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Guidelines for Excellence
Environmental Education Materials

naaee
North American Association
for Environmental Education

For five decades, the North American Association for Environmental Education (NAAEE) has been a leader in promoting excellence in environmental education throughout North America. With members in 45 countries and affiliations with more than 55 state, regional, and provincial environmental education organizations, NAAEE's influence stretches across North America and worldwide. Our mission is to use the power of education to advance environmental literacy and civic engagement to create a more equitable and sustainable future. We work with educators, policymakers, and partners throughout the world.

NAAEE supports the field with a variety of programs and services, including:

Annual Conference and Research Symposium—NAAEE has convened an annual conference for environmental education professionals since 1972. The conference is the largest national gathering of environmental education professionals in North America. It promotes innovation in the field, networking, new tools and resources, and dissemination of research and effective practices.

Resources and eePRO—Through its website and eePRO, our online professional development hub, NAAEE provides its members and supporters with high-quality professional resources at national and international levels including books, resource guides, essays, peer-reviewed research, best practices, research reviews, job listings, grant opportunities, news across the field, and more.

Professional Development—NAAEE offers unique services in professional development and support. Through online networking and professional learning, training seminars, online learning modules, strategic convening of environmental education leaders, and support of certification programs, NAAEE promotes leadership development and builds the capacity of its members and affiliates.

Policy—NAAEE is a non-partisan organization that plays a leadership role in raising the profile of environmental education at an international level. NAAEE works with partners to advocate for environmental education with agencies, organizations, foundations, and others to increase funding and support for the field.

Inspiring Innovation—NAAEE is committed to bringing new voices, ideas, and innovation to the field and broadening environmental education's reach and impact.

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Introduction

Environmental Education Materials: Guidelines for Excellence describes a set of recommendations for developing and selecting environmental education instructional resources. These guidelines aim to help producers of activity guides, lesson plans, and other instructional materials create high-quality products and to provide educators with a tool to evaluate the wide array of available environmental education materials.

Through the National Project for Excellence in Environmental Education, the North American Association for Environmental Education (NAAEE) is taking the lead in establishing guidelines for the development of coherent and comprehensive environmental education materials and programs. These guidelines draw on best practices honed by scholars and practitioners across a variety of fields and settings, including formal and nonformal education, curriculum development, instructional design, early childhood education, and adult education.

To ensure that these *Guidelines for Excellence* reflect a widely shared understanding of environmental education, they were developed by a team of environmental education professionals from a variety of backgrounds and organizational affiliations. This team took on the challenge of turning ideas about quality into tangible recommendations and examples. In addition, drafts of these guidelines were circulated widely to practitioners and scholars in the field (e.g., teachers, educational administrators, environmental scientists, and curriculum developers), and their comments were incorporated into successive revisions of the document. As such, hundreds of practitioners have participated in the writing of these guidelines.

> ### DID YOU KNOW?
>
> ## Definitions of Environmental Education & Environmental Literacy
>
> ### Environmental Education (EE)
>
> … is a process that helps individuals, communities, and organizations learn more about the environment, develop skills to investigate their environment and to make intelligent, informed decisions about how they can help take care of it. It has the power to transform lives and society. It informs and inspires. It motivates action. EE is a key tool in creating healthier and more civically engaged communities.
>
> North American Association for Environmental Education (NAAEE). *About EE and Why it Matters.* n.d. Retrieved from https://naaee.org/about/ee
>
> ### An Environmentally Literate Person
>
> …is someone who, both individually and together with others, makes informed decisions concerning the environment; is willing to act on these decisions to improve the well-being of other individuals, societies, and the global environment; and participates in civic life. Those who are environmentally literate possess, to varying degrees, the knowledge and understanding of a wide range of environmental concepts, problems, and issues; a set of cognitive and affective dispositions; a set of cognitive skills and abilities; and the appropriate behavioral strategies to apply such knowledge and understanding in order to make sound and effective decisions in a range of environmental contexts.
>
> Hollweg, K. S., Taylor, J. R., Bybee, R. W., Marcinkowski, T. J., McBeth, W. C., & Zoido, P. *Developing a Framework for Assessing Environmental Literacy.* 2011. Washington, DC: North American Association for Environmental Education. p. 2-3. https://naaee.org/about/ee/environmental-literacy-framework.

