Guidelines for the Preparation and Professional Development of Environmental Educators

North American Association for Environmental Education

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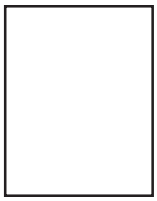

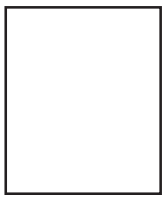

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Preface

Guidelines for the Preparation and Professional Development of Environmental Educators represents another in a series of documents published by the North American Association for Environmental Education (NAAEE) as part of the National Project for Excellence in Environmental Education. These guidelines and others produced as part of the Project synthesize the best thinking about environmental education through an extensive process of review and discussion. Thus far, thousands of individuals and organizations representing all aspects of environmental education have reviewed materials, working outlines, and drafts for the guidelines projects. Reviewers have included teachers, educational administrators, environmental scientists, curriculum developers, university faculty, staff from natural resource agencies and education departments, and people from many other areas of expertise. The National Project for Excellence in Environmental Education has been funded by the U.S. Environmental Protection Agency through the Environmental Education and Training Partnership (EETAP), under agreement with NAAEE.

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Introduction

Guidelines for the Preparation and Professional Development of Environmental Educators is a set of recommendations about the basic knowledge and abilities educators need to provide high-quality environmental education. The guidelines are designed to apply:

- Within the context of pre-service teacher education programs and environmental education courses offered to students with varied backgrounds such as environmental studies, geography, liberal studies, or natural resources;
- To the professional development of educators who will work in both formal and nonformal educational settings, offering programs at the pre-kindergarten through 12th grade levels; and
- To full-time environmental educators as well as for those for whom environmental education is just one of their responsibilities.

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 education, environmental studies, geography, natural resource, 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*** outlines the experiences and learning that will help them deliver instruction that effectively fosters environmental literacy.

This document presents an ambitious overview of the abilities and knowledge of a well-prepared environmental educator; it does not seek to address more general educational competencies. The guidelines provide a mechanism for gauging the quality of pre-service and in-service preparation programs and the abilities of environmental educators. Instead of offering fixed rules, these guidelines suggest a broad vision—a goal to work toward and a guide for professional and programmatic development.

Environmental Education: A Vision for the Future

The guidelines are grounded in a common understanding of effective environmental education. For many environmental educators, that understanding is rooted in two founding documents of the field: the Belgrade Charter (UNESCO-UNEP, 1976) and the Tbilisi Declaration (UNESCO, 1978).

The Belgrade Charter was adopted by a United Nations conference and provides a widely accepted goal statement for environmental education:

The goal of environmental education 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.

Two years later, at the world's first intergovernmental conference on environmental education, the Tbilisi Declaration was adopted. This declaration built on the Belgrade Charter and established three broad goals for environmental education. These goals provide the foundation for much of what has been done in the field since 1978:

- *To foster clear awareness of, and concern about, economic, social, political and ecological interdependence 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 towards the environment.*

As the field has evolved, these principles have been researched, critiqued, revisited, and expanded. They still stand as a strong foundation for an internationally shared view of the core concepts and skills that environmentally literate citizens need. Since 1978, bodies such as the Brundtland Commission (Brundtland, 1987), the United Nations Conference on Environment and Development in Rio (UNCED, 1992), the International Conference on Environment and Society in Thessaloniki (UNESCO, 1997), and the World Summit on Sustainable Development in Johannesburg (United Nations, 2002) have influenced the work of many environmental educators. By highlighting the importance of viewing the environment within the context of human influences, this perspective has expanded the emphasis of environmental education by focusing more attention on social equity, economics, culture, and political structure.

The Instructional Vision of Environmental Education

These guidelines outline the abilities and understandings—or competencies—an educator needs to implement environmental education successfully. Environmental education is a comprehensive and cohesive whole that both draws on and advances broader educational goals and instructional methods. Taken by themselves, these competencies may not capture this rich vision.

Environmental education is, at its heart, an integrative undertaking. Instructors **teach across disciplines**, linking the methods and content of natural and social sciences, arts, mathematics, and humanities to help learners fully understand and address complex environmental issues. Environmental educators need the ability and the commitment to keep the whole picture in mind as they guide students toward environmental literacy.

The learner is an active participant in environmental education. If learning is to become a natural, valued part of life beyond school, instruction should **engage the learner in the process of building knowledge and skills** and be guided in part by the student's interests.

Three important ideas that shape the instructional vision of environmental educators

Systems

The idea of systems helps make sense of a large and complex world. A system has parts that can be understood separately, but the whole cannot be understood completely without recognizing the relationships among its parts. The human body can be seen as a system; so can galaxies. Organizations, individual cells, communities of animals and plants, and families can all be understood as systems. And systems are nested within other systems.

Interdependence

Human well being is inextricably bound with environmental quality. We and the systems we create—our societies, politics, economics, cultural activities, technologies—affect the systems and cycles of the rest of nature. Since we are "in" the system, a part of nature rather than outside it, we are challenged to recognize the ramifications of our interdependence.

The importance of where one lives

Environmental education begins close to home, encouraging learners to explore and understand their immediate surroundings. The sensitivity, knowledge, and skills gained by forging this local connection provide a base for moving out into larger systems, broader issues, and a lifetime of learning about causes, connections, and consequences.

Environmental issues are complex and multifaceted. Especially because they can prompt deep feelings and strong opinions, educators must take a **balanced approach to instruction**. Environmental educators incorporate differing perspectives and points of view evenhandedly and respectfully and present information with intellectual honesty. They involve learners in critical evaluation of data, results, models, conclusions, and opinions. Fairness and accuracy are watchwords for instruction.

Environmental education works both in and outside the classroom. Instructors foster learners' innate curiosity and enthusiasm, providing them with **early and continuing opportunities to explore their environment**. Experiences outside the classroom are an important instructional strategy for engaging students in direct discovery of the world around them. This awareness of their local community can prompt a personal commitment to apply skills and knowledge in pursuit of environmental quality and quality of life.

