exploring

# ENVIRONMENTAL SCIENCE

with children and teens

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# ENVIRONMENTAL SCIENCE

## with children and teens

EILEEN G. HARRINGTON

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# NURTURING FUTURE ENVIRONMENTAL LEADERS IN LIBRARIES AND MUSEUMS

All summer we went on safari to Africa—an imaginary foray into the sights, sounds, and smells of this fascinating continent through books, specimens, and crafts. One week during the Science Story Adventures program I led at the museum where I worked, we learned about elephants. After reading an engaging story about a young elephant growing up in her herd, we donned our own construction-paper elephant ears and placed socks over our arms to represent trunks and began to communicate as elephants would. Just as all mothers like to keep their young safe, we flapped our ears and made soft rumbling noises to call back our young elephants that had wandered away from the herd. When we noticed a lion hiding in the grass, we held our ears straight out to make ourselves look bigger and raised our trunks, giving off a large, trumpeting blast. After reading another story about elephants and their behaviors, we created our own elephant puppets, complete with a movable trunk and ears so we could continue our elephant-communication explorations at home.

Informal environmental education programs such as this one are becoming increasingly important given some of the realities we face today.


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Several reports and articles written over the past decade have stressed the shortcomings of science education in US schools.[1] With the implementation of No Child Left Behind, science education in our K–12 schools has often taken a backseat, with greater emphasis placed on math and reading. A large-scale study on third-grade classrooms across the country found that on average 48 percent of instructional time is spent on literacy and language arts activities, 24 percent on math, and 5 percent on science.[2] The lack of science instruction students receive in the formal education system has had effects on student performance on standardized tests measured both nationally and internationally. The 2009 results of the National Assessment of Educational Progress, which measures students' achievement in different subjects in fourth, eighth, and twelfth grades, found that 34 percent of fourth graders, 30 percent of eighth graders, and 21 percent of twelfth graders scored at the "proficient" level or higher, meaning they have "competency over challenging subject matter."[3] Student performance on international assessments, which compare US students with those from other G-8 or Organization for Economic Cooperation and Development member countries, has either remained flat or shown decline in science literacy. The 2006 Program for International Student Assessment results in science ranked US students below fifteen of twenty-four other countries.[4]

Other studies have shown some positive changes in science and math. A report published by the American Association of University Women found that between 1990 and 2005, the number of credits in math and science that high school students were taking increased, along with a steady increase in grade point averages in science and math classes.[5] This same report pointed out, however, that those from traditionally underrepresented groups in the sciences, such as Latinos and African Americans, are less likely to have access to advanced courses in science and math in high school. Libraries and museums can play a role in helping to fill in some of the gaps in science education for all students.

These deficiencies in science education and literacy become even more troubling given the complex and myriad environmental problems we face in the world today. Issues such as climate change, genetically modified foods, dwindling natural resources, habitat loss, and the contamination of our oceans do not have simple solutions or answers and require an understand-

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ing of and respect for multiple viewpoints. Science is one of various tools that we will need to help solve the environmental problems we are facing now and will face in the future. Studies have shown that when introduced to science at an early age, children are more likely to go into science as a career.[6] We will need future scientists to help tackle these environmental problems, or even if students do not go into science, a scientifically literate citizenship is imperative to help direct policy decisions. As Ursula Franklin, a renowned physicist, author, and educator, has urged: "The task of the future is to build knowledge and understanding among and between citizens and scientists, so that the distinction between the two groups disappears—so that both become citizen scientists, potentially able to solve our problems together."[7]

Another reason to encourage environmental programming in libraries and museums is that children (and adults) are increasingly facing a disconnection with nature. As science education experts Camino, Dodman, and Benessia point out, "We are witnessing a massive increase in the knowledge of our planet, but this has come with an increasing separation of most of humanity from the natural systems that support us and of which we are a part."[8] As our understanding of the workings of our planet increases, our connection to what is natural decreases. More and more humans live in an urban environment. Many children have never swum in a lake or seen a bald eagle, our national symbol, in the wild. Most don't know what part of the plant many of the vegetables they eat come from. Richard Louv has termed this condition "nature-deficit disorder," which is also linked to many other ills, from childhood obesity to social isolation and depression.[9] It can also lead to a lack of empathy for wildlife, and some might argue that you cannot protect what you do not know or care about, thus making environmental education all the more important.