Environmental Education and Learning

The goal of environmental education is to develop environmental literacy for all. A continuous process, environmental education is learner-centered, equitable, inclusive, and culturally responsive, providing all participants with opportunities to construct understandings and develop skills through hands-on, minds-on direct experiences and investigations. Environmental education is a lifelong journey. Beginning at home and extending outward to communities, environmental education encourages learners to understand and forge connections with their immediate surroundings. The awareness, knowledge, and skills needed for local understandings provide a basis for moving out into larger systems and broader issues. Simultaneously, this more sophisticated comprehension of interrelationships often leads directly to deeper connections in their homes and communities.

Environmental education recognizes the importance of viewing human interconnectedness within the environment, incorporating an examination of human systems (e.g., economic, cultural, social, and political systems) and natural processes and systems. Environmental education fosters skills and habits people can use to understand and act on environmental concerns throughout their lives. It cultivates the ability and willingness to recognize uncertainty, envision alternative scenarios, and adapt to changing conditions.

Environmental education facilitates the development of an active learning community where learners share ideas and expertise, listen, consider, collaborate, and participate in continued inquiry. Ultimately, knowledge, skills, motivations, and habits of mind translate into being a member of the global community that can better address our common problems and create opportunities. With a focus on building learners' capacity to work individually and cooperatively to improve environmental quality, social equity, and economic prosperity, environmental education supports efforts to address the Sustainable Development Goals.

DID YOU KNOW?

Sustainable Development Goals

At the core of the 2030 Agenda for Sustainable Development, adopted by world leaders, are 17 Sustainable Development Goals (SDGs) that call on all countries to mobilize efforts to:

...secure a sustainable, peaceful, prosperous, and equitable life on earth for everyone now and in the future. The goals cover global challenges that are crucial for the survival of humanity. They set environmental limits and set critical thresholds for the use of natural resources. The goals recognize that ending poverty must go hand-in-hand with strategies that build economic development. They address a range of social needs including education, health, social protection, and job opportunities while tackling climate change and environmental protection. The SDGs address key systemic barriers to sustainable development such as inequality, unsustainable consumption patterns, weak institutional capacity and environmental degradation.

Environmental education works towards a sustainable future for all where environmental and social responsibility drive individual and institutional choices. By using the Sustainable Development Goals as a springboard, environmental education engages students in meaningful investigations of how to ensure environmental quality, social equity, and economic prosperity.

Source: United Nations. *Transforming Our World: The 2030 Agenda for Sustainable Development.* 2015. Retrieved from https://sustainabledevelopment.un.org/content/documents/21252030%20Agenda%20for%20Sustainable%20Development%20web.pdf

Essential Underpinnings of Environmental Education

Environmental education builds from a core of key principles that inform its approach to education:

Human Well-Being: Human well-being is inextricably bound with environmental quality. Humans are a part of the natural order. Humans, and the systems they create—societies, political systems, economies, religions, cultures, technologies—impact the total environment and are impacted by the environment. Since humans are a part of nature rather than outside it, they are challenged to recognize the ramifications of their interdependence with Earth systems.

Importance of Where One Lives: Beginning close to home, learners connect with, explore, and understand their immediate surroundings. They appreciate the nature around them wherever they live. The sensitivity, knowledge, and skills needed for this local connection to both the natural and built environment provide a base for moving into larger systems, broader issues, and an expanding understanding of connections and consequences.

Integration and Infusion: Disciplines from the natural sciences, social sciences, and the humanities are interconnected through the environment and environmental issues. Environmental education offers opportunities to integrate disciplinary learning, fostering a deeper understanding of concepts and skills. EE works best when infused across the curriculum, rather than being treated as a separate or isolated experience.

Justice, Equity, Diversity, and Inclusion: Environmental education instruction is welcoming and respectful to all learners and embraces the principles of fairness and justice. EE is designed to employ and engage people with different backgrounds, experiences, abilities, and perspectives through culturally relevant and responsive instruction. EE actively works to create equitable learning opportunities and promotes the dignity and worth of people of all races, ethnicities, religions, genders, sexual orientations, gender identities, abilities, incomes, language groups, marital statuses, ages, geographic locations, and philosophies.

Lifelong Learning: Critical and creative thinking, decision making, communication, and collaborative learning, are emphasized. Development and ongoing use of a broad range of skills and practices are essential for active and meaningful learning, both in school and over a lifetime.

Roots in the Real World: Learners develop knowledge and skills through direct experience with their community, the environment, current environmental issues, and society. Investigation, analysis, and problem solving are essential activities and are most effective when relevant to learners' lives and rooted in their experiences.

