 2013).

18 See H. M. Proshansky and A. K. Fabian, The Development of Place Identity in the Child, in *Spaces for Children: The Built Environment and Child Development,* ed. C. S. Weinstein and T. G. David, 21-40 (New York: Plenum Press, 1987).

19 Play in nature allows children the opportunity to take risks and become more familiar with the natural environment in building environmental competencies; see L. Chawla and M. Rivkin, "Early Childhood Education for Sustainability in the United States," in *Research in Early Childhood Education for Sustainability: International Perspectives and Provocations*, ed. J. Davis and S. Elliot, 248-265 (New York, NY: Routledge, 2014).

20 Roger Hart defined environmental competence as the "knowledge, skill, and confidence to use the environment to carry out one's own goals and to enrich one's experience"; see: R. Hart, *Children's Experience of Place,* 225 (New York: Irvington, 1979).

21 Socio-dramatic play has many benefits for learning; see S. Smilansky and L.Shefatya, "Sociodramatic Play: Its Relevance to Behavior and Achievement in School," in *Children's Play and Learning: Perspectives and Policy Implications*, ed. E. Klugman and S. Smilansky, 18-42 (New York, NY: Teachers College Press, 1990).

22 Also described as "purposefully framed play"; see A. Cutter-Mackenzie and S. Edwards, "Towards a Model for Early Childhood Environmental Education: Foregrounding, Developing, and Connecting Knowledge Through Play-Based Learning," *Journal of Environmental Education 44* no.4 (2013): 195-213.

Perspectives on Community Environmental Education

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The purpose and goals of community Environmental Education

This is an exciting time for community approaches to environmental education (EE). In addition to an increasing number of programs examining the connections between social and ecological factors in EE,   a new set of principles for community EE have been developed.   Over time, community EE has taken different forms in both formal and nonformal contexts. This chapter provides a snapshot of a variety of community approaches to EE. We trace a tradition of community approaches, provide the recent set of principles for community EE, and offer examples of community EE in action.

Some would argue that a community approach to EE is not new. For instance many of the early definitions of EE suggest that it should include lessons in citizenry.   And community was mentioned in the 1977 Tbilisi Intergovernmental Conference on Environmental Education that suggested that "environmental education should bring about a closer link between educational processes and real life, building its activities around the environmental problems that are faced by particular communities and focusing analysis on these by means of an interdisciplinary, comprehensive approach."   More recent approaches such as place-based education also have a strong focus on activities taking place within communities.

Similarly, Education for Sustainable Development (ESD) explicitly calls for active and participatory learning to be rooted within communities   and seeks to empower learners to change behaviors and take actions that ensure a sustainable future for their communities. This mandate grew from concerns about social and economic equity, and incorporates social issues such as poverty, health and human rights.   ESD bears similarities to environmental justice and similar forms of EE that emphasize power relations.   However, because of its explicit focus on the human component of environmental issues, on the connection between environmental health and human health, and on social and economic issues, some claim that ESD is a distinct field.

To explore community approaches to EE, chapter author Olivia Aguilar conducted a scholarly review of research articles using

the terms "community EE" and "community and EE." In the first section of this chapter, we describe the diverse traditions she uncovered and illustrate them with two example programs. The second part of this chapter describes the efforts lead by co-author Akiima Price to assess on-the-ground practices of EE and youth and community development professionals and volunteers in order to define community EE as a subfield within EE, and to develop a set of principles for community EE.

Diversity in community approaches to Environmental Education

A review of 25 studies examining community approaches to EE highlights diversity in everything from the origins of the program, to the audience, objectives, settings, and outcomes (which range from changes in parents' perspectives to accumulation of indigenous knowledge). Following are some highlights.

■ **Partnerships**. More than half the programs studied were initiated by or affiliated with local nongovernmental organizations (NGOs). Six studies examined projects initiated in large part by university research efforts, and eight studies examined programs initiated by and specific to a local school. However, many of the programs studied were collaborative projects among schools, NGOs, universities, and local government initiatives. A number of researchers have noted that these collaborations were important to the success of programs.   And, a number of studies (despite the goal origins or target audience of the program in study) have addressed the value of partnerships in strengthening program development, facilitation, or communication.

Environmental NGOs are significant sources for community EE programming and implementation, as they often have the funding, expertise, materials, and other resources to contribute to community collaborations.   Similarly, government agencies

> Environmental NGOs are significant sources for community EE programming and implementation.

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> A common theme among the studies was the importance of stakeholder input and stakeholder recognition for community empowerment.

that house field experts, such as states' Department of Natural Resources and Cooperative Extension offices, attempt to collaborate with community partners to develop locally situated solutions to the environmental issues within their jurisdiction.   However, on occasion, these entities can inadvertently create more community problems if the environmental issue or concern takes precedence over community well-being and empowerment. A misunderstanding of community issues and priorities can lead to mistrust between community members and NGOs or government agencies.

■ **Audiences**. In most of the studies, youth were the target audience. The NGO and university affiliated programs also often addressed community members, from children to the elderly.   Programs that involved local government partnerships were sometimes solely directed at adults.

■ **Stakeholders**. A common theme among the studies was the importance of stakeholder input and stakeholder recognition for community empowerment. Stakeholders include both those participating in the community EE programs as well as those impacted by the programs. Practitioners can provide stakeholders with recognition by increasing stakeholder visibility through media or presentations and/or providing spaces that allow for dialogue and connectivity between learning and concerns of participants. Practitioners can further empower stakeholders by including them in the development of educational tools that can be used within their own community.

■ **Outcomes**. Many studies on community approaches to EE evaluate program impacts on environmental knowledge, literacy, attitudes, and behaviors, which falls in line with general EE definitions and goals. Some also evaluate more affective traits such as increased self-esteem and cultural awareness. However, it is important to evaluate outcomes more specific to community approaches to EE, which generally are "collaborative, information based, and action oriented" and seek to empower communities as well as community members. Potential measures might include positive youth development, social capital, citizenship skills, and other forms of democratic participation.
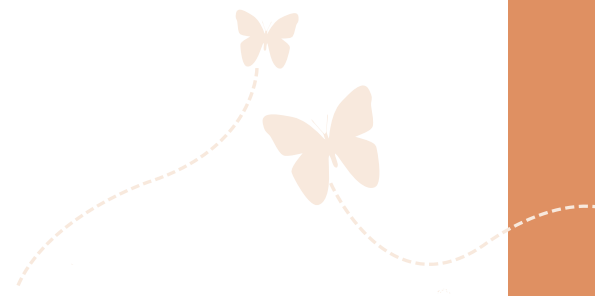
■ **Pedagogical approaches**. Community approaches to EE occur in formal and nonformal contexts and involve a diversity of pedagogical approaches. For example, place-based education (PBE) is inherently based within a community, as it suggests that learning should occur within one's immediate place. Antioch University professor David Sobel writes extensively on the value of PBE and notes that it is quite similar to environmental education because it involves "both the natural and built environments." He continues to point out that "the history, folk culture, social problems, economics, and aesthetics of the community and its environment are all on the agenda." According to the PBE Evaluation Collaborative website, successful PBE should incorporate the following characteristics: (1) learning occurs on local grounds/within local context; (2) learning experiences contribute to community vitality and environmental health; (3) learning is supported through significant and diverse local partnerships; (4) learning is interdisciplinary and localized; (5) learning is the foundation for global citizenship; (6) programming helps to achieve multiple educational and institutional objectives; and (7) learning is relevant and connects the learner to a place.   While learning is the primary goal of PBE, Sobel argues that PBE is also concerned with the development of environmental stewardship and improvement of environmental quality.

Environment as an Integrating Context (EIC) is another popular model for focusing curriculum within a community context. The goal is to create an integrated and interdisciplinary curriculum using the local environment. Principles of EIC suggest that the environment can include both local ecosystems and cultural systems as tools that enable all classes to learn. EIC is learner-centered and has been found to improve science learning. Additionally, teachers report that it helps students with analytical and systems thinking skills.

A third approach is service-learning, which involves work to serve the local community. The National Service Learning Clearinghouse claims that "the distinctive element of service learning is that it enhances the community through the service provided, but it also has powerful learning consequences for the students or others participating in providing a service."   Like PBE, service-learning aims to make the learning experience relevant, immediate, and

> The goal of EIC is to create an integrated and interdisciplinary curriculum using the local environment.

meaningful to the learner. It is rooted in the educational reforms of John Dewey and his call for experiential learning and Paulo Freire's theory of transformative learning.   First and foremost, the experience of service-learning should be reciprocal. It should enrich both the learner and the community being served.

Environmental action can also include community involvement since participants often address community needs and foster community well-being. Tania Schusler and Marianne Krasny note that "as an educational approach, environmental action aims not to modify specific behaviors like recycling or saving water, but rather engages youth in planning and taking action on environmental issues they find relevant."   Thus, the aim is to engage the participants in learning that encourages and supports future action. Schusler and colleagues identify a number of environmental actions to enhance local environmental conditions and simultaneously contribute to positive youth development, including those taken to improve the natural environment, educate the community, serve as a process of inquiry, examine and advocate for policies or the public interest, and provide goods and services to enhance community development.   Most of these actions involve civic participation, which requires participants to be engaged in a decision-making process and provides them with opportunities to affect the significant players and institutions that often create barriers to individual action (e.g., local government).

A common community approach to EE is collective inquiry among scientists, researchers, and local community members. Due to the participatory and democratic nature of community approaches to EE, such programs often are studied through participatory action research (PAR). In PAR, researchers and community members co-create knowledge through collaborative inquiry.   PAR is heavily influenced by Friere's work, which emphasizes the importance of the community voice and the democratic process in decision making, both of which can lead to community empowerment. Practitioners use PAR to promote the interests of the group under study as well as action that will lead to social change.   Still, critics of PAR argue that confusing participation with empowerment can be problematic,

as nonparticipation can also be reflective of empowerment. Therefore, it is critical to understand the social context in which the program or study is taking place.

Two community EE cases

Aguilar conducts research on sociocultural learning in EE, including programs that use a community approach. The following cases describe two youth EE programs focused on water quality. One of the groups was situated in a formal classroom and one in an informal after-school setting. In addition, they were from entirely different sociocultural contexts and involved different approaches to EE — yet both had a strong focus on community.