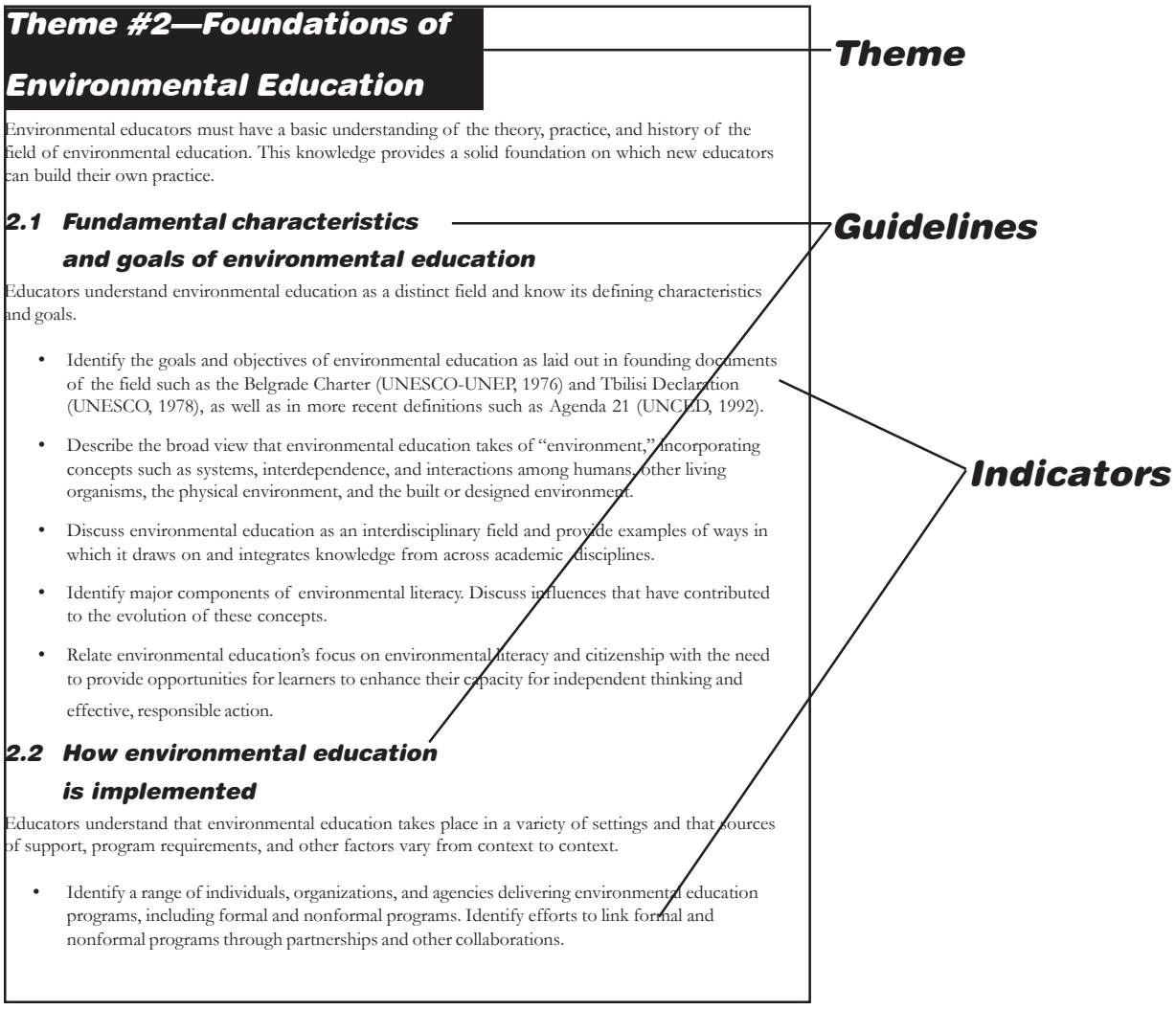
Finally, environmental education provides opportunities for learners to enhance their capacity for **independent thinking and effective, responsible action**. Engaging in individual and group experiences helps learners develop these capacities independently and in collaborative situations

that anticipate the ways in which problem-solving happens in the community, on the job, and in the family. A **strong emphasis on developing communication skills** helps learners demonstrate and disseminate their knowledge.

How to Use the Guidelines

Guidelines for the Preparation and Professional Development of Environmental Educators is organized around six **themes**. Each theme describes a knowledge or skill area that must be included in the pre-service and in-service training of an environmental educator. Under each theme, general **guidelines** further articulate the knowledge and skills that must be mastered to gain competency in that area. Finally, each guideline is accompanied by several more specific **indicators** that suggest ways of assessing the abilities of new environmental educators, as well as the quality of the programs that prepare them for their profession. Indicators are to be used simply as examples and do not represent an all inclusive listing of abilities.

Sample Format for the Guidelines:



To assist in the development of programs for pre-service and in-service preparation, each theme is accompanied by references to several relevant articles and books. These references enable developers and instructors of professional development programs and environmental education courses to delve more deeply into the content of each theme.

The Guidelines at a Glance

This list includes the six themes and general guidelines required for competency in environmental education. Each guideline is further articulated in the sections following this summary.

#1—Environmental Literacy

Educators must be competent in the skills and understandings outlined in *Excellence in Environmental Education—Guidelines for Learning (Pre 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

#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

#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

#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

#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

#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 Learner outcomes

6.2 Assessment that is part of instruction

6.3 Improving instruction

6.4 Evaluating programs

Selected References:

Brundtland, G. H. *Our Common Future: The World Commission on Environment and Development.* New York: Oxford University Press, 1989.

UNCED. *Agenda 21: Programme of Action for Sustainable Development: Rio Declaration on Environment and Development.* New York: United Nations, 1992.

UNESCO/UNEP. "The Belgrade Charter," *Connect* 1, no. 1 (1976): 1–2.

UNESCO. *Final Report: Intergovernmental Conference on Environmental Education.* Organized by UNESCO in cooperation with UNEP, Tbilisi, USSR, 14-26 October 1977. Paris: UNESCO, 1977.

UNESCO. *Educating for a Sustainable Future: A Transdisciplinary Vision for Concerted Action. Report from the International Conference on Environment and Society: Education and Public Awareness for Sustainability.* Organized by UNESCO and the Government of Greece, Thessaloniki, 8–12 December 1997. Paris: UNESCO, 1997.

UNITED NATIONS. *Report of the World Summit on Sustainable Development.* Johannesburg, South Africa, 26 August–4 September 2002. New York: United Nations, 2002.

Theme #1— Environmental Literacy

Environmental educators must possess the understandings, skills, and attitudes associated with environmental literacy. These competencies have been defined in detail in *Excellence in Environmental Education—Guidelines for Learning (Pre K–12)*, published by the North American Association for Environmental Education, which should be considered a companion to this document. Educators must gain a working knowledge of the content and skills they will be teaching, with a mastery, at minimum, appropriate to the grade level at which they will be teaching.

The outline below offers a broad summary of the content knowledge and basic skills required of environmentally literate educators, and should guide the preparation of instructors. A more detailed summary of *Excellence in Environmental Education—Guidelines for Learning (Pre K–12)* is included in the Appendix to this document, and the complete *Guidelines* document is referenced below.

1.1 Questioning, analysis, and interpretation skills

Developing environmental literacy depends on a willingness and ability to ask questions about the surrounding world, speculate and hypothesize, seek and evaluate information, and develop answers to questions. Environmental literacy requires a familiarity with some basic modes of inquiry, a mastery of fundamental skills for gathering and organizing information, and an ability to interpret and synthesize information and communicate explanations.

1.2 Knowledge of environmental processes and systems

Environmental literacy hinges on understanding the processes and systems that comprise the environment, including human social systems and their influences. That understanding is based on

knowledge synthesized from across the traditional disciplines (especially the natural and social sciences) and includes knowledge about: the Earth as a physical system; the living environment; humans and their societies; and how society and the environment are linked.

1.3 Skills for understanding and addressing environmental issues

Environmental literacy includes the abilities to learn about, evaluate, and act on environmental issues. The skills and knowledge outlined in the first two guidelines (1.1, questioning and analysis skills and 1.2, knowledge of environmental processes and systems) are applied and refined in the context of these issues—the real-life dramas where differing viewpoints and interpretations of data about environmental problems and their potential solutions are played out.

1.4 Personal and civic responsibility

Environmental literacy is activated by individual commitment. Environmentally literate citizens are motivated and empowered to act on their own informed conclusions about what should be done to ensure environmental quality. In developing and applying concept-based learnings and skills for inquiry, analysis, and action, people cultivate an understanding that what they do as individuals and in groups makes a difference.

References:

Excellence in Environmental Education—Guidelines for Learning (Pre K–12). Washington, D.C.: North American Association for Environmental Education, 2nd edition 2004.

Theme #2—Foundations of Environmental Education

Environmental educators must demonstrate a basic understanding of the goals, theory, practice, and history of the field of environmental education. This knowledge provides a solid foundation on which educators can build their own practice.

2.1 Fundamental characteristics and goals of environmental education

Educators understand environmental education as a distinct field and know its defining characteristics and goals.

- Identify the goals and objectives of environmental education as laid out in founding documents of the field such as the Belgrade Charter (UNESCO-UNEP, 1976) and Tbilisi

Declaration (UNESCO, 1978), as well as in more recent definitions such as Agenda 21 (UNCED, 1992).

- Describe the broad view that environmental education takes of "environment," incorporating concepts such as systems, interdependence, and interactions among humans, other living organisms, the physical environment, and the built or designed environment.
- Discuss environmental education as an interdisciplinary field and provide examples of ways in which it draws on and integrates knowledge from across academic disciplines.
- Identify major components of environmental literacy. Discuss influences that have contributed to the evolution of these concepts, such as work done by Charles Roth, Harold Hungerford, R. Ben Beyton, and Rick Wilke.
- Relate environmental education's focus on environmental literacy and citizenship with the need to provide opportunities for learners to enhance their capacity for independent thinking and effective, responsible action.