Sustainable Future: Supporting the United Nations Sustainable Development Goals, learning reflects on the past, examines the present, and is oriented to the future. Learning focuses on environmental, social, and economic responsibility as drivers of individual, collective, and institutional choices.

Systems and Systems Thinking: Systems thinking helps make sense of a large and complex world. A system is made up of parts. Each part can be understood separately. The whole, however, is understood only by examining the relationships and interactions among the parts. Earth is a complex system of interacting physical, chemical, and biological processes. Organizations, individual cells, communities of animals and plants, and families can all be understood as systems. And systems can be nested within other systems.

RESOURCES YOU CAN USE

NOAA Education Resource Collections

NOAA's Education Resource Collections portal is designed to help educators easily access classroom-ready instructional materials and data resources. Materials selected for this site are organized by themes, collections, and content types that are aligned with common teaching topics and expressed needs of educators. Linked resources are organized into collections that provide the user with a toolkit of materials and activities suitable for integration into a variety of educational settings. With the exception of elementary science, collections are not grade specific but resources are labeled where applicable. Additional NOAA resources that support educator professional development, academic scholarship, career exploration, and education grants are also available. All materials linked from this site are free for use and distribution unless expressly noted.
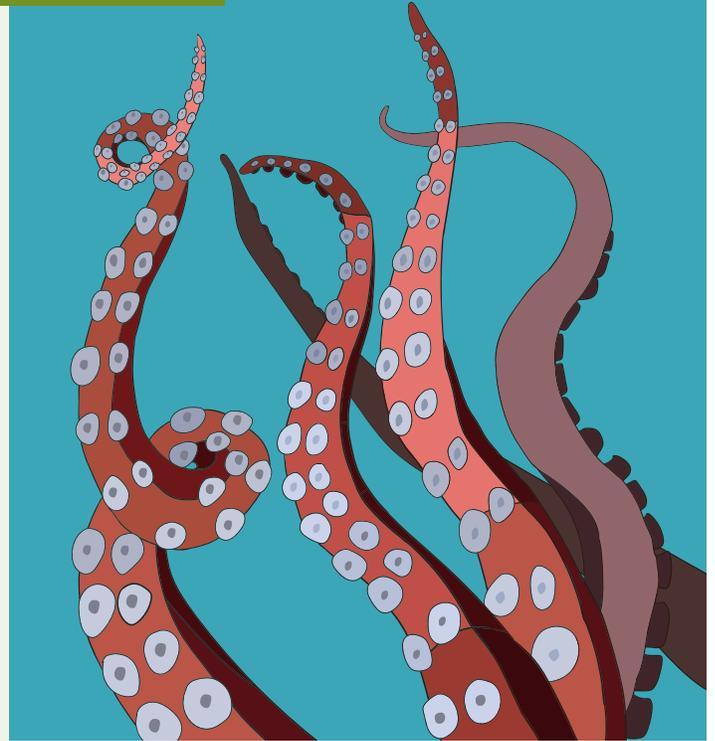
Through the portal, educators can easily access lesson plans and activities, multimedia, background information to assist in understanding the context and systems that the collection topic fits into, career profiles, and feature articles. In addition, data from NOAA's Earth monitoring, modeling, and measurement systems are featured. Some resources are designed specifically for education while others are more technical.

Portal resources are organized into several thematic topics, including oceans and coasts, climate, weather and atmosphere, marine life, freshwater, elementary science, and oceans and coasts. Lesson plans feature NOAA data, as well as real-time and historical data in a variety of forms.

Education resources and topical collections are selected by NOAA staff and educators to directly support teaching of concepts and topics identified in national educational standards. Additionally, several state standards and common classroom texts were consulted to identify common naming and grouping patterns of topics. Direct input from educators at conferences and through other forums on an ongoing basis also helps shape the content of this site. Each collection contains resources vetted by the NOAA education team to support teaching in formal and informal settings. The key characteristics of the resources in the collections are:

- Based on real world and current science
- Relevant to science education teaching requirements in formal settings
- Fine grained components that educators can use individually or mix and match to enhance current teaching
- Technically functional, scientifically accurate, and use educational best practices
- Actively engage learners in scientific activities and discussions aimed at critical thinking and problem solving
- Easy to use
- Easily edited, modified, printed, and/or displayed

For more information and to access the collections, visit:
https://www.noaa.gov/education/resource-collections/about