The first group was from a higher income community and was comprised of mostly gifted middle-school students engaged in EE using inquiry into the local lagoon and policy promotion as forms of environmental action. Over the course of a school semester, they worked as a small group of six within a larger civics course (which was engaged in Project Citizen) to propose a policy that would limit residential fertilizer application during rainy seasons to prevent nutrient overload. The students met with local scientists and government leaders to learn about the impacts of fertilizer on their local lagoon and then worked to create a policy that would address this problem. Due to the involvement of many people within their small community, they received media attention and were able to present the policy proposal to the local city council.

While the council did not ultimately pass a bill based on the students' proposal, this did not appear to discourage this group of students. Instead, they seemed to be empowered by their interactions with local community leaders and their presentation to the city council, which was widely publicized. They believed they gained important skills in communication, research, presentation, and civic involvement. After their presentation, they continued to show interest in environmental action beyond their class project.

Another case describes students from a low-income, urban community at risk of not graduating from high-school. They spent their time in an after-school and summer program, the Austin Youth River Watch, testing water quality and visiting wetlands.

> Students believed they gained important skills in communication, research, presentation, and civic involvement.

Program participants were picked up and transported to different sites as a group. They received a stipend for their work based on their years in the program and their status as either mentee or mentor, which in turn was based on their knowledge of water-quality testing. The EE program also provided a safe space, in the form of a clubhouse, where students could work on their school assignments, play basketball, converse with each other and eat a substantial meal after they entered data from their water-quality tests. A significant objective of the program was to help the student participants graduate from high school.

While the students from this program did not show an immediate interest in future environmental action as students in the previous case, they did appear to be empowered in different ways through their involvement in the program. They increased self-confidence in their skill sets as they were able to illustrate their knowledge of water testing and even species identification. They also felt that the program provided them with a sense of belonging and a safe space in which they had a voice. One student even shared his sexual orientation, for the first time, while on a weekend retreat with the group. In the end, this program appeared to address several of the students' basic needs that were not being addressed outside of the club.

These examples suggest how different contexts might call for different approaches to community EE. Stressed communities might especially benefit from community approaches to EE, as empowerment can provide community members with the skills needed to deal with future and recurring problems.

Community Environmental Education Principles

Whereas community approaches to EE are broad, we are particularly interested in programs that address two realities: (1) diverse communities—large and small, urban and rural, rich and poor—face multiple stresses that threaten community well-being; and (2) community well-being is intimately connected to the health of the environment. To create a definition of community EE, and support practices that address these realities, Price undertook

a three-year effort to develop the *Community EE Principles*. She first conducted a series of workshops and discussions with EE and youth and community development professionals and volunteers in cities across the United States (U.S.) Then in collaboration with Bora Simmons (see chapter 4), who has led previous efforts to develop guidelines for multiple approaches to EE,   Price and Simmons iteratively drafted the principles; got feedback online; and, through additional workshops and taking into account both the practical knowledge shared by practitioners and relevant research, redrafted the principles. The principles are written for multiple audiences, including environmental educators and other environmental professionals and volunteers, as well as professionals and volunteers who are primarily focused on youth and community well-being and use environmental experiences and EE to achieve their goals.

> *Community EE aims to enhance a community's wellness through thoughtful environmental action. It fosters collaborative learning and action, taking into account the social, cultural, economic, and environmental conditions of a community.*

According to the principles, community EE is most effective when efforts are focused on the participatory processes that develop authentic relationships, foster community leadership, enhance social capital, and strengthen a community's capacity for improvement. The outcomes of community EE should reflect action around issues that communities care most about and should honor the process of relationship building. Key to the process are experiences that build relationships among individuals and organizations coming from diverse perspectives but sharing common goals around community wellness and the environment. Together these individuals and organizations follow a process to identify community issues and the role each can play in addressing them. Then they build a shared understanding, commitment, and confidence that enables them to advocate and take action. Such community-led, community-sustained efforts build and maintain the community

Community EE is most effective when efforts are focused on the participatory processes that develop authentic relationships, foster community leadership, enhance social capital, and strengthen a community's capacity for improvement.

> The community EE principles can be used as general principles and tools for creating partnerships to address community wellness through environmental stewardship, learning, and action.

wellness that comes from a safe and healthy environment. They are able to do this by addressing the social and environmental stresses facing the neighborhoods where the EE and related programs take place.

Examples of where we find community EE:

- In Chester, Pennsylvania, a community leader engages teens in community gardening and outdoor art to build a work ethic, promote healthy eating, and foster the youth's creativity.

- In the South Bronx, New York, youth in the after-school program at the nonprofit organization Rocking the Boat build historic wooden rowboats, take community members out onto the Bronx River during Community Row Days, and take action to improve the environment through constructing wetlands to filter water contaminants and monitoring oyster survival on artificial reefs they install in one of New York's urban estuaries.

- In Washington, D.C., teen leaders at Groundwork-Anacostia and Earth Conservation Corps remove trash from Bandalong weirs placed along a tributary to the Anacostia River and collaborate with wildlife scientists to reintroduce bald eagles to their city's river-side habitats.

- In rural northeast Pennsylvania, high school students work with the nonprofit Eastern Pennsylvania Coalition for Abandoned Mine Reclamation to help restore abandoned mining sites and to understand how community well-being depends on a healthy environment.

The community EE principles can be used as general principles and tools for creating partnerships to address community wellness through environmental stewardship, learning, and action. The first three principles identify what local community and environmental wellness issues you care about and what experiences, ideas, and networks you bring to community EE. Once you have identified what you care about and what capacities you bring to the table, you are ready to start the work of building relationships. Principles 4 through 7 include questions and tips to help you to identify what kinds of capacities—and partnerships—are needed to address the community EE issue of concern. They also provide suggestions for developing those partnerships. Keep in mind that once you have formed

partnerships, you will be revisiting your plan with your partners to develop a common goal and strategy for moving forward. Finally, principles 8 through 11 steer you through developing an action plan that includes goals, activities, and project management, as well as a strategy for determining how well your project is reaching its goals. These principles include pointers about developing and implementing a collaborative action plan or strategy that builds on local and organizational strengths and shared interests and that leads to sustained changes in community well-being and environmental quality. Finally, you can use assessments of your project to make changes in areas where you experience challenges and to share your successes with funders and others.

But the written *Community EE Principles* are only the first step in expanding community EE across North America and beyond. We are now developing an online site to match people with different interests—for example, those who are most passionate about an environmental issue with those most passionate about community well-being—so that they can work together to address multiple social and environmental stresses.

Community EE Principles

Part 1. Caring and Capacity

Principle 1. Caring and Commitment

Principle 2. My Capacities

Principle 3. My Networks

PART 2. Getting to Partnerships

Principle 4. Environment-Community Connections

Principle 5. Identify Gaps

Principle 6. Begin the Conversation

Principle 7. Consider Compatibilities

Part 3: Planning, Implementation, and Assessment

Principle 8. Building Relationships

Principle 9. Defining Collective Goals

Principle 10. Defining Collective Action

Principle 11. Managing your Community EE Partnership

Principle 12. Adaptation and Transformation

Through helling to steward community and environmental well-being, people gain a sense of community, of place, and of empowerment.

Community Environmental Education: An Integrated Approach

Community EE suggests that rather than working in opposition, community and environmental well-being go hand-in-hand. This approach reflects the work of environmental psychologists such as Rachel and Stephen Kaplan, Frances Kuo, Nancy Wells, Heather Okvat and Alex Zautra, and Margaret Gooch, who have shown us that human well-being is closely linked to environmental well-being. And further, that through helping to steward community and environmental well-being, people gain a sense of community, of place, and of empowerment. Community EE is emerging through the efforts of professionals and volunteers in neighborhoods facing multiple social and environmental stresses in cities and elsewhere, and we should all be on the lookout for what they have to teach us.

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Environmental Citizens through Earth Force Evaluation

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THE LAUNCH:
**BUILDING COMMUNITY
AND TEAMWORK**

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STEP 1:
**COMMUNITY ENVIRONMENTAL
INVENTORY**

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STEP 2:
**ISSUE
SELECTION**

↓

STEP 3:
**POLICY AND COMMUNITY
PRACTICE RESEACRH**

↓

STEP 4:
**GOAL AND
STRATEGY SELECTION**

↓

STEP 5:
**PLANNING AND
TAKING CIVIC ACTION**

↓

STEP 6:
**REFLECTING, GOING PUBLIC AND
PLANNING FOR THE FUTURE**

Introduction

Earth Force is an international nonprofit that believes young people are the key to building communities that are socially and ecologically resilient. For the past two decades, Earth Force has worked to engage young people as active citizens in improving the environment and their communities now and in the future.

At the core of Earth Force's programming is the Community Action and Problem-Solving Process, a six-step instructional model that guides young people from investigating their local environments to working with their communities to solve problems.

Educators use the Process to support young people in environmental problem-solving, while also building positive youth development. Through our programming, we want youth to be engaged authentically with their communities by working to solve real problems.

Every educator who works with Earth Force starts his/her experience by participating in an in-depth training on the Community Action and Problem-Solving Process. During this training, educators go through the Process as if they were students, performing a community environment inventory, selecting an issue, researching policies and practices, and developing a strategy that would theoretically be implemented. Educators also learn about key concepts, such as "environmental citizen," the idea of being a member of the community who understands the importance of being a steward of the planet 's limited natural resources and is committed to sustaining them; and "youth voice," supporting young people in taking a leading role in their own education through asking questions and working on projects. This immersive experience is meant to develop in educators the skills and knowledge to successfully implement the Process with their students. Our goal is for every young person who participates in Earth Force to go through all six-steps. We also want to see students make significant gains in comprehension and use of civic skills, environmental knowledge, and STEM skills.

To ensure that the Community Action and Problem-Solving Process training and implementation is effective, we have worked with Brandeis University's Center for Youth & Communities for 15 years to evaluate this educational model. Each year, we send surveys out to about 2,000 young people and 300 educators. With the support of the Center for Youth & Communities, we use

BOX 1

The Community Action and Problem-Solving Process

The Process takes students through the following:

The Launch – Building Teamwork and Community
Students gain a common understanding of environmental citizenship and civic engagement.

Step 1 – Community Environmental Inventory
Students assess and evaluate conditions within their community, noting the strengths and issues.

Step 2 – Issue Selection
Using a democratic decision-making process, students refine and identify one issue to focus on. This step ensures that students select an issue they are excited about and feel capable of researching and addressing.