2.2 How environmental education is implemented

Educators understand that environmental education takes place in a variety of settings and that sources of support, program requirements, and other factors vary from context to context.

- Identify a range of individuals, organizations, and agencies delivering environmental education programs, including formal and nonformal programs. Identify efforts to link formal and nonformal programs through partnerships and other collaborations.
- Discuss how school policies, state or local mandates for environmental education, and federal legislation influence environmental education efforts.
- Describe a variety of national, regional, state, and local environmental education programs and support services, including funding sources and resources.

2.3 The evolution of the field

Educators are familiar with how the field of environmental education has changed over time and continues to change.

- Discuss how educational movements, including progressive education, nature study, outdoor education, conservation education, and ecology education, contributed to the development of environmental education and how they differ from environmental education.
- Discuss how the work of bodies such as the Brundtland Commission (Brundtland, 1987), the United Nations Conference on Environment and Development (UNCED, 1992), the International Conference on Environment and Society (UNESCO 1997), and the World Summit on Sustainable Development (2002) has influenced—or might influence—environmental education.

- Describe specific findings from environmental education research and discuss their effect on how environmental education might be perceived, defined, or practiced.
- Identify current and emerging issues in the field of environmental education. For example, evaluate assertions that environmental education focuses more on advocacy rather than education and discuss how these assertions are affecting environmental educators and education programs.
- Describe how specific environmental education research findings have informed the educator's own perspective.

Selected References:

Brundtland, G. H. *Our Common Future: The World Commission on Environment and Development.* New York: Oxford University Press, 1989.

Disinger, J. F. "Environmental Education's Definitional Problem," *ERIC Clearinghouse for Science, Mathematics and Environmental Education Information Bulletin #2.* Columbus: ERIC/SMEAC, 1983.

Disinger, J. F. "Tensions in Environmental Education: Yesterday, Today, and Tomorrow." In *Essential Readings in Environmental Education*, edited by H. Hungerford, W. Bluhm, T. Volk, and J. Ramsey. Champaign, IL: Stipes Publishing Company, 2001.

Disinger, J. F. and M. C. Monroe. *Defining Environmental Education*. EE Toolbox—Workshop Resource Manual. Ann Arbor, MI: National Consortium for Environmental Education and Training, 1994.

Disinger, J. F. and C. E. Roth. *Environmental Literacy*. ERIC Clearinghouse for Science, Mathematics and Environmental Education. CSMEE Digest 92-1, 2003.

Elder, J. *A Field Guide to Environmental Literacy: Making Strategic Investments in Environmental Education.* Manchester, MA: Environmental Education Coalition, 2003.

Hungerford, H. R., R. B. Peyton, and R. Wilke. "Goals for Curriculum Development in Environmental Education." *Journal of Environmental Education* 11, no. 2 (1980): 42–47.

Massachusetts Executive Office of Environmental Affairs. *Benchmarks on the Way to Environmental Literacy*. Boston, MA: Massachusetts Executive Office of Environmental Affairs, 2003

National Environmental Education Advisory Council. *Report Assessing Environmental Education in the United States and the Implementation of the National Environmental Education Act of 1990*. Washington, DC: U.S. Environmental Protection Agency, 1996.

National Environmental Education and Training Foundation. *Environmental Education: Resources at a Glance.* Washington, DC: National Environmental Education and Training Foundation, 2002.

Schoenfeld, C. "What's New About Environmental Education?" *Journal of Environmental Education* 1, no. 1 (1969): 1–4.

Simmons, D. *The NAAEE Standards Project: Papers on the Development of Environmental Education Standards*. Rock Spring, GA: North American Association for Environmental Education, 1995.

Stapp, W. B., et al. "The Concept of Environmental Education." *Journal of Environmental Education* 1, no. 1 (1969): 30–31.

Swan, M. "The Forerunners of Environmental Education." In *What Makes Education Environmental?* edited by N. McInnis and D. Albrecht. Louisville, KY: Data Courier, 1975.

Tilbury, D., R. Stevenson, J. Fien and D. Schreuder (eds.) *Education and Sustainable Development: Responding to the Global Challenge*. Gland: IUCN Commission on Education and Communication, 2002.

UNCED. *Agenda 21: Programme of Action for Sustainable Development: Rio Declaration on Environment and Development*. New York: United Nations, 1992.

UNESCO-UNEP. "The Belgrade Charter." *Connect*: UNESCO-UNEP Environmental Education Newsletter 1, no. 1 (1976): 1–2.

UNESCO. "The Tbilisi Declaration: Final Report Intergovernmental Conference on Environmental Education Organized by UNESCO in cooperation with UNEP, Tbilisi, USSR, 14-26 October 1977." *Connect* 3, no. 1 (1978).

UNESCO. *Educating for a Sustainable Future: A Transdisciplinary Vision for Concerted Action*. (Report from the International Conference on Environment and Society: Education and Public Awareness for Sustainability, Thessaloniki, December 8-12, 1997), 1997.

UNESCO. *Education for Sustainability - From Rio to Johannesburg: Lessons Learned from a Decade of Commitment*. NY: UNESCO, 2002.

Theme #3—Professional Responsibilities of the Environmental Educator

Environmental educators must understand and accept the responsibilities associated with practicing environmental education. In their pre-service and in-service preparation, educators should come to understand environmental education as a profession that maintains consistent and high standards for instruction and professional conduct.

3.1 Exemplary environmental education practice

Educators understand their responsibility to provide environmental education that is appropriate, constructive, and aligned with the standards of the field.

- Identify ways in which environmental education can be used as a tool for meeting curriculum standards and addressing education reform goals. Identify and practice ways in which educators can enhance these links in their work.
- Assess the role of partnerships with community members and organizations, government agencies, businesses, the formal and nonformal education systems, and others in providing environmental education that is appropriate and helpful to the community.
- Model responsible, respectful, and reasoned behavior during instruction.
- Model the process of inquiry and application of environmental investigations in instruction.

3.2 Emphasis on education, not advocacy

Educators understand that their commitment as environmental educators is to provide accurate, balanced, and effective instruction—not to promote a particular view about environmental conditions, issues, or actions.

- Identify and implement instructional techniques for presenting differing viewpoints and theories in a balanced manner and identifying potential sources of bias in information.
- Differentiate among instructional materials on the basis of their factual accuracy. Select and use materials that together present a range of differing viewpoints, ethical positions and interpretations where there are differences of opinion or competing scientific explanations. Weigh evidence regarding environmental problems based on validity of data (e.g., from scientific societies or reputable journals).
- Identify and implement instructional strategies and techniques that encourage learners to explore different perspectives, form their own opinions, and explain their beliefs.

3.3 Ongoing learning and professional development

Educators are aware of the need to be active learners in their professional lives.

- Identify and practice ways of continually updating information about the environment and issues, current research, environmental education materials, and instructional methods. For example, critically read scientific journals or join and actively participate in local, state, national, or international organizations associated with environmental education, or participate in a professional certification program.
- Identify and develop relationships with mentors, advisors, and others who challenge educators to expand and upgrade their knowledge and skills and expand their firsthand understanding of different points of view about environmental issues.
- Reflect on and learn from personal practice as an environmental educator, both individually and with other professionals and colleagues. Use tools such as peer coaching, portfolios, and journals.

- Seek out opportunities to learn essential content and skills in real-world environmental settings or contexts, especially within the communities and ecosystems in which one lives and teaches.
- Learn and use research and analytical skills to expand existing knowledge about the environment, related issues, and environmental education.

Selected References:

Archie, M. *Environmental Education—Moving into the Educational Mainstream.* Alexandria, VA: Association for Supervision and Curriculum Development, 2001.

Archie, M. *Advancing Education Through Environmental Literacy.* Alexandria, VA: Association for Supervision and Curriculum Development, 2003.