Educating About Connected Systems
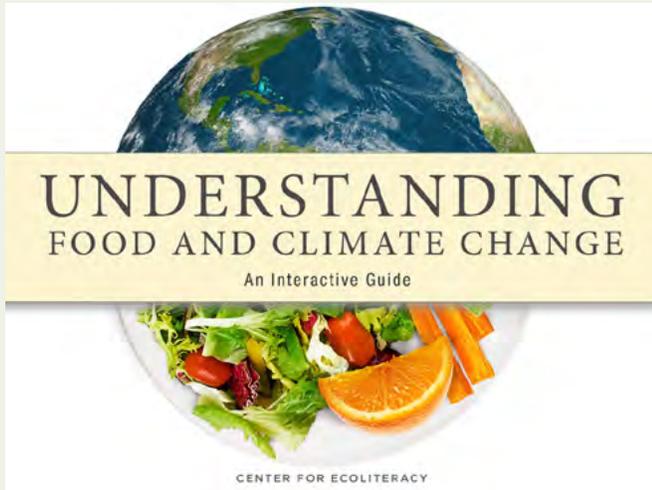
Systems thinking is in the DNA of the nonprofit Center for Ecoliteracy in Berkeley, California. It was founded in 1995 by physicist and systems thinker Fritjof Capra, business-leader-turned-regenerative-farmer Peter Buckley, and Zenobia Barlow, a pioneer in leadership and education for systems change connected to the environment.

In 1998, the Center for Ecoliteracy, working with with 17 community-based organizations, received a three-year USDA Community Food Security Projects grant. They used this grant to establish the Food Systems Project and embark on an effort to recraft food systems in California leveraging school lunch programs.

This focus on food systems continues today through initiatives that advance the teaching and modeling of sustainable practices in K–12 schools. One initiative, California Food for California Kids®, is helping build the capacity and commitment of school districts to provide all students with fresh, locally grown food and educate students about how their food choices can make a difference to their community and the planet. The initiative includes a growing network of 89 public school districts in California that collectively serve 330 million meals a year to more than 2 million students.

In 2018, the Center for Ecoliteracy released two educational publications that help educators, students, and advocates explore the impact of food systems on climate change and the impact of a changing climate on our ability to grow food and feed ourselves. One, *Understanding Food Systems and Climate Change: A Systems Perspective,*[1] is a collection of essays, exploring the links between food systems and climate change from a systems thinking perspective. The other is *Understanding Food and Climate Change: An Interactive Guide.*[2] Available on the web or as a free iBook, the guide uses video, photography, text, and interactive experiences to help learners explore the links between what we grow, eat, and throw away and the impact of climate change—and how our choices about food can make a difference.

The rich and engaging 26-page guide includes multiple links to short videos and text that explain and provide examples of key concepts, connections, and solutions. The guide also identifies connections with middle school and high school Next Generation Science Standards, Common Core State Standards, and relevant themes from the National Curriculum Standards for Social Studies to ease the way for teachers to use it in classrooms.

GUIDELINES IN PRACTICE

Educating About Connected Systems

Through a collaboration with Columbia University's Teachers College, the interactive guide has been incorporated into the online course, Teaching Food and Nutrition for All. Course instructor Pam Koch, who works at the intersection of sustainable food systems and nutrition education, takes the educators enrolled in the course through a learning process that begins with their personal experiences and culminates in individual food and nutrition education plans to use during the next school term.

Eight Columbia University Teachers College Sustainability Fellows completed the course in 2019, creating plans to pilot the resource in their own classrooms in 2020. While the COVID pandemic interrupted implementation, the fellows' plans for using *Understanding Food and Climate Change: An Interactive Guide* as an instructional tool suggest its versatility. Among these plans:

- Grounding the environmental issues component of an after-school program focused on healthy food and gardening
- Informing the selection of topics for student team investigations into human impacts on climate change
- Serving as a curriculum backbone for a project-based environmental science course
- Providing information and inspiration for design of student-led personal, small-group, community or global change projects focused on food systems and climate change

For more information, visit: Center for Ecoliteracy, https://www.ecoliteracy.org

What Is a Food System?

The UN's Food and Agriculture Organization (FAO) defines *food system* as encompassing all the stages of keeping people fed: growing, harvesting, packing, processing, transporting, marketing, consuming, and disposing of food. But it's not just one system—it's systems within systems. It's ecosystems, agricultural systems, processing systems, transportation systems, marketing systems, and much more. It's the interconnected web of resources, activities, and people and the decisions that they make that gets food to your table.

What steps are involved in a bottle of ketchup's journey from farm to table?