Step 3 – Policy and Community Practice Research
Students conduct research on their issue, exploring the policies and practices related to the issue through carefully constructed research questions, identifying stakeholders, and discovering strategies for change.

Step 4 – Goal and Strategy Selection
Students develop a project goal statement to clarify the change they want to see. They then democratically select a strategy, based on their research, that will help them achieve their goal.

Step 5 – Planning and Taking Civic Action
Students work collaboratively to develop an action plan, breaking down their chosen strategy into specific tasks and assigning those tasks to committees. This step also requires the development of a plan for evaluating project sustainability and impact.

Step 6 – Reflection, Going Public, and Planning for the Future
Students analyze and celebrate the Earth Force experience, publicize their project's success, and plan for what lies ahead.

Earth Force in Action

Youth identify issues in their communities and develop sustainable environmental solutions. For example, students at Reagan Middle School in Grand Prairie, Texas, were concerned about a beaver dam on school property that caused flooding in the Outdoor Learning Center. Trapping and removing the beavers was not a guaranteed solution as they might return. In order to create a sustainable solution, students had to get to the root of the problem. Rather than remove the beavers, the students partnered with several local organizations (Wildlife 911, Texas Parks and Wildlife District, General Motors, and Earth Force) to install a "beaver deceiver." This contraption allows water to escape while keeping the dam intact, which was a sustainable solution for both the school and the beavers.

an ongoing process of feedback and reinvention to provide consistently high-profile programming.

Our survey protocol includes a pre- and post program survey of young people, and a post program survey of educators. In some years, we have also conducted focus groups with young people and educators. The surveys examine young people's gains in civic action and problem-solving skills and attitudes related to the environment, participants' communities, and participants' ability to effect change there. Educator surveys look at teachers' perceptions of students' experience as well as changes in teaching practice and attitudes **(Figure 1)**.

Baseline Mean. Average score for all students before starting Earth Force — so for the 1st item — 2.87 on scale of 4.

Post Program Mean. Average score at the end of the program. Those listed are statistically significant, meaning that for all students, the positive change in their ratings was large enough to not be random or by any chance. We assume these changes are attributable to having done Earth Force. The data files list all the teams.

Indicator	Earth Force Surveys		Earth Force GREEN Surveys		Earth Force Surveys		Earth Force GREEN Surveys	
	Baseline Mean*	Post-program Mean*	Baseline Mean*	Post-program Mean*	Baseline Mean*	Post-program Mean*	Baseline Mean*	Post-program Mean*
Life-long committment to community work	2.87	3.09	2.43	2.68	2.83	2.91	2.64	2.80
Know how to work to change policies	2.30	2.74	2.29	2.67	2.40	2.67	2.41	2.71
Awareness of environmental issues	3.17	3.50	2.68	3.00	3.16	3.37	2.82	3.22
Resposibilities to help solve environ-mental problems	2.94	3.14	2.60	2.79	2.83	2.94	2.57	2.84
Know how to contact adults to get information on issues	2.31	2.77	2.14	2.50	2.45	2.67	2.11	2.56

FIGURE 1: Example of pre and post evaluation.

In the evaluation process, we divide a sample based on how the program is implemented. So, students, whose experience meets all of the essential characteristics of an excellent Earth Force program **(Table 1)**, are evaluated together as are the students whose experience includes fewer of those characteristics. A historical view of the data clearly shows that the closer program implementation is to the model—the better the results for students. In fact, if the student's experience is low quality it will result in a slightly negative impact, a decrease from the baseline evaluation, on young people. For example, if a student starts the Process with an environmental inventory, selects an issue, but then does not go any further in the Process (meaning they were never able to develop a sustainable solution), their post evaluation scores may be even lower than their pre-evaluation scores.

The closer the program implementation is to the model – the better the results for students.

Table 1. **Essential Characteristics of an Excellent Earth Force Program**

Universal Themes
1. Students had a say in choosing their issue.
2. Students felt the project was important.
3. Students were engaged with others around addressing the issue.
4. Students completed all six steps of the Process.
5. Educators tied the project to classroom work.

Through evaluation we've learned the following:

■ **Youth voice is essential**. When young people research and choose their own projects they grow as scientists, environmentalists, and community problem solvers.

■ **Young people need to discuss public policy**. When young people study the relationship between science and public policy, they are more likely to become environmentally literate. For example, they have a better understanding of environmental issues and are more likely to care about environmental issues in their community.

■ **Multiple experiences matter**. The more opportunities young people have to engage in environmental problem-solving, the more likely they will be civically engaged for a lifetime.

The ideas raised in this chapter are not necessarily new. Others have identified the critical components to youth environmental engagement to include concept such as "youth as contributors, genuine participation, deliberate action, inquiry, critical reflection, and positive youth development *. This chapter focuses on the three aspects specifically drawn from the Earth Force evaluations.

The Role of Youth Voice in Environmental Citizenship

Many educators have heard of "youth voice" but are unsure of how to bring it into the classroom. We define youth voice in this way: supporting young people in taking a leading role in their own education through asking questions and working on projects.

Youth voice can be incorporated in a number of ways:

■ Take youth into the local environment (whether it's through a community walkabout or visiting a local waterway or wildlife refuge) to observe the pros and cons of the surroundings.

■ Ask young people to talk about *why* they view something as a positive or negative. It is surprising how often youth can make a great argument for why something that's typically negative can be an asset to a community or vice versa.

■ Allow young people to guide group decision-making. Whether it's choosing an issue or selecting a strategy, support youth in developing criteria to weigh the proposed options. Youth can then work through democratic decision-making, selecting an issue or strategy as a group that best fits the criteria they developed.

■ Encourage peer-to-peer mentoring. This can be incorporated in various stages of the process such as conducting an environmental inventory and researching an issue by pairing seasoned attendees with new students or asking students to work in pairs.

Through evaluation, we found that young people who take active leaderships roles show substantial growth in civic skills, a better understanding of how classroom skills translate to the real world, and a deeper understanding of how to use STEM skills and knowledge to solve environmental problems. Youth are able to gain these skills when, for example, they lead the research that identifies the environmental project, select the project that will be the focus of their work, lead discussions about how to solve the problem, and follow their research through to take action. Students who feel true

ownership of their environmental projects are more likely to believe that their projects make a difference and are more likely to discuss environmental topics with friends and parents and pay attention to local environmental issues.

Understanding Public Policy to Support Environmental Change

While all six steps of the Process are important, our evaluation shows that if we hope to create environmentally literate adults, step 3 (Policy and Practice Research) is critical.

Engaging youth in policy can be the most challenging part of any problem-solving process. Students may identify an issue in a community, but in order to find a sustainable solution, they need understand the root cause of the problem. A root cause usually appears in one of two ways: a *practice* that people consciously or unconsciously participate in, for example, littering; or a *policy,* which is a rule or guideline that is generally imposed on people and/or a community, for example, speed limits. Addressing public policy can take many forms including the following:

- Researching policies affecting a particular environmental issue
- Talking with government officials about how policies are created
- Presenting a project proposal to public officials

Young people who address public policy are more likely to show substantial growth on civic and environmental scales than students who skipped step 3, incorporated no elements of civic engagement, or did not complete the entire Process.

Providing Multiple Experiences to Solve Environmental Problems

Young people are not often able to participate in programs that engage them in leadership roles in order to identify and address local environmental issues.   It is even more unlikely that a young person will get that experience multiple times over during the course of his or her education.

> We work to engage young people as environment problem solves and create lifelong environmental citizens.

Young people need multiple opportunities, year after year, to participate in their communities in order to discover the depth and breadth of leadership skills that will drive sustained civic commitment.   In our evaluations, we have observed that students who participate in Earth Force programs more than once have higher gains in civic skills, a better understanding of the environmental issues affecting their communities, and a stronger belief that they can drive change. Research indicates that having a guided service-learning experience more than once significantly increases the ability for youth to carry these skills into adulthood.

We have created opportunities for young people to have multiple experiences as environmental leaders in a number of ways:

■ Integration of the Community Action and Problem-Solving Process into school district curriculum, providing scaffolded learning opportunities.

■ Participation in Earth Force's international water education program, General Motors GREEN, in which partnering watershed organizations engage students year after year.

■ Involvement with *Friends of the Force,* a pipeline program that prepares young people as potential youth board members at Earth Force. A young person who shows interest in leading change in his/her community is paired with a current board member who serves as a personal mentor.

By focusing on these three specific components of our programming—the role of youth voice in environmental citizenship, understanding public policy to support environmental change, and providing multiple experiences to solve environmental problems—we work to engage young people as environmental problem solvers and create lifelong environmental citizens.

To learn more about Earth Force's evaluation, visit www.earthforce.org.

Chapter 14 Endnotes

1   A. Melchior and L. N. Bailis, "Impact of Service-Learning on Civic Attitudes and Behaviors of Middle and High School Youth: Findings from Three National Evaluations," in *Advances in Service-Learning Research: Vol.1. Service-Learning: The Essence of the Pedagogy,* ed*.* A. Furco and S. H. Billig, 201–222 (Greenwich, CT: Information Age, 2002).

2   Melchior and Bailis, 2002 (see n. 2)

3   T. Schusler and M. Krasny, "Youth Participation in Local Environmental Action: An Avenue for Science and Civic Learning?" in *Participation and Learning Perspectives on Education and the Environment, Health and Sustainability,* ed. A. Reid, B. B. Jensen, J. Nikel, V. Simovska, 268-284 (Springer, 2008).

5   T. Schusler, M. Krasny, S. Peters, and D. Decker, "Developing Citizens and Communities through Youth Environmental Action. *Environmental Education Research* 15, no. 1 (2009) 111-127.

6   Melchior and Bailis, 2002 (see n. 2)

7   Melchior and Bailis, 2002 (see n. 2)

Linking Citizen Science and Civic Ecology Practices in Environmental Education

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Introduction

Public participation in scientific research (PPSR) refers to a range of projects that engage the public in scientific investigations. A popular form of PPSR is citizen science, that is, investigations in which volunteers, generally scattered across a large area, collect data for scientists.   Whereas many citizen science projects focus on collecting data used to develop conservation policies—for example, data about bird populations that are are used in planning for protected areas—the emphasis is not on hands-on conservation or stewardship. In contrast, civic ecology focuses more specifically on how citizens engage in hands-on community and environmental restoration and stewardship practices. As a field, civic ecology studies the interactions between (1) community-based environmental stewardship (civic ecology practice); (2) education and learning situated in these practices (civic ecology education); (3) the people and institutions involved; and (4) the ecosystem services produced by the people, their stewardship, and related educational practices.