Environmental Education Materials: Guidelines for Excellence. Washington, D.C.: North American Association for Environmental Education, 2nd edition 2004.

Hug, J. "Two Hats." In *The Report of the North American Regional Seminar on Environmental Education for the Real World*, edited by J. Aldrich, A. Blackburn, and A. George. Columbus, OH: SMEAC Information Reference Center, 1977.

National Environmental Education and Training Foundation and North American Association for Environmental Education. *Environment-Based Education: Creating High Performance Schools and Students.* Washington, DC: National Environmental Education and Training Foundation, 2000.

National Environmental Education and Training Foundation and North American Association for Environmental Education. *Using Environment-based Education to Advance Learning Skills and Character Development.* Washington, DC: National Environmental Education and Training Foundation, 2001.

"Nine Guiding Principles: Professional Responsibilities of Environmental Educators. In *Environmental Education in the United States—Past, Present, and Future: Collected Papers of the 1996 National Environmental Education Summit*, edited by M. Archie. Washington, DC: North American Association for Environmental Education, 1998.

Nonformal Environmental Education Programs: Guidelines for Excellence. Washington, D.C.: North American Association for Environmental Education, 2004.

Theme #4–Planning and Implementing Environmental Education

Environmental educators must combine the fundamentals of high-quality education with the unique features of environmental education to design and implement effective instruction. Their professional preparation should enable educators to provide the interdisciplinary, hands-on, investigative learning opportunities that are central to environmental education.

4.1 Knowledge of learners

Educators know how to tailor instructional approaches to meet the needs of, yet challenge, different learners.

- Identify and model methods for presenting the environment or environmental issues in appropriate and engaging ways for learners of different ages, backgrounds, levels of knowledge, and developmental abilities. (This range may include adults, especially for educators in nonformal settings.)
- Select environmental education materials and strategies that are developmentally appropriate for a designated age or level of knowledge. Adjust these to respond to individual differences among learners.
- Demonstrate an understanding of learning theories such as multiple intelligences and learning styles. Organize environmental education instruction to accommodate different approaches to learning.
- Apply theories of cognitive and moral/social development in creating an environmental education instructional plan for a particular grade level, class, or group.
- Recognize and acknowledge the validity of varying cultural perspectives present in groups of learners. Tailor instructional approaches to respond to these perspectives and use them as an educational resource.

4.2 Knowledge of instructional methodologies

Educators are familiar with and can employ a range of instructional methods that are particularly suited to environmental education.

- Select among relevant environmental topics and issues for study based on learners' interests and their ability to construct knowledge to gain conceptual understanding.
- Use a variety of teaching methods and strategies appropriate for the environmental education content and context (see box below).

Essential Approaches to Environmental Education Instruction

Environmental educators employ many instructional strategies—ranging from lecture and discussion to action research, and from reading assignments to panel discussions and debates. While many methods are useful in environmental education, there are some instructional methods that are particularly well suited to environmental education content. Educators should be familiar with these and be able to put them into action. They include:

- ***Hands-on observation and discovery in the environment***
- ***Inquiry***
- ***Cooperative learning***
- ***Community-based action research and problem solving***
- ***Investigating environmental issues***
- ***Service learning***
- ***Simulations and models***
- ***Case studies***
- ***Problem-based learning***
- ***Project-based learning***

References for these instructional methods are included at the end of this section.

- Select instructional methodologies based on learning objectives, learner characteristics, time requirements, involvement of community members, community dynamics and policies, available resources, and the instructional setting.

4.3 Planning for instruction

Educators are able to plan age-appropriate environmental education instruction and programs that meet specific instructional goals.

- Produce a plan for environmental education instruction and demonstrate how the overall plan and specific elements (such as plans for units of instructional or daily activities) enhance coordination or integration across disciplines or help meet specific goals of environmental education.
- Develop a plan for a coherent, focused environmental education program that is consistent with the content outlined in *Excellence in Environmental Education—Guidelines for Learning (Pre K–12)* or comparable expectations for adults.

- Demonstrate how plans for environmental education instruction will help learners meet relevant national, state, and local educational standards for learning performance in specific disciplines.

4.4 Knowledge of environmental education materials and resources

Educators are aware of a range of materials and resources for their environmental education efforts and understand how to access, evaluate and use these resources.

- Identify and evaluate materials and education resources using criteria such as those suggested in *Environmental Education Materials: Guidelines for Excellence*.
- Demonstrate ways in which the community can be a resource for environmental education, identifying local businesses, service organizations, government agencies, nonprofit organizations, and others that may participate in and support instructional programs.
- Identify and use sources of information about instructional materials and other resources including training offered by national, state, and local environmental education programs and professional organizations.
- Use the Internet to identify and access sources of information about the environment, particular issues, and educational resources. Critically evaluate the usefulness of resources found on the Internet.

4.5 Technologies that assist learning

Educators are familiar with a range of technologies available to assist student learning.

- Use a variety of tools for environmental observation, measurement, and monitoring (e.g., magnifying glasses, chemical tests, hygrometers, survey and interview techniques, traffic counts) and instruct learners in their safe and proper use.
- Demonstrate proficiency with technologies used to display, analyze, and communicate environmental information.
- Identify sources of expertise about unfamiliar learning technologies and learn from them or incorporate this outside expertise into instruction.

4.6 Settings for instruction

Educators understand the importance of a safe and conducive learning environment both indoors and outside.

- Demonstrate a concern for learner safety in designing, planning, and implementing instruction, especially experiences that are hands-on or that take place outside the classroom. Attend to the physical layout and maintenance of the learning facility or center so learners can use it safely and effectively.

- Identify, create, and use diverse settings for environmental education, appropriate to different subject matter and available resources. These may include the school yard, laboratory, field settings, community settings, museums, zoos, demonstration sites, and other places.
- Identify or develop and implement responses to real or perceived barriers to using expanded settings (such as outdoor settings) in educational and safe ways.
- Plan and implement instruction that first links content to learners' immediate surroundings and experience then expands learners' horizons as appropriate to larger environmental issues and contexts.

4.7 Curriculum planning

Educators are familiar with ways of including environmental education in the curriculum.

- Describe basic approaches to creating a developmentally appropriate scope and sequence for environmental education curricula.
- Develop an environmental education program designed to meet the educational goals of an agency or other institution using criteria such as those outlined in *Nonformal Environmental Education: Guidelines for Excellence*.
- Develop a plan for integrating environmental education into the formal school curriculum, either across the curriculum or as a separate course or emphasis within one or more areas of study.
- Demonstrate links between environmental education curricula (or plans for integrating environmental education into an existing curriculum) and national, state, or local standards in disciplines such as science, mathematics, social studies, geography, and language arts.
- Correlate environmental education with state education standards in a particular discipline or grade level.

Selected References:

Abrams, K. and J. Ballas. *Teaching Naturally: Using Environment to Improve Teaching and Learning*. Tallahassee: Florida Gulf Coast University, Florida Department of Education, 1997.

Armstrong, T. *Multiple Intelligences in the Classroom*. Alexandria, VA: Association for Supervision and Curriculum Development, 2000.

Athman, J. "'Park as Classrooms' Field Trips: Just Another Day in the Park?" *Legacy*, July/August 1997.

Babcock, B. (ed.) *Learning from Experience: A Collection of Service-Learning Projects Linking Academic Standards to Curriculum*. Madison, WI: Wisconsin Department of Public Instruction, 2000.

Baloche, L. A. *The Cooperative Classroom: Empowering Learning*. Columbus, OH: Prentice Hall, 1997.

Bardwell, L. V., M. Monroe, and M. Tudor, eds. *Environmental Problem Solving: Theory, Practice and Possibilities in Environmental Education*. Rock Spring, GA: North American Association for Environmental Education, 1994.

Barell, J. *Developing More Curious Minds.* Alexandria, VA: Association for Supervision and Curriculum Development, 2003.