People are eating sushi in Anchorage, Chicago, London, Paris, Milan, Dubai, and Bangkok. When did sushi become a global food?

What we choose to eat affects what is grown and raised. How do our food choices impact the food system?

[1] Center for Ecoliteracy. *Understanding Food and Climate Change: A Systems Perspective.* 2018. Berkeley, CA: Learning in the real World. https://www.ecoliteracy.org/download/understanding-food-and-climate-change-systems-perspective
[2] Center for Ecoliteracy. *Understanding Food and Climate Change: An Interactive Guide.* 2018. Berkeley, CA: Learning in the real World. https://www.ecoliteracy.org/download/understanding-food-and-climate-change-interactive-guide

How to use the Guidelines

Environmental Education Materials: Guidelines for Excellence points out six key characteristics of high-quality environmental education instructional materials. For each of these characteristics, specific guidelines for environmental education materials are listed. Each guideline is accompanied by several indicators listed under the heading. These indicators suggest ways of gauging whether the materials being evaluated or developed address the guidelines. They are simply attributes you might look for to help you figure out whether the characteristic is embodied in the materials you are reviewing or developing.

The *Guidelines for Excellence* can help educators, administrators, curriculum designers, or activity guide developers weigh the quality of environmental education materials. They provide direction while allowing flexibility to shape content, technique, and other aspects of instruction.

These guidelines offer a decision-making tool for selecting instructional materials, a target to aim for in developing new materials, and a set of ideas about what a well-rounded environmental education curriculum might be like. It is not reasonable to expect that all environmental education materials will reflect all the guidelines. For example, a set of materials might not present differing viewpoints, as outlined in guideline 1.3. (Balanced presentation of differing viewpoints and theories.) This shortcoming does not necessarily mean that the materials should not be used. An instructor could work them into a larger set of activities that explores different viewpoints and helps learners discern opinion and bias in individual presentations of the issue. In cases such as this one, the *Guidelines for Excellence* can point out a weakness that instructors can compensate for in how they use the materials.

Of course, no set of guidelines could be complete, and there are bound to be important characteristics missing. *Environmental Education Materials: Guidelines for Excellence* provides a foundation on which to build evaluation systems that work for different people in different situations. As a tool to inform decision-making, these *Guidelines for Excellence* can contribute to more effective environmental education.

Sample format for the guidelines

> **Key Characteristic #1**
>
> ## Title
>
> **1.1 Guideline**
>
> **Indicators:**
> • Text
>
> **1.2 Guideline**
>
> **Indicators:**
> • Text

Background information, definitions, and explanations

> **DID YOU KNOW?**

Stories of Guidelines from the field

> **GUIDELINES IN PRACTICE**

Guidelines resources and tips

> **RESOURCES YOU CAN USE**

Environmental Education Materials: Guidelines for Excellence Summary

#1 Accurate and Inclusive

Environmental education instructional materials are accurate and inclusive in describing environmental conditions, concepts, attitudes, processes, challenges, and decisions, and in reflecting the diversity of perspectives on them.

1.1 Accurate
1.2 Centers on equity and inclusion
1.3 Balanced presentation of differing perspectives and theories

#2 Emphasis on Skills Building

Environmental education instructional materials build lifelong skills that enable all learners to arrive at their own conclusions and make reasoned decisions about environmental challenges and opportunities.

2.1 Thinking and process skills
2.2 Skills for asking questions and exploring different perspectives
2.3 Skills for decision-making
2.4 Skills for addressing environmental challenges and opportunities

#3 Depth of Understanding

Environmental education instructional materials aim to foster the development of the personal awareness and deep conceptual understandings necessary for environmental literacy.

3.1 Awareness
3.2 Focus on concepts
3.3 Concepts in context
3.4 Attention to different scales

#4 Personal and Civic Responsibility

Environmental education instructional materials promote personal and civic responsibility, encouraging learners to use their knowledge, skills, and assessments of environmental, social, political, cultural, and economic systems as a basis for environmental decision-making and action.

4.1 Sense of personal stake and responsibility
4.2 Self-efficacy and personal agency

#5 Instructional Effectiveness

Environmental education materials rely on instructional principles and techniques that create effective, culturally responsive, and inclusive learning environments for all learners.