Despite their relative emphasis on research and stewardship, both citizen science and civic ecology have in common the practices of environmental learning. Citizen science focuses first and foremost on science learning through data collection and analysis and through increasing the public's understanding of how such data contribute to conservation.   Civic ecology focuses on learning opportunities created by environmental stewardship practices, which can include learning about ecosystem services and cultural traditions, as well as about trust, social connections, and collective action.   In this chapter, we first present the history and current practices of citizen science and civic ecology. Next, we suggest that integrating these practices can help address the recognized shortcomings of each field, as well as foster multiple goals of environmental education programs.

Citizen Science

Background

The countless citizen science projects being undertaken around the world encompass a range of tasks such as reporting weather patterns, monitoring wildlife populations, engaging in discovery research of protein folding, and tracking the presence of invasive

plant species. At the forefront of citizen science initiatives, however, are those that relate to astronomy and ornithology. These fields engage the highest numbers of amateur experts and have attracted the participation of volunteers for the longest period of time.   Astronomy-related citizen science projects, for example, were in existence as early as 1874, with the British-funded Transit of Venus project. To acquire a more precise measurement of the Earth's mean distance to the Sun, this initiative inspired both the interest and voluntary participation of the general public.   The American Association of Variable Star Observers was established in 1911 and currently has more than a thousand observers in 52 countries, who submit hundreds of observations on variable stars each year.

Volunteer data collection in ornithology has an even lengthier history. In 1749, Professor Johannes Leche of the Finnish Turku Academy launched the first large-scale, collaborative survey of birds by enlisting volunteers to record the arrival dates of migrant species. Long-standing citizen science projects in the ornithological realm include the annual Christmas Bird Count and the Breeding Bird Survey. Overseen by the National Audubon Society, the Christmas Bird Count was initiated in 1900 by ornithologist Frank M. Chapman of the American Museum of Natural History, as a protest against the traditional holiday bird hunt.

> At the forefront of citizen science initiatives are those that relate to astronomy and ornithology.

In 1962, Rachel Carson's book Silent Spring sparked widespread public concern about the negative impacts of the pesticide DDT on bird populations at both regional and national levels. In response, the Breeding Bird Survey was launched in 1965 in what was then the Bird and Mammal Laboratories in the Branch of Wildlife Research of the U.S. Fish and Wildlife Service. Today, this well-established ornithological citizen science project is jointly coordinated by the Patuxent Wildlife Research Center and Environment Canada. These two institutions oversee the efforts of thousands of volunteers who undertake spring bird data collection along roadsides throughout North America. Their data inform scientists, conservation managers, and the public about current populations and distributions of bird species.

Photo by L. Briggs

It was only one year earlier, in 1965, that the Cornell Lab of Ornithology (CLO) began its NestWatch program. This initiative is but one of CLO's many current bird-focused citizen science projects, and although the concept of citizen science has been around for centuries, Rick Bonney of CLO coined the term for these data collection efforts in 1995. Additionally, a citizen science project called eBird was launched by CLO in 2002. This online database compiles bird observations submitted by individuals from anywhere around the world. CLO has been a leader in developing, disseminating, and evaluating the impacts of citizen science, as well as describing the challenges and benefits of this field.

Over the years, citizen science projects have resulted in multiple scientific and educational outcomes in keeping with the two key goals of gathering data to help answer large-scale scientific questions and building the environmental literacy of individual project participants. Citizen science data also have made valuable contributions to conservation endeavors by providing information about species behaviors, abundance, and distributions, which in turn informs management strategies.

Scientific outcomes of citizen science

With respect to science, citizen science projects have generated historical documentation of phenological changes; comprehensive bodies of data regarding the behaviors, abundance, and distributions of different species; and records of local-level environmental changes due to air, water, and land pollution. For example, Amy Mayer reports how citizen documentation of lilac blooming times in the United States exposed the advanced onset of spring by one week relative to 30 years ago. Also using citizen science data, Allen Hurlbert and Liang Zhongfei determined that for each degree Celsius of spring temperature warming, bird species adjusted their spring arrival dates in North America up to six days earlier. Citizen science data also have been used in scientific research and publications of other vertebrate species, such as a volunteer sighting network used to study the presence and behaviors of North Atlantic Right Whales. Finally, citizen scientists have collected data related to environmental pollution. In Europe, for example,

Photograph courtesy NOAA

the Open Air Laboratories (OPAL) air survey engages citizens in monitoring local air quality through the study of lichens. Citizens in communities affected by industrial pollution in the United States have monitored environmental toxins in their water and air, thereby "collecting data needed for developing new zoning laws and enforcement."

This breadth of information has been widely applied to formal scientific studies and publications, as well as technical and government reports. To date more than 200 scientific papers, many of which were published in reputable scientific journals, have been based on data collected through citizen science programs.

Learning outcomes of citizen science

Citizen science projects have created countless educational experiences that can enhance participants' knowledge about a particular species, heighten awareness of the local biodiversity and environment in their surroundings, and increase scientific literacy overall. For example, the evaluation of a CLO citizen science project called The Birdhouse Network pointed to an overall increase in participants' scientific understandings of cavity-nesting birds and their habitat requirements.   In some cases, "volunteers may also develop a greater sense of stewardship over the populations or sites they are responsible for surveying or monitoring."   However, other research indicates that simply exposing people to wildlife and the environment does not necessarily influence their attitudes and behaviors toward the natural world. In The Birdhouse Network evaluation, the results did not indicate any changes in attitudes toward the environment. The authors argue that their findings underscore a need for citizen science projects to more explicitly highlight and address the relevant environmental issues.

In another CLO citizen science initiative, The Seed Preference Test, more than 700 participants, out of approximately 17,000 individuals initially interested, wrote letters reflecting on their experiences with the test. According to a content analysis of these letters, "nearly 80% revealed that participants had engaged in thinking processes similar to those that are part of science investigations."   Thus contributors to citizen science projects may learn both about the process of scientific inquiry

Citizen science projects have created countless educational experiences that can enhance participants' knowledge about aparticular species, heighten awareness of the local biodiversity and environment in their surroundings, and increase scientific literacy overall.

and the species or events under investigation, though this is not always the case. An empirical study of a program that involved collecting data on non-native invasive plants, as well as education about these species, showed no increase in understanding of the scientific research process. However, the participants did report an "increased ability to recognize invasive plants and increased awareness of effects of invasive plants on the environment."

Environmental outcomes of citizen science

Citizen science data have also made valuable contributions to conservation endeavors by providing information about species behaviors, abundance, and distributions, which in turn informs management strategies. For example, the annual *State of the Birds* report relies significantly on eBird data.   Like the Breeding Bird Survey, the data synthesized in each *State of the Birds* report advises professionals in the fields of conservation and natural resources management about the current status of different bird species. The authors of an upcoming publication on bird migration only used sightings reported by thousands of amateur bird watchers through eBird. They argue that based on such powerful, collective data, they have been able to determine the locations of migratory stopover spots and make specific management recommendations.   Finally, several initiatives are underway to more rigorously apply citizen science data concerning a variety of other topics to natural resource management laws, regulation, and planning.

While the outcomes described above are positive and beneficial, citizen science and PPSR have been critiqued for their emphasis on collecting data for the scientific community.   Therefore, it has been suggested that in moving forward, citizen science projects should strive to better incorporate direct environmental stewardship and conservation action. Most citizen science projects conducted by CLO and other conservation organizations do focus on scientific research questions that are driven by a concern for conservation, such as preserving biodiversity. These programs

generate data used for this worthy purpose as well as in the development of natural resource management laws, regulation, and planning. However, they do not necessarily promote further engagement of individuals in addressing conservation issues, beyond collecting more scientific data. For example, in a study of how bird species are impacted by cat predation in residential landscapes, the conclusions focused primarily on goals for future research, such as improving volunteer survey techniques for better estimations the causes and rates of bird mortality. Other North American citizen science programs concerning the spring blooming times of plants or the status of wolves greatly value the data collected by their dedicated volunteers, yet do not advocate for their involvement beyond data collection.

Michael Mueller and co-authors further emphasize that "citizen science, as it is currently conceptualized, does not go far enough to resolve the concerns of communities and environments." We suggest that one means of addressing these critiques is to promote further integration of hands-on environmental stewardship (civic ecology projects) with citizen science projects, in which professionals and volunteers are directly engaged in data collection. Civic ecology projects could in turn benefit from citizen science, as few of these projects formally monitor their effectiveness.   We turn now to a deeper discussion of civic ecology practices, after which we will describe how a partnership with citizen science could enhance conservation and stewardship outcomes and also foster key goals of environmental education.

> We suggest further integration of hands-on environmental stewardship (civic ecology projects) with citizen science projects, in which professionals and volunteers are directly engaged in data collection.

Civic Ecology

Background

The term *civic ecology* has held different meanings related to civic engagement community planning. Throughout this chapter, it is understood as the study of stewardship practices and their links with the community, the environment, and other components of the related social-ecological systems. In developing this definition, scholars of the Civic Ecology Lab (CEL) at Cornell University combined the words *civic* and *ecology*, in order "to reflect the ties between traditions of civil society engagement and of an environmental ethic based on humans' deep connections to the land."

People can, and often do, act as meaningful stewards of ecosystems and communities of which they are an integral part.

Civic ecology is more than just a field of study, however. It is also a way of viewing the world differently. Drawing from the seminal work of conservationist Aldo Leopold, whose ideas have strongly influenced modern environmental ethics, and Alexis de Tocqueville, an early observer of civil society in the United States, a civic ecology perspective recognizes that the majority of nature has been touched by civilization, yet does not view humans as irreconcilable enemies of the environment. People can, and often do, act as meaningful stewards of ecosystems and communities of which they are an integral part.

Civic ecology practices, which often take place in cities, are community-based stewardship efforts such as community gardening, planting trees, removing invasive species, restoring native habitat, and reintroducing native species. These grass-roots or locally-organized initiatives are beneficial to local ecosystems and have positive impacts on individuals, communities, and ecosystems. Civic ecology practices take place in many areas of the world, including community gardening on vacant lots in North American, European, and South African cities, pond restoration to encourage fish and dragonfly populations in Japanese cities, tree planting after Hurricane Katrina in New Orleans, and village grove restoration in South Korea.