Brandt, R., ed. *Collaborative Learning and the Cooperative School.* Alexandria, VA: Association for Supervision and Curriculum Development, 1991.

Cairn, R. and T. L. Coble. *Learning by Giving: K–8 Service-Learning Curriculum Guide*. Roseville, MN: National Youth Leadership Council, 1993.

Chard, S. *The Project Approach: A Practical Guide for Teachers*. Edmonton, Alberta: North University of Alberta, 1996.

Clifton, L., T. Mauney, and R. Falkner. *Take a Class Outdoors: A Guidebook for Environmental Service Learning*. Clemson, SC: National Dropout Prevention Center, 2001.

Cothron, J., R. N. Giese and R. J. Rezba. *Students and Research*. Dubuque, IA: Kendall/Hunt Publishing, 1996.

Delisle, R. *How to Use Problem-Based Learning in the Classroom*. Alexandria, VA: Association for Supervision and Curriculum Development, 1997.

Engleson, D. C. and D. Yockers. *A Guide to Curriculum Planning in Environmental Education*. Milwaukee: Wisconsin Department of Public Instruction, 1994.

Environmental Education Materials: Guidelines for Excellence. Washington, DC: North American Association for Environmental Education, 2nd edition 2004.

Excellence in Environmental Education- Guidelines for Learning (Pre K–12). Washington, DC: North American Association for Environmental Education, 2nd edition 2004.

Erlauer, L. *The Brain-Compatible Classroom: Using What We Know About Learning to Improve Teaching*. Alexandria, VA: Association for Supervision and Curriculum Development, 2003.

Glasgow, N. A. *New Curriculum for New Times: A Guide to Student-Centered, Problem-Based Learning.* Thousand Oaks, CA: Corwin Press, 1997.

Grant, T. and G. Littlejohn (eds). *Greening School Grounds: Creating Habitats for Learning*. Gabriola Island, BC: New Society Publishers, 2001.

Hagenruber, D. and H. R. Hungerford. *Threatened and Endangered Animals.* Champaign, IL: Stipes Publishing Company, 1993.

Hammond, W. F. "Educating for Action: A Framework for Thinking about the Place of Action in Environmental Education." *Green Teacher,* no. 50 (1997): 6–14.

Hammond, W. F., J. T. Christensen, J. Butler, and M. Stuart. *The Monday Groups: Engaging Students in Community Based Action*. Fort Myers, FL: Lee County Schools, 1971.

Heimlich, J. *Environmental Education: A Resource Handbook*. Bloomington, IN: Phi Delta Kappa Educational Foundation, 2002.

Hungerford, H. R., et al. *Investigating and Evaluating Environmental Issues and Actions: Skills Development Program*. Champaign, IL: Stipes Publishing Company, 2003.

Jarrett, D. *Inquiry Strategies for Science and Mathematics Learning. It's Just Good Teaching*. Portland, OR: Northwest Regional Educational Laboratory, 1997.

Jensen, E. *Teaching with the Brain in Mind*. Alexandria, VA: Association for Supervision and Curriculum Development, 1998.

Johnson, D., R. T. Johnson and E. J. Holubec. *The New Circles of Learning: Cooperation in the Classroom and School*. Alexandria, VA: Association for Supervision and Curriculum Development, 1994.

Johnson, D. W., R. T. Johnson, and E. J. Holubec. *Cooperative Learning in the Classroom*. Alexandria, VA: Association for Supervision and Curriculum Development, 1995.

Jones, B. F., C. M. Rasmussen and M. C. Moffitt. *Real-Life Problem Solving: A Collaborative Approach to Interdisciplinary Learning*. Washington, DC: American Psychological Association, 1997.

Kaye, C. *The Complete Guide to Service Learning*. Minneapolis, MN: Free Spirit Publications, 2003.

Kinsley, C. W. and K. McPherson, eds. *Enriching the Curriculum through Service Learning*. Alexandria, VA: Association for Supervision and Curriculum Design, 1995.

Knapp, C. *Just Beyond the Classroom*. Charleston, WV: ERIC Clearinghouse on Rural Education and Small Schools, 1996.

Lazear, D. *Eight Ways of Knowing*. 3rd ed. Arlington Heights, IL: SkyLight Training and Publishing Inc., 1999.

Lieberman G. and L. Hoody. *Closing the Achievement Gap: Using the Environment as an Integrating Context for Learning*. Poway, CA: Science Wizards, 1998.

Lounsbury, J., ed. *Connecting the Curriculum through Interdisciplinary Instruction*. Columbus, OH: National Middle School Association, 1992.

Mamchur, C. *A Teacher's Guide to Cognitive Type Theory and Learning*. Alexandria, VA: Association for Supervision and Curriculum Development, 1996.

Marcinkowski, T., T. Volk, and H. Hungerford. *An Environmental Education Approach to the Training of Middle Level Teachers: A Prototype Programme*. Paris: UNESCO/UNEP, 1990.

Marzano, R. *What Works in Schools: Translating Research into Action*. Alexandria, VA: Association for Supervision and Curriculum Development, 2003.

Monroe, M. and D. Cappaert. *Integrating Environmental Education into the School Curriculum*. EE Toolbox—Workshop Resource Manual. Ann Arbor, MI: National Consortium for Environmental Education and Training, 1994.

Moore, R. and H. Wong. *Natural Learning: Creating Environments for Rediscovering Nature's Way of Teaching*. Berkeley, CA: MIG Communications, 1997.

National Environmental Education and Training Foundation. *Environmental Education and Educational Achievement: Promising Programs and Resources*. Washington, DC: National Environmental Education and Training Foundation, 2002.

Nonformal Environmental Education Programs: Guidelines for Excellence. Washington DC: North American Association for Environmental Education, 2004.

Ramsey, J. "Comparing Four Environmental Problem Solving Models." In *Essential Readings in Environmental Education*, edited by H. Hungerford, W. Bluhm, T. Volk, and J. Ramsey. Champaign, IL: Stipes Publication Company, 1998.

Rogers, L. *The California Freshwater Shrimp Project: An Example of Environmental Project-Based Learning*. Berkeley, CA: Heyday Books, 1996.

Rohwedder, W. J. *Computer-Aided Environmental Education*. Rock Spring, GA: North American Association for Environmental Education, 1990.

Service-Learning: Education Beyond the Classroom. Washington, DC: U.S. Environmental Protection Agency, 2002.

Share, E. and L. Rogers. "Get Real! Project-Based Learning." *Learning*, January-February 1996, 61-65.

Silver, H. R. Strong, M. Perini. *So Each May Learn: Integrating Learning Styles and Multiple Intelligences*. Alexandria, VA: Association for Supervision and Curriculum Development, 2000.

Slavin, R. E. *Student Team Learning: A Practical Guide to Cooperative Learning*. 3rd ed. Washington, DC: National Education Association, 1991.

Sobel, D. *Place-Based Education: Connecting Classrooms and Communities*. Great Barrington, MA: Orion Society, 2004.

Stapp, W. B. "Environmental Education: Approaches to Curriculum Development (K–12)." In *Processes for a Quality Environment*, edited by R. S. Cook and G. T. O'Hearn, 77-78. Green Bay: University of Wisconsin Press, 1971.

Stapp, W. B., A. E. J. Wals, and S. L. Stankorb. *Environmental Education for Empowerment: Action Research and Community Problem Solving*. Dubuque, IA: Kendall/Hunt Publishing, 1996.

Tomlinson, C. and C. Cunningham. *Differentiation in Practice: A Resource Guide for Differentiating Curriculum, Grades 5–9*. Alexandria, VA: Association for Supervision and Curriculum Development, 2003.

Tomlinson, C. and C. Cunningham. *Differentiation in Practice: A Resource Guide for Differentiating Curriculum, Grades K-5*. Alexandria, VA: Association for Supervision and Curriculum Development, 2003.