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 Equitable and inclusive learning environments
5.6 Interdisciplinary
5.7 Goals and objectives
5.8 Appropriateness for specific learning settings
5.9 Assessment

#6 Usability

Environmental education materials are 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 Support accepted recommendations and requirements
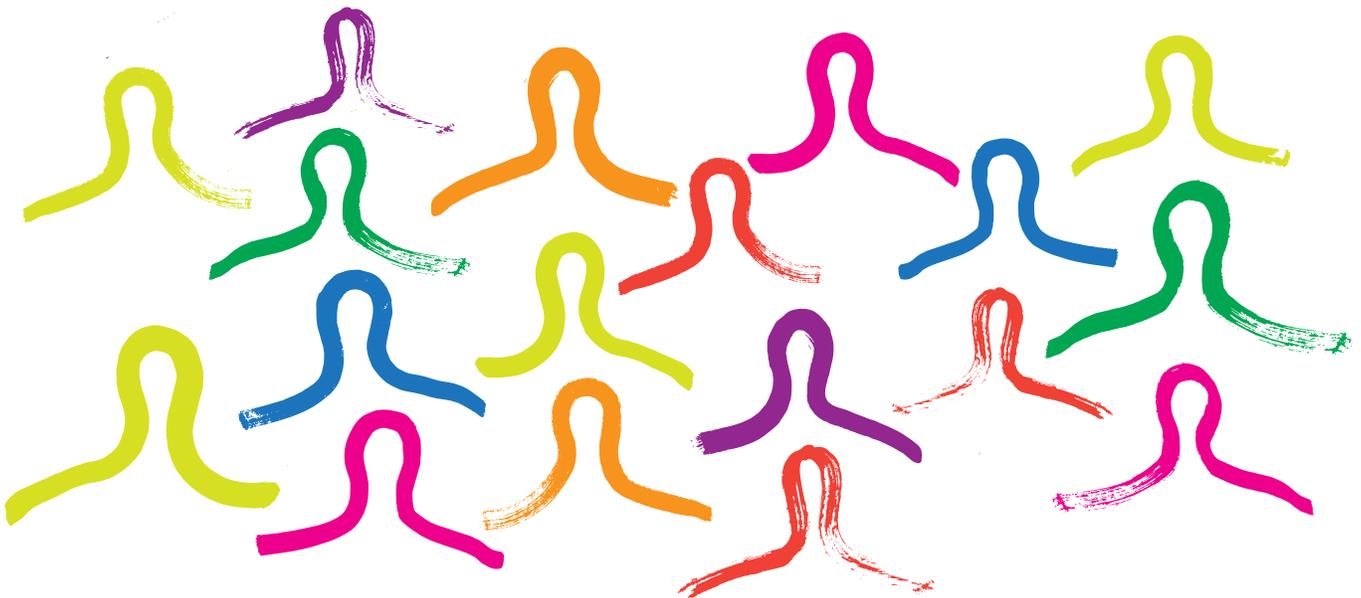
Culturally Responsive Instruction

How to avoid possible pitfalls associated with culturally responsive instruction[1]

What Is the Issue?

All learning is a cultural process. For the purposes of equity, it is crucial for teaching to make meaningful connections to the cultural knowledge, experiences, and ways of knowing of learners and their communities. However, it is complex work and involves avoiding possible complications and prevalent myths. Culturally responsive and sustaining instruction should attend to the historical and dynamic nature of culture, inherent variation within cultural communities, and issues of power and sovereignty that come with responsibly connecting to culture.

Things to Consider

- **Avoid Essentializing Cultural Groups.** Do not assume entire cultural groups engage in certain behaviors—or share values and worldviews. Within every cultural group, there may be some cultural regularities (practices, values, and worldviews), but there will also be variation. Cultural groups also change over time.

- **We Are All Cultural Beings.** Do not send the message that the dominant culture has no culture (e.g., that it is "normal" and that only people of color "have culture"). Each of us belongs to multiple communities that share practices, purposes, ways of interacting, and approaches to conceptualizing and engaging with the world.

Attending to Equity

- **Culturally Responsive vs. Sustaining Pedagogy:[3]** Instruction can be culturally responsive by connecting to the cultural lives of youth and their communities—their languages, literacies, and practices. It can also be a context for sustaining cultural communities—by valuing and working to maintain the languages, literacies, and practices of cultural communities. Culturally sustaining pedagogy promotes cultural pluralism within our democracy.

[3] According to the California Department of Education, "Culturally Sustaining Pedagogy builds upon the Asset-Based Pedagogies that came before it but presents the need to not only affirm and connect to students' cultural backgrounds, but also to sustain them through schooling." https://www.cde.ca.gov/pd/ee/culturallysustainingped.asp

Culturally Responsive Instruction

Recommended Actions You Can Take

- **Build on Prior Interest and Identity.** Learn how to use self-documentation techniques[2] to identify and leverage local, dynamic views of cultural life in culturally responsive science instruction.