Ten hypotheses help define idealized civic ecology practices, which are summarized in **Table 1**.   Compared to the scientific research objectives prioritized by citizen science practices, civic ecology practices place a stronger emphasis on environmental and social outcomes, and on learning outcomes related to stewardship, as opposed to scientific literacy.

Table 1. Hypotheses of Idealized Civic Ecology Practices

Hypotheses
1. Civic ecology practices emerge in broken places.
2. Because of their love for life and love for the places they have lost, civic ecology practitioners reclaim and re-create these broken places.
3. In re-creating place, civic ecology practices re-create community.
4. Civic ecology practitioners draw on social-ecological memories to re-create places and communities.
5. Civic ecology practices produce ecosystem services.
6. Civic ecology practices foster well-being.
7. Civic ecology practices provide opportunities for learning.
8. Civic ecology practices start out as local, small-scale innovations and expand to encompass multiple partnerships.
9. Civic ecology practices are embedded in cycles of chaos and renewal, which in turn are embedded in social-ecological systems.
10. Policy makers have a role to play in growing civic ecology practices.

> Civic ecology practices involve ecological restoration at the community level.

Environmental and social outcomes of civic ecology practices

Civic ecology practices involve ecological restoration at the community level. As a result such projects have multiple environmental outcomes, such as the reintroduction of trees and other native species in areas impacted by natural disasters and other disturbances or the replacement of abandoned lots with green spaces and community gardens.   The presence of trees and green space can contribute to the mental and physical well-being of individuals, as well as help decrease crime and other social problems in cities.   By actively engaging in the civic ecology practices that create thriving community gardens or reintroduce flora and fauna, individuals also build stronger relationships with others while helping to provide local ecosystem services.

Whereas the foundations of citizen science are scientific research and science learning, civic ecology has a much stronger focus on social or community outcomes such as the social ties, trust, and civic engagement that are part of social capital. Collecting data on the outcomes of stewardship projects can help support future project modifications or guide changes to applied practices. For

example, students at a youth development and environmental education organization based in the Bronx, called Rocking the Boat, engage in oyster seeding efforts on the Bronx River and closely monitor the growth and survival of the oysters. As environmental education practitioners monitor the results of such stewardship activities, they can simultaneously adapt and improve project strategies and goals based on the knowledge gained through their ongoing scientific data collection.

Despite claims regarding the many benefits of civic ecology practices, in reality few practitioners concertedly monitor the outcomes of their projects. Marianne Krasny and her colleagues have described how citizen science protocols and other means of assessing biodiversity and ecosystem services could be adapted to assess the outcomes of civic ecology practice. They propose three key approaches: citizen science protocols to measure biodiversity, functional measures of ecosystem services, and ecosystem services valuation **(Table 2)**.

TABLE 2. Possible Approaches to Assessing Civic Ecology Practices

APPROACH	DEFINITION	EXAMPLES
Citizen science protocols to measure biodiversity	Lay persons could make use of accessible, existent citizen science protocols for measuring the abundance and distribution of different species, with the potential for incorporating measures of social dimensions.	The City Biodiversity Index, which measures ecosystem services and urban biodiversity, as well as relevant governance and management capacity.
Functional measures of ecosystem services	Hands-on, small-scale collaboration between civic ecology practitioners and researchers in order to monitor the impacts of a specific, local stewardship initiative.	i-Tree, software that uses data collaboratively collected by city foresters and laypersons to generate information about ecosystem services provided by different species of trees, as well as the monetary value of such services.
Ecosystem services valuation	Various measures of the tangible values of ecosystem services.	A survey implemented at the Peterson Community Garden in Chicago to evaluate how various dimensions of the gardening experience are valued by individuals.

Learning outcomes of civic ecology practices

Civic ecology practices create opportunities for cultural and environmental learning in informal and formal contexts. Cultural learning is possible given that many civic ecology practitioners integrate cultural and historical traditions into their stewardship practices. For example, refugees from Southeast Asia now living in California grow vegetables with seeds from their native homelands in community gardens, thus sharing their unique cultural traditions with youth and gardeners of other ethnic backgrounds. Oyster seeding efforts in New York City give participants an opportunity to learn about the historical significance of oysters to the region. Environmental and science learning occurs through engaging in community environmental stewardship inherent to civic ecology practices, as well as through supplemental materials provided by universities and other organizations.   If civic ecology practices could better incorporate monitoring of community and environmental outcomes, additional opportunities for learning would ensue. **Table 3** summarizes the respective practices of civic ecology and citizen science that have been reviewed here.

> If civic ecology practices could better incorporate monitoring of community and environmental outcomes, additional opportunities for learning would ensue.

TABLE 3. **Overview of Citizen Science and Civic Ecology Practices**

	CITIZEN SCIENCE PRACTICES	CIVIC ECOLOGY PRACTICES
Definition	Involve volunteers in the scientific research process, such as monitoring of different species, weather patterns, and stars.	Entail community-based stewardship efforts such as community gardening, planting trees, removing invasive species, restoring native habitat, and reintroducing native species.
Scientific outcomes	Information gathered through citizen science projects has been widely applied to formal scientific studies and publications, as well as technical and government reports.	Despite claims regarding the many benefits of civic ecology practices, in reality few practitioners are concertedly monitoring outcomes of their projects.
Environmental outcomes	Information about species behaviors, abundance, and distributions informs management strategies. For example, the annual State of the Birds report relies significantly on eBird data.	Ecological restoration at the community level has reintroduced trees and other native species, replaced abandoned lots with green spaces and community gardens, and thus provided local ecosystem services.
Community outcomes	Not emphasized.	Diverse local community members of different ages and from a variety of ethnic backgrounds work collaboratively through civic ecology practices, which may lead to building social capital.
Learning outcomes	Increased scientific literacy among participants, particularly understandings and awareness of the local biodiversity and environment.	Promotion of cultural and environmental learning, youth development, science learning, and social learning, as well as learning about the dynamics of the local social-ecological system.

Linking Citizen Science and Civic Ecology

Integrating citizen science and civic ecology within projects that focus on issues such as species conservation or water quality can be mutually beneficial to both fields. Further, combining civic ecology and citizen science practices specifically within the context of environmental education (EE) can help EE practitioners achieve multiple objectives.

Mutual benefits to both fields

Ecological projects that integrate both data collection and stewardship give participants an opportunity to develop monitoring skills and engage in science learning. Participants simultaneously gain stewardship experience while promoting the conservation action desired by the field of PPSR at large. The Monarch Larva Monitoring Project (MLMP), for example, is a citizen science project that oversees the collection of data on this butterfly species' habitat and populations. However, many participants in this project are also involved in stewardship efforts, specifically, protecting abandoned fields as wildflower gardens to provide habitat for the monarch.   In the case of the Australian Waterwatchers, a project that was initially focused on monitoring has now also become involved in "restoration with streamlining projects, silt-trapping efforts, weed control projects, roadside re-vegetation plans, [and] riparian zone fencing."   There are also civic ecology based projects that include concerted data collection. In New York, for example, the Bronx River Alliance removes invasive plants. This civic ecology practice is coupled with monitoring to evaluate success in preventing the regrowth of invasive species and in helping to reestablish native species. Another nonprofit organization, Compost for Brooklyn, tracks the amount of compost it processes, as well as the number of households that use the designated compost drop-off location. Such projects that combine citizen science and civic ecology practices expand the possibilities for learning, increase the potential for positive environmental and social impacts, and allow for stronger evaluations of these impacts over the short and long term.

The value of formalized monitoring has been recognized in other fields concerned with both conservation and education. For example, Martha Monroe and Shorna Allred recently proposed a synergy between community-based natural resource management and EE

(CBNRM-EE). Within this framework, monitoring is encouraged not only to track ecological progress, but to also promote learning and capacity-building. The mutual ecological and educational benefits of this approach are illustrated by communities that are more prepared to manage common pool resources, such as water used in irrigating farmers' fields, if members are directly involved in the monitoring, as compared to communities that are dependent on external authorities for this information.

Fostering multiple goals of environmental education programs

Within the context of EE, combining civic ecology and citizen science practices can be a powerful strategy for enabling EE practitioners to achieve multiple objectives. Civic ecology practice involves directly identifying and addressing local environmental problems, such as blighted vacant lots or invasive species, through community-based stewardship efforts. In collaboration with other community members, individuals participating in these efforts have an opportunity to become more familiar with the problems at hand and learn effective strategies for addressing them. While engagement in this type of conservation action does not necessarily translate into other environmental behaviors, it could help foster important EE goals including empowerment and a sense of place, which may be related to environmental behaviors.   Through active stewardship experiences comes the development and reinforcement of relevant environmental action skills, which can empower individuals due to a greater sense of pride and competence and the knowledge that they are capable of making a difference. This empowerment can in turn motivate and inspire future involvement in other environmental action projects. Some stewardship efforts can even promote economic empowerment; for example, the development of horticultural skills through community gardens can allow individuals to grow more of their own food. In the context of environmental education, empowerment is a key goal for many practitioners.   However, caution must be taken to avoid projects that fail to produce tangible positive results or that cause unintended negative outcomes, which can leave participants feeling disempowered, ineffectual, and hopeless.

Research also shows that stewardship activities can foster individuals' sense of place, particularly in urban areas. Sense of

> Within the context of EE, combining civic ecology and citizen science practices can be a powerful strategy for enabling EE practitioners to achieve multiple objectives.

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place refers to "the meanings and attachments to a setting held by an individual or group," and often includes a strong connection to the natural elements of a setting. This concept is attracting growing interest from the environmental education field, as it has been shown to enhance pro-environmental behaviors closely linked to a place.

Finally, civic ecology practices by definition entail leadership and participation by community members, including in low-income urban and other stressed communities, and commonly take place after flooding, conflict or other disasters. Joining forces with civic ecology practices may not only enable citizen science to foster the EE goals of empowerment and sense of place, but also expand on its current efforts in cities and in disaster contexts.   For example, the Cornell Lab of Ornithology's citizen science project called Celebrate Urban Birds (CUBs) engages urban youth in ecological and cultural learning activities around local birds.   The volunteer assessments of tree damage in New Orleans' Lower 9th Ward after the landfall of Hurricane Katrina in August 2005 is an example of citizen science being practiced in a disaster context.