Torp, L. and S. Sage. *Problems as Possibilities: Problem-Based Learning for K–12 Education.* Alexandria, VA: Association for Supervision and Curriculum Development, 2002.

Wade, R. C., ed. *Community Service-Learning: A Guide to Including Service in the Public School Curriculum*. State University of New York: SUNY Press, 1997.

Wilke, R., R. B. Peyton, and H. Hungerford. *Strategies for the Training of Teachers in Environmental Education*. Paris: UNESCO/UNEP, 1987.

Wilson, R. A., ed. *Environmental Education at the Early Childhood Level*. Rock Spring, GA: North American Association for Environmental Education, 1994.

Woodhouse, J. and Knapp, C. "Place-Based Curriculum and Instruction: Outdoor and Environmental Education Approaches." *ERIC Digest. Report* EDO-RC-00-6; 4 p. Dec. 2000.

Theme #5—Fostering Learning

Environmental educators must enable learners to engage in open inquiry and investigation, especially when considering environmental issues that are controversial and require learners to seriously reflect on their own and others' perspectives. Educators' training should prepare them to foster an environment, including participant interactions, that is conducive to learning.

5.1 A climate for learning about and exploring the environment

Educators understand how to create a climate in which learners are intellectually stimulated and motivated to learn about the environment.

- Relate the idea of lifelong learning to instructional practices that engage learners in taking responsibility for their own learning and expectations for achievement. Demonstrate proficiency with these practices in instructional settings.
- Imbue instruction with a sense of the importance and excitement of the content.
- Provide opportunities for experiences that increase learners' awareness of—and enthusiasm for—the natural and human-designed environment.
- Incorporate opportunities for learners to have firsthand experiences exploring the world around them.
- Discuss why fostering clear and independent thinking is important in light of environmental education's goal of developing environmentally literate citizens.
- Identify and use instructional techniques that encourage learners to ask questions and explore a variety of answers.

5.2 An inclusive and collaborative learning environment

Educators know how to maximize learning by fostering openness and collaboration among learners.

- Identify and use ways to encourage flexibility, creativity, and openness, considering the assumptions and interpretations that influence the conclusions that learners and others draw about the environment and environmental issues.
- Relate learners' capacity for collaborative work to their ability to function as responsible and effective citizens. Describe and implement management techniques that foster independent and productive group work.
- Include diverse cultures, races, genders, social groups, ages, and perspectives with respect, equity, and an acknowledgment of the value of such diversity. Use diverse backgrounds and perspectives as instructional resources.

5.3 Flexible and responsive instruction

Educators know how to augment proper planning with the flexibility that allows them to take advantage of new instructional opportunities.

- Modify instructional plans and approaches, when appropriate, to take advantage of unexpected opportunities (e.g. new developments in community issues, recent events or phenomena that are in the news, or breakthroughs in scientific understanding) and learner questions and interests.
- Blend a variety of instructional methods and activities to meet instructional objectives. Make smooth transitions from one to another.
- Work collaboratively with other instructors and discipline areas, adapting instructional approaches as needed to blend or complement instructional styles and to meet shared environmental education goals.

Selected References:

Marouli, C. "Multicultural Environmental Education: Theory and Practice." *Canadian Journal of Environmental Education,* V 7 no. 1, p 26–42, Spring 2002.

Reissman, R. *The Evolving Multicultural Classroom.* Alexandria, VA: Association for Supervision and Curriculum Development, 1994.

Salter-Stith, C. J. Washburn, and D. A. Barton. *Circle of Sharing: Making Your Environmental Education Programs Multicultural.* Proceedings of the 1993 National Interpreters Workshop. Washington, DC: National Park Service, 1994.

Sobel, D. *Beyond Ecophobia; Reclaiming the Heart in Nature Education.* Great Barrington, MA: Orion, 1996.

Weilbacher, M. "Education that Cannot Wait." *E Magazine*, March/April 1991, 29–35.

Theme #6—Assessment and Evaluation

Environmental educators possess the knowledge, abilities, and commitment to make assessment and evaluation integral to instruction and programs. Professional preparation should provide educators with tools for assessing learner progress and evaluating the effectiveness of their own programs.

6.1 Learner outcomes

Educators understand the importance of tying assessment to learning.

- State expected learner outcomes that are tied to the goals and objectives of environmental education.
- Identify national, state, and local standards that apply to stated learner outcomes and link assessment of environmental education learnings to these.
- Develop and use a variety of strategies for assessing learning outcomes that reflect both subject area standards and environmental education goals and objectives.
- Describe and use means for engaging learners in setting their own expectations for achievement. Discuss the importance of these abilities in light of environmental education's emphasis on learner-centered education and lifelong learning.

6.2 Assessment that is part of instruction

Educators are familiar with ways of incorporating assessment into environmental education.

- Make objectives and other expectations clear to learners at the outset of an environmental education activity or instruction.
- Provide examples of and implement specific performance-based assessments such as portfolios, open-ended questions, oral reports, group or independent research, or other projects appropriate to environmental education instruction.
- Identify and use techniques that assess learners' baseline understandings and skills at the beginning of environmental education programs, lessons, units, and other segments of instruction such as school terms.
- Develop formative and summative assessment tools appropriate to specific environmental education instructional segments or projects.

- Discuss the importance of and identify techniques for encouraging learners to assess their own and others' work. Use these assessments to improve their learning experiences.

6.3 Improving instruction

Educators know how to use their instructional experiences and assessments to improve future instruction.

- Organize, interpret, and use the results of differing kinds of assessment to help modify and improve future instruction.
- Demonstrate a willingness and ability to collect additional information from and about learners to help modify and improve future instruction.
- Seek out opportunities to reflect, individually and with colleagues, on their own instructional practices and the broader practice of environmental education within the field.

6.4 Evaluating Programs

Educators understand the importance of evaluating environmental education programs and are familiar with basic evaluation approaches.

- Discuss how program evaluation, including needs assessment, formative evaluation, and summative evaluation, contributes to program design and implementation.
- Differentiate among program outputs, outcomes, and impacts and explain how they relate to program goals and objectives.
- Describe reasons for evaluating environmental education programs.
- List a variety of data collection methods used in environmental education program evaluation.
- Develop a plan for integrating evaluation into the overall program design process using criteria such as those suggested in *Nonformal Environmental Education Programs: Guidelines for Excellence*.

Selected References:

Bennett, D. "The Evaluation of Environmental Education Learning." In *Trends in Environmental Education*. Paris: UNESCO/UNEP, 1977.

Bennett, D. *Evaluating Environmental Education in Schools*. Paris: UNESCO/UNEP, 1984.

Diamond, J. *Practical Evaluation guide: Tools for Museums and Other Informal Educational Settings*. Walnut Creek, CA: Alta Mira Press, 1999.

Doran, R. F. Chan, and P. Tamir. *Science Educator's Guide to Assessment*. Arlington, VA: National

Science Teachers Association, 1998.

Fitz-Gibbon, D., L. Morris. *How to Design a program Evaluation*. Newbury Park: Sage Publications, 1987.

Frechtilling, J. et. al. *The 2002 User Friendly Handbook for Project Evaluation.* Washington, DC: National Science Foundation, 2002.

Hibbard, K. M., et al. *A Teacher's Guide to Performance-Based Learning and Assessment.* Alexandria, VA: Association for Supervision and Curriculum Development, 1996.

Hollweg, K. *Are We Making a Difference?* Rock Spring, GA: North American Association for Environmental Education, 1997.

Marcinkowski, T. "Assessment in Environmental Education." In *Essential Readings in Environmental Education*, edited by H. Hungerford et al. Champaign, IL: Stipes Publishing Company, 2001.

Patton, M. *Qualitative Research and Evaluation Methods.* Beverly Hills, CA: Sage publications, 2001.

Sanders, J. *The Program Evaluation Standards*. Thousand Oaks, CA: Sage Publications, 1994.