- **Move Beyond Token Cultural References.** Do not make token references to the history of cultural groups. Do not include unrealistic scenarios about non-dominant communities in instruction. Instead, interweave the history, present, and future of cultural groups deeply throughout instruction.

- **Work Against the Savior Fetish.** Narratives often position members of a dominant culture as saviors, rescuers, and fixers of non-dominant communities. Instead focus on: How are non-dominant communities already effecting change? How can non-dominant perspectives and knowledge contribute to the betterment of society?

- **Do Not Position Learners as Cultural Representatives but Welcome Their Voices.** Do not ask learners to shoulder the burden of representing what "their culture" is like. No individual speaks for their culture, race, or gender. Do support learners to share aspects of their lived cultural experiences in ways they are comfortable.

- I**nvite Genuine Cultural Contributions from Learners.** Building on the cultural funds of knowledge of youth and communities is a best practice. But if you do so, be prepared to truly engage and respect their varied contributions.

- **Minimize Epistemic Injury.** Fully embrace relevant sensemaking routines learners bring to instruction. Do not adversely position their contributions against a Western science way of knowing.

- **Support Learners in Taking Meaningful Action.** Knowledge can be used to guide and promote social progress, community interests, and civic action. Support learner agency in efforts to critically and meaningfully engage in real-world issues.

[1] Excerpted with permission from: Bell, P. Rodriguez, A., Tzou, C. & Morrison, D. *How to avoid possible pitfalls associated with culturally responsive instruction.* 2018. STEM Teaching Tools Initiative, Institute for Science + Math Education. Seattle, WA: University of Washington. Retrieved from http://stemteachingtools.org/brief/53

[2] For information about self-documentation instructional techniques, visit: http://stemteachingtools.org/brief/31
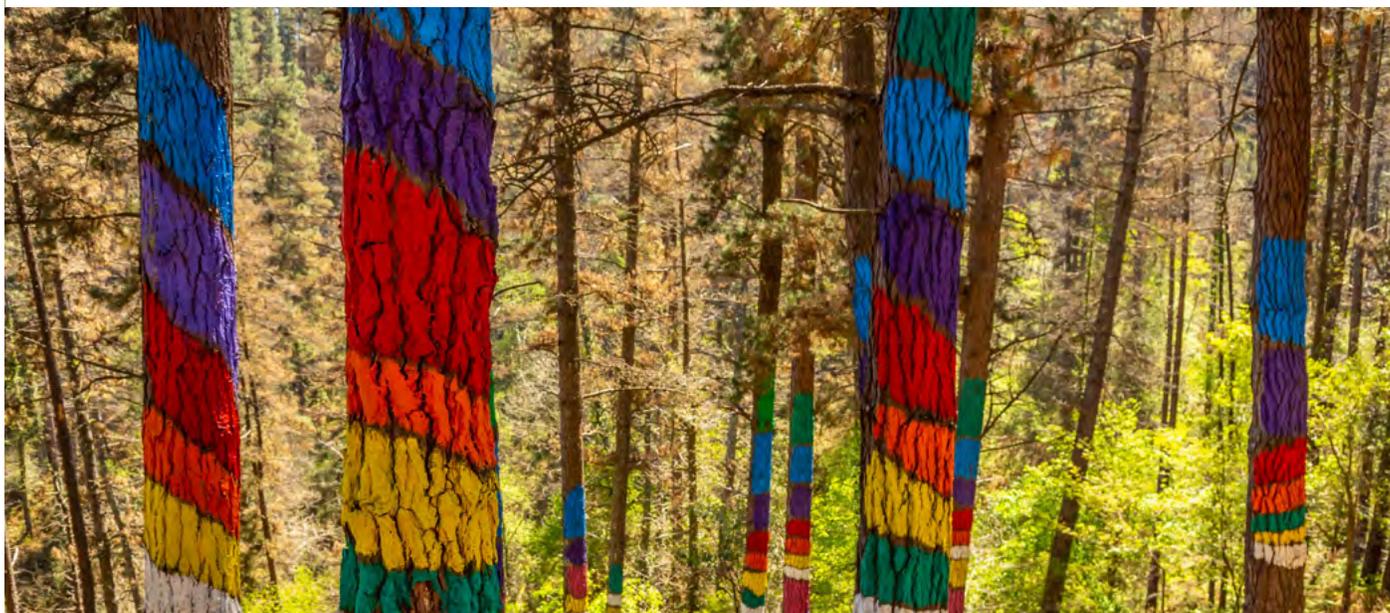
Key Characteristic #1

Accurate and Inclusive

Environmental education instructional materials are accurate and inclusive in describing environmental conditions, concepts, attitudes, processes, challenges, and decisions, and in reflecting the diversity of perspectives on them.