To explore how combining civic ecology and citizen science practices could be a powerful EE strategy, Lilly Briggs worked with the community-based youth organization Rocking the Boat (RTB) to design and implement an EE project in the low-income urban setting of the Bronx, New York City. Although the project did not encompass formal evaluation, it is offered as an example of how EE practitioners could link civic ecology and citizen science. RTB works with "young people challenged by severe economic, educational, and social conditions to develop the self-confidence to set ambitious goals and gain the skills necessary to achieve them."   The organization accomplishes these goals by facilitating on-water programs, through which students explore the Bronx River in wooden rowboats. In collaboration with Cornell University's Civic Ecology Lab and the Cornell Lab of Ornithology, Briggs worked with Chrissy Word, then director of public programs for RTB, to develop and implement the Tree Swallow Breeding Project. Through this project, youth participants in RTB's programs build tree swallow nest boxes in their boatbuilding shop; install these boxes in nearby parks and restoration areas; monitor the activity of the tree swallows that ultimately use the boxes and of other species of birds in the vicinity; and contribute their observational data to eBird. Briggs led classes to engage the students in relevant learning about the significance of birds to our
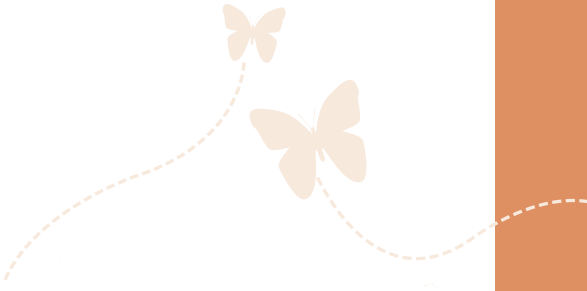
planet, the natural history of tree swallows, and the protocols of eBird data collection and for building nest boxes. The civic ecology component of the project, which is the creation of tree swallow nesting sites, involves participants in hands-on, local habitat restoration. These efforts are in turn supported by the citizen science dimension, as the data collected through the monitoring activities can provide insight into whether or not the stewardship efforts are having a positive impact on birds.

Conclusion

Independently, the practices of citizen science and civic ecology make meaningful contributions to conservation. Citizen science practices provide scientifically valid data that can positively influence natural resource management practices, while civic ecology practices involve hands-on community-based environmental stewardship. We have demonstrated that there is power, not previously recognized, in combining these practices. The respective interests of citizen science practitioners in having a greater impact on local conservation, and civic ecology practitioners in better documenting their stewardship outcomes, can be supported through active collaboration between the two endeavors. Furthermore, we suggest that environmental educators take the best of both in the design of innovative environmental-action projects to help foster empowerment and a positive sense of place. Such integrated projects may contribute to a larger set of potential EE outcomes, including positive youth development.

Citizen Science Practices
Monitoring and Data Collection

Civic Ecology Practices
Hands-on, community based stewardship

Environmental Education
Monitoring Environmental Impacts

Stewardship Project   Monitoring Social Impacts

Adaptation and Improvement to Stewardship Project

Empowerment   **Sense of Place**

FIGURE 4. Integrating citizen science and civic ecology practices in environmental education.

Chapter 15 Endnotes

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Social Theatre as a Tool for Environmental Learning Processes: A Case Study from Madrid, Spain

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> Theatre is a powerful art form to illustrate the difficulties we face and address complex concepts.

Overview

Environmental educators face the challenge of creating learning experiences that help people develop knowledge, values, and skills that may inspire them to become actively involved in dealing with the social and environmental issues in their communities. This chapter explores social theatre as one instrument for achieving that goal.

Introduction: Education through Theatre

Historically, art has been used as a way to represent the world and to manage the immensity, the unknown, and what is not said. Theatre, one of many artistic forms available to educators, is often powerfully used to illustrate the difficulties in human lives and is frequently able to address complex concepts with scenarios to which people can relate.

Issues concerning the environment and ecosystems are sometimes more difficult to express through theatre, as these themes are not always perceived as personally relevant. However, many authors, such as Marie Jeanne Mcnaughton and Tamara Guhrs and colleagues have considered drama (and theatre) to be potent tools to address issues regarding human and environmental coexistence. Additionally, Moacir Gadotti has described it as a way to include new perspectives on human-environmental relationships that can promote synergies rather than conflicts as well as encourage ecological world views.

In this sense, theatre is a potentially powerful instrument for learning about sustainability. Theatre can provide participants with meaningful contexts in which educational concepts are explored; allow practicing and developing a variety of skills; illustrate the interdependence of economic, ecological, and social factors; and encourage environmentally conscious attitudes and values. Augusto Boal said that "theatre is a form of knowledge; it should and can also be a means of transforming society. Theatre can help us build our future, rather than just waiting for it".

In this chapter we, both researchers and members of an environmental theatre group (CACTUS), explore the potential of theatre as a tool for environmental learning towards sustainability through the case study of the development of one of our plays, *AKWA*.

Artistic Collective for Environmental and Social Theatre

The Artistic Collective for Environmental and Social Theatre (CACTUS) was founded by a group of people who shared common interests in environmental work.   We met through the Spanish Environmental NGO *Ecologistas en Acción* (EeA), in which some of us had been directly involved, and others loosely connected via other informal environmental or arts-based collectives.

As a part of EeA, but also as an independent collective, CACTUS shares the environmental NGO's approach to sustainability, i.e., facing environmental concerns by taking into account the interdependence of economic, social, and ecological factors, as well as the promotion of synergies between the environment and people   **(Figure 1)**.

Our Vision

Members CACTUS come from many different backgrounds: some have trained in theatre professionally, others have not. The members are also influenced by their experiences in related arts such as dance, clowning, and physical theatre.   Some have professional training in research and environmental/social sciences. Some were simply eager to act and get involved in environmental issues. For this reason, our interpretation of "theatre" is broad, understanding it as the combination of many arts and types of expression. In a general sense, our practice can be included in the bracket of *social theatre*, which has been influenced, for example, by Augusto Boal's *Theater of the Oppressed,*   the perspectives of Viewpoints,   community-based theatre,   theatre-in action, and Lecoq's physical theatre.

The group's shared vision is to combine environmental concerns with innovative performance methods to convey messages in fun, dynamic, easy-to-absorb, entertaining ways and to promote participation in socio-environmental issues. Thus, using theatre, we believe learning is "an essentially creative, reflexive, and participative process, [which allows working] with ambiguity and uncertainty, [and where] space, reflective time, experimentation and error are valued to allow creativity, imagination and cooperative learning flourish"   **(Figure 2)**.

FIGURE 1. Still from video "¿Qué es CACTUS? (What is CACTUS?). Directed, filmed, and edited by Alba Maiques-Díaz, Lucía Díaz Muñoz

FIGURE 2. The first performance of AKWA in Madrid. Photo by I. Martínez

In our vision, it is just as important for theatre to stimulate communication, reflection, and participation as it is to address environmental questions. This is supported by the approach of researchers who argue that by promoting critical thinking, drama that can engage directly with audience members' lives and concerns might trigger the deeper understanding and thinking necessary to envision possible solutions and alternatives to social and environmental problems **(Figure 3)**.

Our Working Principles

The working principles of our approach to social theatre for environmental awareness can be summarized as described below.

- *Belief in creativity*. We believe that everyone is creative. This starting point involves being flexible and saying "yes!!" to suggestions. Embracing ideas, challenges and problems to work through allows us to untangle notions that might seem immovable. We learn from sharing and playing. We understand that creativity takes many forms and can be explored in verbal and non-verbal ways, often by changing perspectives.

- *Creative and embodied research.* This is our starting point for learning and for creating theatre that addresses environmental issues. Research is done inside and outside the rehearsal studio involving, for example, collecting articles, books, and films. It also includes exploring personal narratives and classical stories related to the theme through sketches and improvisation.

- *Work in progress*. Exploring and devising is crucial to our creative process. So is valuing the process as much as the final performance, which often turns out to be another step in the process!

- *Circular creative process.* There are many phases to a creative process and ours is typically circular. The stages depend on the project, but often include the following: preparation, generation of ideas, reflection, evaluation and selection, development and application, feedback, and adaptation.

FIGURE 3. A working-progress performance to a small audience in Madrid. Photo by CACTUS

■ *Trust in the collective.* A collective process is one where individual actions take meaning in the context of the collective. A deep process will also involve stages of confrontation and consensus. Ideas, opinions, and proposals are debated and negotiated in a deliberative way with the group being open to how the individual ideas and the process itself leads the project forward. Through both action-led and verbal versions of deliberative confrontation and consensus, both in the drama studio and outside it, this opens up and helps define the possibilities and limitations of the work.

■ *Sharing the load.* We work with a role-changing dynamic or pluri-leadership. We have had no fixed group leader, and we support members taking on leadership, and changing from one role to another when they can. This might mean leading a session, or several, and then stepping back to follow the session or direction of another.

■ *Protected spaces for creative exploration.* Spaces for exploration should be spaces in which everyone is comfortable and where there is a high degree of trust. This means moving as many logistical and planning conversations outside of the time for creation and making sure that the creative space is as comfortable and accessible as possible.

■ *Individual and collective empowerment and catharsis.* Theatre can be empowering and cathartic for group members and the audience, particularly when we deal with issues relevant to people's lives. This makes it important for everyone to have moments to reflect, respond, and discuss during the creative process as well as after performances.