Given this landscape, libraries and museums can play an important role in increasing young people's exposure to environmental issues and in developing science literacy. In many ways, both of these types of institutions possess characteristics that make them ideally situated to engage young people in science and the natural world. The audience that comes to museums or libraries come there of their own free will. They visit because they want to be there, so in some ways, they are more invested in their learning than those

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in a traditional classroom. Programs can build on and nurture environmental interests that children already possess, possibly leading them to a desire to go into this field as a career in the future. Also, informal educational programs do not have as many restrictions as the formal school system, such as curriculum guidelines, so they can respond more quickly and innovatively to the changing needs and interests of the communities they serve. Finally, libraries and museums provide learning opportunities that children might not experience in their schools, such as intergenerational learning and increased opportunities for underrepresented groups in the sciences. A study that looked at the impact of a science center on its community found that "adults strongly agreed that the Science Center created opportunities for them to talk with their children about science and technology, and that it gave their child opportunities in life not supported by other organizations or institutions in the community."[10] Museums and libraries create spaces for the sharing of knowledge among family members and increase exposure to science for groups of people from a variety of backgrounds.

Often libraries do not jump to mind when people think about environmental programming, and many librarians do not come from a science background. Literature on environmental or science programming is largely absent from the library field, and most curriculum or activity books on the subject are geared toward classroom teachers or informal environmental educators. This book will help give confidence to librarians that environmental programming is something they can and should do in their libraries.

At the same time, many programs that are second nature to librarians are not those that one immediately associates with a science center or natural history museum. Museum educators might not have a background in literacy development or children's literature, both of which can be utilized to foster scientific literacy. These things are also the purview of children's librarians and the library literature. In this way, this book will help introduce museum educators to some of these types of programs and resources that they can incorporate into their programs. Although library-museum partnerships do exist, in many ways they are not as common as one would think. Another goal of this book is to foster these partnerships by highlighting ways to create linkages and to draw on each other's strengths.

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The overall approach to the programs and activities outlined in this book follows a desire to engage the whole child. Programs that foster a sense of wonder for the natural world and help children to see the connections between them and their environment call upon the use of their heart. These types of programs are connected to the emotional or empathetic aspects of their personality and can help children see the intrinsic value of the natural world. Other activities may focus more on intellectual pursuits in which children can develop their critical-thinking skills rather than just partaking in the accumulation of facts or new knowledge of certain issues. Programs that engage the physical aspects of learning allow children to do real science and/or environmental projects. Children need to be able to apply what they are learning in real-life situations in order to truly develop their skills and values. Often these types of programs also draw on children's own personal experiences, which can make them more meaningful to them and lead to lasting change. The different programs in the book emphasize some or all of these different aspects of learning. They also are meant to be guidelines, but they are by no means a one-size-fits-all solution. You can and should adapt and alter them to meet the needs and desires of your own communities.

The following is an overview of the various chapters in this book. Chapters 2–4 focus on what many will recognize as more traditional library programs. Chapter 2 outlines recommendations for creating environmental-themed family storytimes and includes ten ready-made programs. Chapter 3 provides the ins and outs of developing environmental book clubs for tweens and teens, as well as sample discussion guides for ten books. Chapter 4 explores preschool programming, specifically a simple lab-based program that allows preschoolers to begin to think and act like scientists.

Self-directed programs abound in chapter 5. These include kits that visitors can borrow to undertake their own nature explorations after visiting a museum or participating in a library program. The chapter also includes an overview on creating discovery centers in libraries and museums, along with some sample themes.

Chapter 6 focuses on citizen science, an area of science education that is gaining popularity in museums and schools. It examines the various approaches to citizen science; possible partnerships between libraries,

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schools, and museums for implementing citizen science projects; and ways that libraries and museums can act as hubs for disseminating citizen science information.

It's all in the family in chapter 7 with family science workshops. Recommendations for developing and delivering this type of program are included, along with sample workshops.

For those young people that want to get out and make a difference, chapter 8 focuses on environmental action clubs. Tips and tricks on how to organize a club at your museum or library are included, as well as ways that librarians can help with the background research that might be necessary to implement a project.

It is my hope that by providing concrete ways to implement environmental programming in libraries and museums, as well as a variety of options, will inspire educators and librarians to do just that. Given the many challenges we face, it is imperative that we support one another in working for a sustainable future. We can also encourage the young people with whom we work to do the same.

## NOTES

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