Appendix

Executive Summary: Excellence in Environmental Education—Guidelines for Learning (Pre K–12)

The Executive Summary can be used as an easy reference to *Excellence in Environmental Education—Guidelines for Learning (Pre K–12*) published by the North American Association for Environmental Education. As in the full document, the Executive Summary is organized into four strands, each of which is further delineated by a set of guidelines that describe a level of skill or knowledge appropriate for each of three grade levels: fourth, eighth, and twelfth. In the Executive Summary, guidelines for a particular strand are arranged on two page layouts, so the user can quickly understand the flow of guidelines at a grade level or compare how guidelines progress across the grade levels. It should be remembered that the Executive Summary is designed to provide only an overview. For a more in-depth view of the strands and their guidelines, it will be necessary to refer to *Excellence in Environmental Education—Guidelines for Learning (Pre K–12).*

FOURTH GRADE

Learners should be able to meet the guidelines included in this section by the end of fourth grade.

The pre kindergarten through fourth grade years are a time of tremendous cognitive development. By third and fourth grades, learners have developed some basic skills that help them construct knowledge. Instructors in earlier grade levels should use these fourth grade guidelines as a target, extrapolating from this end goal appropriate activities and lessons for younger learners.

In these early years of formal education, learners tend to be concrete thinkers with a natural curiosity about the world around them. Environmental education can build on these characteristics by focusing on observation and exploration of the environment—beginning close to home.

EIGHTH GRADE

Learners should be able to meet the guidelines included in this section by the end of eighth grade.

In the fifth through eighth grades, learners begin to develop skills in abstract thinking and continue to develop creative thinking skills—and along with these, the ability to understand the interplay of environmental and human social systems in greater depth. Environmental education can foster this development by focusing on investigation of local environmental systems, problems, and issues. As learners become actively engaged in deciding for themselves what is right and wrong, educators can use environmental problems to help learners explore their own responsibilities and ethics.

TWELFTH GRADE

Learners should be able to meet the guidelines included in this section by the time they graduate from high school.

By the end of twelfth grade, learners are well on their way to environmental literacy. They should possess the basic skills and dispositions they need to understand and act on environmental problems and issues as responsible citizens—and to continue the learning process throughout their lives. In the ninth through twelfth grades, environmental education can promote active and responsible citizenship by challenging learners to hone and apply problem-solving, analysis, persuasive communication, and other higher level skills—often in real-world contexts.

STRAND 1—
Questioning, Analysis and Interpretation Skills

FOURTH GRADE

A) Questioning—Learners are able to develop questions that help them learn about the environment and do simple investigations.

B) Designing investigations—Learners are able to design simple investigations.

C) Collecting information—Learners are able to locate and collect information about the environment and environmental topics.

D) Evaluating accuracy and reliability— Learners understand the need to use reliable information to answer their questions. They are familiar with some basic factors to consider in judging the merits of information.

E) Organizing information—Learners are able to describe data and organize information to search for relationships and patterns concerning the environment and environmental topics.

F) Working with models and simulations—Learners understand that relationships, patterns, and processes can be represented by models.

G) Drawing conclusions and developing explanations—Learners can develop simple explanations that address their questions about the environment.

EIGHTH GRADE

A) Questioning—Learners are able to develop, focus, and explain questions that help them learn about the environment and do environmental investigations.

B) Designing investigations—Learners are able to design environmental investigations to answer particular questions—often their own questions.

C) Collecting information—Learners are able to locate and collect reliable information about the environment or environmental topics using a variety of methods and sources.

D) Evaluating accuracy and reliability— Learners are able to judge the weaknesses and strengths of the information they are using.

E) Organizing information—Learners are able to classify and order data, and to organize and display information in ways that help analysis and interpretation.

F) Working with models and simulations— Learners understand many of the uses and limitations of models.

G) Drawing conclusions and developing explanations—Learners are able to synthesize their observations and findings into coherent explanations.

TWELFTH GRADE

A) Questioning—Learners are able to develop, modify, clarify, and explain questions that guide environmental investigations of various types. They understand factors that influence the questions they pose.

B) Designing investigations—Learners know how to design investigations to answer particular questions about the environment. They are able to develop approaches for investigating unfamiliar types of problems and phenomena.

C) Collecting information—Learners are able to locate and collect reliable information for environmental investigations of many types. They know how to use sophisticated technology to collect information, including computer programs that access, gather, store, and display data.

D) Evaluating accuracy and reliability— Learners can apply basic logic and reasoning skills to evaluate completeness and reliability in a variety of information sources.

E) Organizing information—Learners are able to organize and display information in ways appropriate to different types of environmental investigations and purposes.

F) Working with models and simulations— Learners are able to create, use, and evaluate models to understand environmental phenomena.

G) Drawing conclusions and developing explanations—Learners are able to use evidence and logic in developing proposed explanations that address their initial questions and hypotheses.

STRAND 2—
Knowledge of Environmental Processes and Systems

FOURTH GRADE

STRAND 2.1—
The Earth as a Physical System

A) Processes that shape the Earth— Learners are able to identify changes and differences in the physical environment.

B) Changes in matter—Learners are able to identify basic characteristics of and changes in matter.

C) Energy—While they may have little understanding of formal concepts associated with energy, learners are familiar with the basic behavior of some different forms of energy.

STRAND 2.2—
The Living Environment

A) Organisms, populations, and communities—Learners understand basic similarities and differences among a wide variety of living organisms. They understand the concept of habitat.

B) Heredity and evolution—Learners understand that plants and animals have different characteristics and that many of the characteristics are inherited.

C) Systems and connections—Learners understand basic ways in which organisms are related to their environments and to other organisms.

D) Flow of matter and energy—Learners know that living things need some source of energy to live and grow.

EIGHTH GRADE

A) Processes that shape the Earth— Learners have a basic understanding of most of the physical processes that shape the Earth. They are able to explore the origin of differences in physical patterns.

B) Changes in matter—Learners understand the properties of the substances that make up objects or materials found in the environment.

C) Energy—Learners begin to grasp formal concepts related to energy by focusing on energy transfer and transformations. They are able to make connections among phenomena such as light, heat, magnetism, electricity, and the motion of objects.

A) Organisms, populations, and communities—Learners understand that biotic communities are made up of plants and animals that are adapted to live in particular environments.

B) Heredity and evolution—Learners have a basic understanding of the importance of genetic heritage.

C) Systems and connections—Learners understand major kinds of interactions among organisms or populations of organisms.

D) Flow of matter and energy—Learners understand how energy and matter flow among the abiotic and biotic components of the environment.

TWELFTH GRADE

A) Processes that shape the Earth— Learners understand the major physical processes that shape the Earth. They can relate these processes, especially those that are large-scale and long-term, to characteristics of the Earth.

B) Changes in matter—Learners apply their understanding of chemical reactions to round out their explanations of environmental characteristics and everyday phenomena.

C) Energy—Learners apply their knowledge of energy and matter to understand phenomena in the world around them.

A) Organisms, populations, and communities—Learners understand basic population dynamics and the importance of diversity in living systems.

B) Heredity and evolution—Learners understand the basic ideas and genetic mechanisms behind biological evolution.

C) Systems and connections—Learners understand the living environment to be comprised of interrelated, dynamic systems.

D) Flow of matter and energy—Learners are able to account for environmental characteristics based on their knowledge of how matter and energy interact in living systems.

STRAND 2—
Knowledge of Environmental Processes and Systems

FOURTH GRADE

STRAND 2.3—
Humans and Their Societies

A) Individuals and groups—Learners understand that people act as individuals and as group members and that groups can influence individual actions.

B) Culture—Learners understand that experiences and places may be interpreted differently by people with different cultural backgrounds, at different times, or with other frames of reference.

C) Political and economic systems— Learners understand that government and economic systems exist because people living together in groups need ways to do things such as provide for needs and wants, maintain order, and manage conflict.

D) Global connections—Learners understand how people are connected at many levels—including the global level—by actions and common responsibilities that concern the environment.

E) Change and conflict—Learners recognize that change is a normal part of individual and societal life. They understand that conflict is rooted in different points of view.