■ *Audience members as participants*. We embrace Boal's notion that in social theatre the barrier between actors and spectators (the audience) should be challenged. Boal blended the division between actors and spectators, and we have experimented with this idea by including public participation in our performances.   For example, we usually invite audience members to interact with characters in the last section of some of our plays.
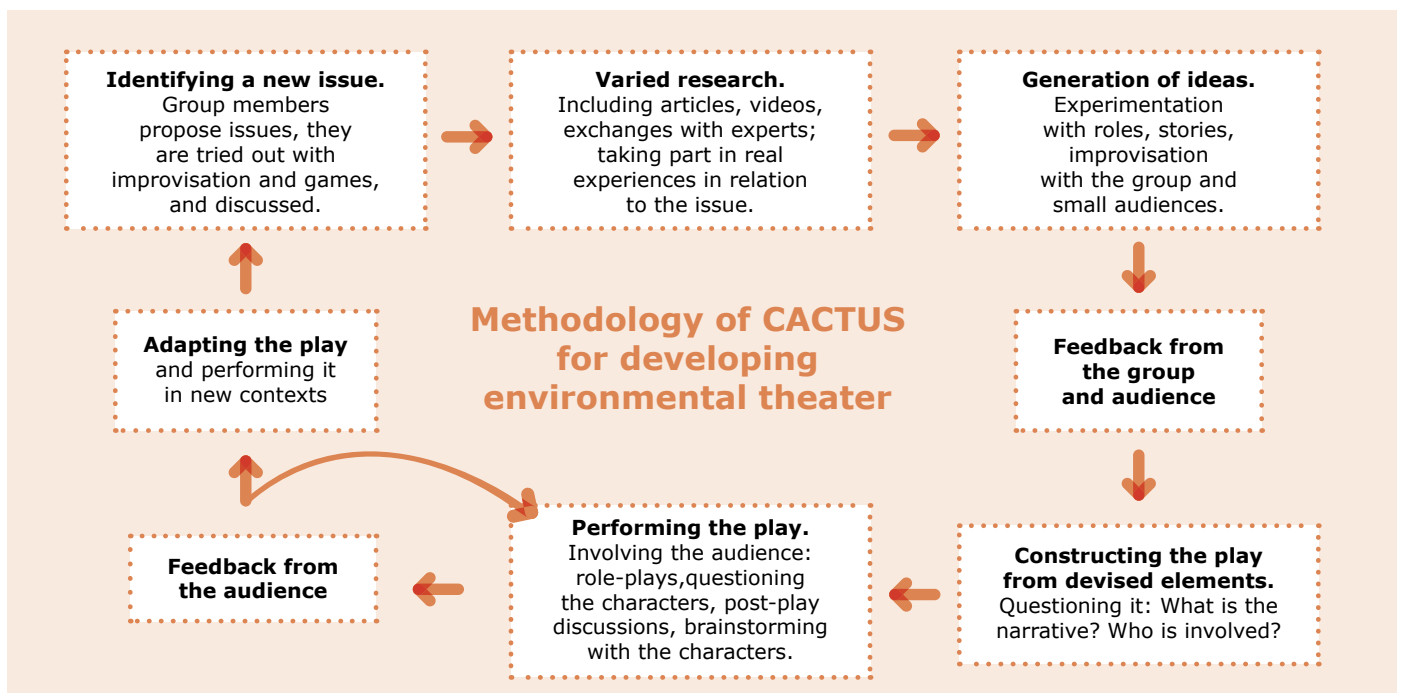
> Ideas, opinions, and proposals are debated in a deliberative way that still protects creativity.

Our Methodology

Through CACTUS, the group emphasizes theatre as a space for active communication and participation. This happens both inside and outside the group: among ourselves as actors and actresses; between ourselves and our audiences; among community groups and associations; and between ourselves and those affected by the issues that we present. CACTUS brings the tools and resources of theatre to forums of environmental activism and education in addition to infusing research and knowledge of environmental issues into theatrical spaces.

Our method is based on the program development process, which includes periods of formative evaluation, reflection, and revision as the program evolves in a nonlinear practice. Both the process of creation and the final product, in this case the play *AKWA*, have evolved with the contributions and feedback of audiences (**Figure 4**). Furthermore, our performances have involved varied social and environmental research and contain theatre, dance, poetry, music, and technology. The performances have been suited to different spatial contexts and are often performed in traditional spaces like theatres or in alternative ones such as cafés, bars, streets, and public spaces.

Identifying a new issue. Group members propose issues, they are tried out with improvisation and games, and discussed.

Varied research. Including articles, videos, exchanges with experts; taking part in real experiences in relation to the issue.

Generation of ideas. Experimentation with roles, stories, improvisation with the group and small audiences.

Methodology of CACTUS for developing environmental theater

Adapting the play and performing it in new contexts

Feedback from the group and audience

Feedback from the audience

Performing the play. Involving the audience: role-plays, questioning the characters, post-play discussions, brainstorming with the characters.

Constructing the play from devised elements. Questioning it: What is the narrative? Who is involved?

FIGURE 4. Methodology diagram for developing environmental theatre. There is no fixed starting point and individuals might join at various stages; however, in the case of AKWA we began by identifying an environmental issue to explore (in this case water).

AKWA: Addressing Water Conflicts through Social Theatre

AKWA is an hour-long play set in a future fictional world in which usable water has become very limited and is controlled by a few corporations.   Through sketches and stylized scenes, the play explores how a community might experience life and remember (or not) a world in which water was freely available and publicly owned. It is both funny and touching and invites the audience to participate in imagining such a world, as well to think about water in their own communities   **(Figure 5)**.

Typically, the collective selects current issues that are important to the environmental community. In 2011, when we began working on *AKWA*, the privatization of water was at stake in Madrid. Moreover, Spain is a country that suffers water shortages. We felt that water was a critical issue and would be challenging and meaningful for CACTUS.

FIGURE 5. The AKWA poster. Version by C.M. Delgado

Embodied Research

Our research was a process of drawing materials about water into the rehearsal space and gradually attempting to "embody" our theme: water. For *AKWA*, we contacted those already working on the issue of water within the environmental organization, Ecologistas en Accion, a collaborative partner for CACTUS. Within this organization there was already a dedicated "commission" researching and campaigning on issues related to water. We asked the members of this commission to participate in our early sessions and share resources about water. We organized drama rehearsals in which we explored these resources and materials. For example, we watched videos together and also gathered our own images and texts about water. Before one rehearsal, we all collected six photos of water and then we used these to create improvisations. In another, we used dance and our bodies represented streams, rivers, and oceans. By exploring a mixture of resources and using these in physical rehearsal scenarios involving improvisation, dance and voice work, we were able to *embody* our own research: expanding the creative process from the mind and integrating our bodies into our exploration of research.

FIGURE 6. A working-progress performance to a small audience in a community garden to gather audience inputs, Madrid. Photo by CACTUS

Dividing up research tasks also helped us to gather background details about water. In one exercise, each group member gathered different information about water. We ended up with a collation of linguistic, cultural, and meta and micro details about water (e.g., chemical and biological properties, availability, social issues). Even the name of the play came out of our research: *"akwa"* which is a root of the word *water* in prehistoric Indo-European languages.

Incorporating all the senses and exploring options

An advantage of theatre is its ability to appeal to many senses. We found the process of moving away from the spoken word quite liberating for ourselves and for the small audiences we invited into working sessions. Music, soundscapes, and visual elements were particularly interesting, but we also explored touch and smell, and discussed how much these might be incorporated (e.g., sound of the beach or touch of raindrops). Additionally, during all the performances we had a huge circular ice cube melting away during the production. The sound of a constant dripping was one of the features of the play **(Figure 6)**.

An important challenge to this work has been exploring how to convey complex environmental (and sometimes political) issues in ways that audiences can understand and relate to. Through this project, we sought (and continue to seek) to raise awareness, and invoke empathy while considering environmental questions. Part of our work was exploring how theatre provided us opportunities to do this.

We used two main strategies to connect to our audiences. The first experimental approach was to use movement and dance to embody all the phases of water (solid, liquid, and gas). The second was to personalize the issue of water. In one session, we told the story of our own lives in terms of water. The stories took many shapes: "I was born near a river…", or, "My mother always took me to the water fountain in our village." Similarly, we drew attention to the importance of water in our daily lives by doing a group experiment of restricting our use of water for three days **(see Box 1)**. These individual and shared experiences allowed us to build physical connections to water from which we were able to create dramatic sketches that we felt expressed the environmental injustices we saw in the world.

Embodied Research: Three Days without Water

Our play was about a world without usable water. So we asked ourselves, "Why don't we try living without water?" The group was captured by the idea! So everyone in the group spent three days without using water. We agreed this should mean that we couldn't drink any water, cook with water, clean with water, brush our teeth with water, wash with water, use bottled water or use taps. We made one exception for the benefit of those around us – we would flush the toilet. A terrific world of impairments and sensations appeared! We discovered an amazing range of ways in which our world without usable water already existed. For example, we found commercial products that replaced freely available water in most areas of life. These were three intense days that ended up in a drama-workshop session where we explored all our feelings and physical sensations, during which we enthusiastically drank water!

Although this exercise does not have health dangers for most people, it may be inappropriate for some circumstances. For example, young children, elders, and those with certain health concerns or on medication should not be encouraged to go without water for this timeframe. However, with proper instructions about how and where to find enough hydration over three days (fruits, vegetables, soft drinks, or other fluids) most populations should be able to accomplish this challenge. This and other exercises, by connecting daily life experiences with more general environmental concerns, are useful tools to personalize issues and reach audiences when developing environmental theater.

back to text

Devising the play

After a year and a half of informal brainstorms and experimentation in rehearsal studios and parks, we found we had a lot of material. While we had ideas and important reflections and even feelings about water, we needed to narrow our work and coalesce it into a play. We needed to identify a narrative or question, develop clear characters, decide what the play would look like visually and technically, and determine what type of relationship we wanted to have with the audience. From that point on, our work sessions were designed to lead us to answers to these questions.

FIGURE 7. Group creation of the order of the play and the script using sticky-notes and prompt cards. Photo by L. Medland

The specific idea of a world without usable water emerged and inspired us. This became the central proposition around which we began to focus the play, drawing on our previous work and directing our future explorations. In the rehearsals, characters began to emerge and develop in the context of questions posed by this focused scenario: how would it be living in a world where there is almost no available water? Who controls that water? Will people forget that water once freely existed? This idea also allowed us to better imagine the real-world situations of those who do not have access to water, and the myriad of practical problems that must appear in such a world. The embodied research enhanced creative access to the theatrical scenario in which water had been fully commoditized and transformed.

A piece of theatre usually needs a script, but our general approach was not to start with a script, but to develop one. Rather than looking for one script-writer or one director, we adopted a method of setting up periodic challenges and splitting into director-groups to guide the process along each step. Finally, a script was written as a guide to follow once we had arranged scenes in order, which we did through the use of sticky-notes. This might appear messy; however, it is wholeheartedly emergent, and allowed the play to be led by the action **(Figure 7)**.