EIGHTH GRADE

A) Individuals and groups—Learners understand that how individuals perceive the environment is influenced in part by individual traits and group membership or affiliation.

B) Culture—As they become familiar with a wider range of cultures and subcultures, learners gain an understanding of cultural perspectives on the environment and how the environment may, in turn, influence culture.

C) Political and economic systems— Learners become more familiar with political and economic systems and how these systems take the environment into consideration.

D) Global connections—Learners become familiar with ways in which the world's environmental, social, economic, cultural, and political systems are linked.

E) Change and conflict—Learners understand that human social systems change over time and that conflicts sometimes arise over differing and changing viewpoints about the environment.

TWELFTH GRADE

A) Individuals and groups—Learners understand the influence of individual and group actions on the environment, and how groups can work to promote and balance interests.

B) Culture—Learners understand cultural perspectives and dynamics and apply their understanding in context.

C) Political and economic systems— Learners understand how different political and economic systems account for, manage, and affect natural resources and environmental quality.

D) Global connections—Learners are able to analyze global, social, cultural, political, economic, and environmental linkages.

E) Change and conflict—Learners understand the functioning of public processes for promoting and managing change and conflict, and can analyze their effects on the environment.

STRAND 2—
Knowledge of Environmental Processes and Systems

FOURTH GRADE

STRAND 2.4—
Environment and Society

A) Human/environment interactions— Learners understand that people depend on, change, and are affected by the environment.

B) Places—Learners understand that places differ in their physical and human characteristics.

C) Resources—Learners understand the basic concepts of resource and resource distribution.

D) Technology—Learners understand that technology is an integral part of human existence and culture.

E) Environmental issues—Learners are familiar with some local environmental issues and understand that people in other places experience environmental issues as well.

EIGHTH GRADE

A) Human/environment interactions— Learners understand that human-caused changes have consequences for the immediate environment as well as for other places and future times.

B) Places—Learners begin to explore the meaning of places both close to home and around the world.

C) Resources—Learners understand that uneven distribution of resources influences their use and perceived value.

D) Technology—Learners understand the human ability to shape and control the environment as a function of the capacities for creating knowledge and developing new technologies.

E) Environmental issues—Learners are familiar with a range of environmental issues at scales that range from local to national to global. They understand that people in other places around the world experience environmental issues similar to the ones they are concerned about locally.

TWELFTH GRADE

A) Human/environment interactions— Learners understand that humans are able to alter the physical environment to meet their needs and that there are limits to the ability of the environment to absorb impacts or meet human needs.

B) Places—Learners understand "place" as humans endowing a particular part of the Earth with meaning through their interactions with that environment.

C) Resources—Learners understand that the importance and use of resources change over time and vary under different economic and technological systems.

D) Technology—Learners are able to examine the social and environmental impacts of various technologies and technological systems.

E) Environmental issues—Learners are familiar with a range of environmental issues at scales that range from local to national to global. They understand that these scales and issues are often linked.

STRAND 3—
Skills for Understanding and Addressing Environmental Issues

FOURTH GRADE

STRAND 3.1—
Skills for Analyzing and Investigating Environmental Issues

A) Identifying and investigating issues— Learners are able to identify and investigate issues in their local environments and communities.

B) Sorting out the consequences of issues—As learners come to understand that environmental and social phenomena are linked, they are able to explore the consequences of issues.

C) Identifying and evaluating alternative solutions and courses of action—Learners understand there are many approaches to resolving issues.

D) Working with flexibility, creativity, and openness—Learners understand the importance of sharing ideas and hearing other points of view.

EIGHTH GRADE

A) Identifying and investigating issues— Learners are able to use primary and secondary sources of information, and apply growing research and analytical skills, to investigate environmental issues, beginning in their own community.

B) Sorting out the consequences of issues—Learners are able to apply their knowledge of ecological and human processes and systems to identify the consequences of specific environmental issues.

C) Identifying and evaluating alternative solutions and courses of action—Learners are able to identify and develop action strategies for addressing particular issues.

D) Working with flexibility, creativity, and openness—Learners are able to consider the assumptions and interpretations that influence the conclusions they and others draw about environmental issues.

TWELFTH GRADE

A) Identifying and investigating issues— Learners apply their research and analytical skills to investigate environmental issues ranging from local issues to those that are regional or global in scope.

B) Sorting out the consequences of issues—Learners are able to evaluate the consequences of specific environmental changes, conditions, and issues for human and ecological systems.

C) Identifying and evaluating alternative solutions and courses of action—Learners are able to identify and propose action strategies that are likely to be effective in particular situations and for particular purposes.

D) Working with flexibility, creativity, and openness—While environmental issues investigations can bring to the surface deeply held views, learners are able to engage each other in peer review conducted in the spirit of open inquiry.

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STRAND 3—
Skills for Understanding and Addressing Environmental Issues

FOURTH GRADE

STRAND 3.2—
Decision-Making and Citizenship Skills

A) Forming and evaluating personal views—Learners are able to identify, justify, and clarify their views on environmental issues and alternative ways to address them.

B) Evaluating the need for citizen action— Learners are able to think critically about whether they believe action is needed in particular situations and whether they believe they should be involved.

C) Planning and taking action—By participating in issues of their choosing—mostly close to home—they learn the basics of individual and collective action.

D) Evaluating the results of actions— Learners understand that civic actions have consequences.

EIGHTH GRADE

A) Forming and evaluating personal views—Learners are able to identify, justify, and clarify their views on environmental issues and alternative ways to address them.

B) Evaluating the need for citizen action— Learners are able to evaluate whether they believe action is needed in particular situations, and decide whether they should be involved.

C) Planning and taking action—As learners begin to see themselves as citizens taking active roles in their communities, they are able to plan for and engage in citizen action at levels appropriate to their maturity and preparation.

D) Evaluating the results of actions— Learners are able to analyze the effects of their own actions and actions taken by other individuals and groups.

TWELFTH GRADE

A) Forming and evaluating personal views—Learners are able to communicate, evaluate, and justify their own views on environmental issues and alternative ways to address them.

B) Evaluating the need for citizen action— Learners are able to decide whether action is needed in particular situations and whether they should be involved.

C) Planning and taking action—Learners know how to plan for action based on their research and analysis of an environmental issue. If appropriate, they take actions that are within the scope of their rights and consistent with their abilities and responsibilities as citizens.

D) Evaluating the results of actions— Learners are able to evaluate the effects of their own actions and actions taken by other individuals and groups

STRAND 4—
Personal and Civic Responsibility

FOURTH GRADE

A) Understanding societal values and principles—Learners can identify fundamental principles of U.S. society and explain their importance in the context of environmental issues.

B) Recognizing citizens' rights and responsibilities—Learners understand the basic rights and responsibilities of citizenship.

C) Recognizing efficacy—Learners possess a realistic self-confidence in their effectiveness as citizens.

D) Accepting personal responsibility— Learners understand that they have responsibility for the effects of their actions.

EIGHTH GRADE

A) Understanding societal values and principles—Learners understand that societal values can be both a unifying and a divisive force.

B) Recognizing citizens' rights and responsibilities—Learners understand the rights and responsibilities of citizenship and their importance in promoting the resolution of environmental issues.

C) Recognizing efficacy—Learners possess a realistic self-confidence in their effectiveness as citizens.

D) Accepting personal responsibility— Learners understand that their actions can have broad consequences and that they are responsible for those consequences.

TWELFTH GRADE

A) Understanding societal values and principles—Learners know how to analyze the influence of shared and conflicting societal values.

B) Recognizing citizens' rights and responsibilities—Learners understand the importance of exercising the rights and responsibilities of citizenship.

C) Recognizing efficacy—Learners possess a realistic self-confidence in their effectiveness as citizens.

D) Accepting personal responsibility— Learners understand that their actions can have broad consequences and accept responsibility for recognizing those effects and changing their actions when necessary.