While this script-development methodology took time, it created strong foundations for the play and a resilient and adaptable team. During this process, we decided that we wanted to avoid rushing; we preferred taking the time we needed until we had something we all were happy with. Despite this, however, we did establish some deadlines to avoid becoming stuck in any part of the process; for example, presenting working versions of devised pieces which would later contribute to the play, and participating in special or annual events. Thus, we could work rapidly during an intensive period for a deadline but overall maintain a slower development process. The group found it empowering to define a flexible timeframe and work at a self-directed pace with intermediate goals based on working conditions, people involved, issues addressed, and how the work affected community participants.

FIGURE 8. Exercise with the audience during a working-progress performance in a community garden in Madrid. Photo by CACTUS

The play continued to develop as we responded to different audiences, and even changed objectives to meet the needs of audiences.

Moving with our Audience and Community

Although we performed *AKWA* for the first time June 2012, the play continued to develop over two years based on the group needs as well as the specific needs and responses of our different audiences. Our objectives changed slightly with the nature of the audience. In the case of the environmentally active community that had assisted in our research, our objective was to return to them something stimulating and refreshing. This audience invited us to perform at events such as assemblies and days of action. *AKWA* has complemented workshops, trainings, meetings and public environmental campaigns. We also performed the play for general audiences that were not necessarily interested in environmental issues but simply interested in the play as a source of entertainment. In rural contexts, for example, the play was a community event and source of intrigue, drawing very mixed audiences of all ages, professions, and perspectives (e.g., teachers, farmers, retired couples with grandchildren). This audience expected entertainment but not necessarily to engage in discussion around environmental issues. Thus, we developed a "finished" play that was also in a constant process of creative adjustment allowing us opportunities to share the play with as many audiences as possible **(Figure 8)**.

FIGURE 9. Talking tables discussion with the audience, in Cantabria. Photo by L. Medland

Additionally, we have varied the type of audience participation at the end of the play, according to the needs of the community and the space in which we are working **(Table 1)**. As a result, audience participation has evolved to play a more substantial role in the performance. During the first performances the audience was invited to take part at the end by asking questions and discussing the characters' different perspectives on water concerns. This allowed members of the public, for example, to ask the politician character questions about the privatization of water in the city and to some extent *rehearse* real life topical scenarios in the ethos of Boal's *Theatre of the Oppressed*.
In later performances the water-related concerns and questions changed from the privatization of water to water pollution from fracking.   So, we adapted the play again. Additionally, we decided we wanted to work more closely with our audiences, so we have also developed a "talking tables" style of interaction at the end of the performance where people move between different topic tables to discuss a variety of related issues **(Figure 9)**.

Challenges and limitations

We have faced many challenges in developing this performance. Some of these were specifically related to the implementation of methodologies involving theatre for building environmental education initiatives, such as the following:

- Engaging people to be active participants, especially if they were expecting to passively watch a play.

- Development of a nonhierarchical process cycle; the interaction with the audience and collection of feedback requires a great amount of time, energy, and involvement from the members of the group.

- Working with complex environmental problems, and the lack of concrete and specific solutions for the problems addressed, which may generate disappointment among members of the audience.

- The need to avoid blaming, alarmist, demagogic, or moralistic messages about water issues, as well as telling people the potential answers or solutions. We had to keep in mind that the purpose was to motivate to action rather than generate a paralyzing anxiety or ready-made solutions.

We have been able to address some of these challenges and have either adapted the play or adapted our approach within the group. Others we have simply recognized as on-going questions and dilemmas that we should be aware of in every context. **Table 1** summarizes the ways in which key challenges were addressed.

TABLE 1. Challenges Faced and Some Strategies and Adaptations

PERFORMANCE	KEY CHALLENGE	STRATEGY OR ADAPTION
March 2011: Working Progress	Lack of clear narrative	Broke scenes into sticky notes and reordered scenes in play
June 2012: First Performance	Difficult to engage audience in interactive elements	Introduced new warm-up exercises for audiences
November 2012: Village Performance	Technical requirements of working in a theatre increased expectations of aesthetic quality	Group member volunteered to act as "director" for upcoming performances in order to oversee whole production
December 2012: National Environmental Conference	Audience has expertise on issue	More preparation and environmental research
February 2013: City Centre Theatre	Public calls for direct involvement and answers in relation to the local struggle	Evaluation of the role of the play in community settings and contexts of environmental activism
March 2013: Village Performance	Need to maintain positive atmosphere given much of audience facing redundancy having worked for years on environmental campaign coming to an end	Careful introduction, up-beat, and interactive performance
March 2013: Performance for Environmental NGO	Need to maintain positive atmosphere given much of audience facing redundancy having worked for years on environmental campaign coming to an end	Careful introduction, up-beat, and interactive performance
July 2013: Summer Tour of Play, four performances in: agricultural project centre, urban social centre, church and town theatre	Very different physical and atmospheric spaces	Minimalist set and props

Conclusions

Theatre has many potential uses as a tool to involve and empower communities and groups. It establishes a common language for communication and engagement, where artists may facilitate social participation by raising participants' self-confidence, stimulating their hope for change and breaking through apathy.   Theatre can also

FIGURE 10. Group and audience in a community hall, Ávila. Photo by L. Cotilla

trigger discussion that enables people to reflect on their own situations, to look critically at the world in which they live and the factors that influence their lives, to seek possible solutions or alternatives to socio-environmental problems.

As a tool for learning and communication, theatre provides opportunities for practitioners to bring environmental issues to the stage in ways that audiences can relate to, respond to, and use as a learning, or starting point, for transformative socio-ecological action. For example, theatre can bring together different community actors including those who are not usually engaged in environmental issues. In this chapter we have shown just one example of how such a process can take shape. We urge environmental educators to learn from this and other examples and consider where theatre can best be used to stimulate environmental learning or action in contexts suited to their audiences.

This case study of *AKWA* has demonstrated how, in the sense of Boal's hopes for social theatre, environmental theatre can be a means for audiences to evolve from consumers of art to individuals who question and discuss their social and ecological environments. By moving peoples' understanding "back and forth from the concrete to the abstract, the scientific to the political and economic, the local to the global and the causes and consequences of personal and societal actions," theatre contributes to a form of environmental education that engages both actors and spectators in a self-reflective process. Thus, the learning process delivered by *AKWA* has been bi-directional, taking place within the group and outside of it; cyclical; and influential in nourishing audiences, the group, and the play itself.

Finally, the one-off nature of a performance makes it difficult to identify specific outcomes or impacts (e.g., whether the discussion groups that formed after the play went on to work together or address the problems that they identified). However, the active involvement of audiences and communities, their continued suggestions, and the calls for *AKWA* in different interactive settings have demonstrated the usefulness of theatre to the environmental community and its audiences **(Figure 10)**.

Chapter 16 Endnotes

1   D. Cless , *Ecology and Environment in European Drama* (Abingdon, UK: Routledge, 2010), 1-229; S.K. Jacobson, M.D. McDuff and M.C. Monroe, "Using the arts for conservation," in *Conservation Education and Outreach Techniques*, eds. S.K. Jacobson, M.D. McDuff and M.C. Monroe (Oxford, UK:Oxford University Press, 2006), chapter 6, 184-208.

2   T. Guhrs, L. I. Z. Rihoy and M. Guhrs, "Using theatre in participatory environmental policy making," *Participatory Learning and Action* 55 (2006): 87-93; M.J. McNaughton, "From Acting to Action: Developing Global Citizenship Through Global Storylines Drama," *The Journal of Environmental Education* 45,no. 1 (2014): 16-36.

3   M. Gadotti, "Transformative learning," in *Tomorrow Today*, eds. M. Witthaus, K. McCandless and R. Lambert (Tudor Rose/ UNESCO, 2010), 157-159. http://unesdoc.unesco.org

4   McNaughton 2014 (see n. 2).

5   B. Augusto, *Games for actors and non-actors* (London, UK: Routledge, 2nd edition, 2002), 1-301.

6   AKWA is a root of the word water *(agua)* in prehistoric Indo-European languages, which is the main theme of the play.

7   CACTUS is the Spanish acronym of "Colectivo Artístico Cactus-Teatro Utópico y Social" [Artistic Collective Cactus- Social Utopian Theatre]. And, why CACTUS? The answer may be because it is green as the group's environmental activism and prickly like its role of social critique. It resists arid environments and accumulates water – which is essential for life.

8   For more information, go to http://www.ecologistasenaccion.es.

9   To see a short documentary about CACTUS and the way it works, go to https://www.youtube.com/watch?v=VWc1UPefnuM. Directed, filmed and edited by A. Maiques-Díaz, L. Díaz Muñoz and L. Cerezo, 2015

(accessed July 31, 2015); for more information, see also https://teatrocactus.wordpress.com/

10   "Clowning" is a word also used in Spanish which comes from the English word "clown". Now it denotes a contemporary art, in which ridiculing or satirizing issues and situations, through the role of the clown, can allow us to see situations in new ways. It strives to allow individuals to live to their greatest potential, without judgment, and with humility and courage. For more information, go to http://www.jesusjaraclown.com/ (accessed August 18, 2015). There are many kinds of physical theatre however, one kind that influences our group was the variety developed by Jacques Lecoq. For more information, go to J. Lecoq, J-G. Carasso and J-C. Lallias, *The Moving Body: Teaching Creative Theatre* (New York, USA: Routledge, 1997), 1-184.

11   Boal 2002 (see n. 5).

12   A. Bogart and T. Landau, *The Viewpoints Book: A Practical Guide to Viewpoints and Composition* (New York, USA: Theatre Communications Group, 2005), 1-224.

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18   A. Delgado, "Creatividad Cotidiana" [Everyday Creativity], https://teatrocactus.files.wordpress.com/2012/06/creatividad-cotidiana-2014.pdf

19   Boal 2002 (see n. 5)

20   For more information, go to https://www.youtube.com/watch?v=H7LO8sgepIs

21   To see the complete play, go to https://www.youtube.com/watch?v=80hgV6JsLms

22   For more information, go to http://dictionary.reference.com/browse/aqua

23   Boal 2002 (see n. 5)

24   For more information, go to http://www.ecologistasenaccion.es/rubrique379.html

25   Abad 2014 (see n. 17)

26   N. Räthzel and D. Uzzell D, "Transformative Environmental Education: A Collective Rehearsal for Reality," *Environmental Education Research* 15, no. 3 (2009): 263–277.

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