1.1 Accurate.

Environmental education instructional materials reflect current, accepted, and well-documented information from the sciences, social sciences, and other knowledge systems such as Traditional Ecological Knowledge.

Indicators:
- Sources of information are relevant, accessible, timely, and documented.
- A range of people knowledgeable about applicable fields and representing differing points of view reviewed the materials or somehow participated in their development. The materials provide a list of the people involved in development and review, and their areas of expertise.
- Information, descriptions, depictions, and data about people of various races, ethnic groups, cultures, sexual orientations and gender identities, abilities, ages, social groups, classes, language groups, and religious traditions are accurate and come from well-documented sources.
- Data are displayed clearly, using accepted presentation practices, and are drawn from current, identified, peer reviewed sources.
- Information is presented in language appropriate for education rather than for marketing or political persuasion.
- Traditional Ecological Knowledge is presented and referenced, as appropriate.
- Knowledge systems based on communities of color and other groups are presented and referenced, as appropriate.
- Information comes from primary sources that provide context, documentation, and explanation, rather than from reviews or newspaper articles, which may simply provide bits and pieces of perspectives or evidence.

Five Questions to Ask About Media

All information comes from somewhere—whether discussed on a TV show, posted on social media, or published in a newspaper. Someone authored it. Someone published or distributed it. Someone made decisions about what information was to be conveyed and how it should be conveyed. Determining the appropriateness of an information source is not necessarily easy though. The following questions, based on the work of the National Association of Media Literacy Education, may help.

Five Questions to Ask About Media

1. Who created this message?
   a. Was it created by an individual, a group, an organization, or a company?

2. Why was the message made?
   a. Is the message's purpose to inform? To entertain? To persuade? (Or some combination?)
   b. Who is the message's intended audience?

3. Who paid (or is paying) for this message?
   a. Money motivates a lot of media—who paid to have this message made?
   b. What else have they paid for? What other agendas might they have?

4. How is the message trying to get your attention?
   a. What techniques are being used to grab people's attention?
   b. What techniques are being used to keep people's attention?

5. Who is represented in the message? And who is missing?
   a. Whose points of view and values are represented (or being appealed to)?
   b. Whose points of view and values are missing?

Selected Resources:

National Association of Media Literacy Education, https://namle.net.

News Literacy Project, https://newslit.org/

International Federation of Library Associations and Institutions (IFLA). *How to spot fake news.* 2017. https://www.ifla.org/node/11175

Adapted from Common Sense Education. *Five Questions to Ask About Media.* n.d. https://d1e2bohyu2u2w9.cloudfront.net/education/sites/default/files/tlr-asset/5-questions-to-ask-about-media-student-teacher.pdf CREATIVE COMMONS: ATTRIBUTION-NONCOMMERCIAL-SHAREALIKE

DID YOU KNOW?

Ways of Knowing

How did we develop our understandings of the world around us? How is our worldview shaped? What's the role of culture and experience? These questions (and many more) delve into ways of knowing:[1] "The tools we use to gather, create, represent and pass on knowledge." As we think about environmental understandings and teaching others about the environment, considering our ways of knowing becomes increasingly important.

Although there are many ways of knowing, two are particularly relevant to environmental education: **Science as a Way of Knowing** and **Traditional Ecological Knowledge**.

Science as a Way of Knowing

Understanding the nature of science has shifted considerably in the last several years, away from a more linear notion exemplified by the scientific method, to one that embraces science as a way of knowing. The National Research Council's *Framework for K–12 Science Education*[2] elaborates on this:

> Scientific knowledge is a particular kind of knowledge with its own sources, justifications, ways of dealing with uncertainties, and agreed-on levels of certainty. When students understand how scientific knowledge is developed over systematic observations across multiple investigations, how it is justified and critiqued on the basis of evidence, and how it is validated by the larger scientific community, the students then recognize that science entails the search for core explanatory constructs and the connections between them. They come to appreciate that alternative interpretations of scientific evidence can occur, that such interpretations must be carefully scrutinized, and that the plausibility of the supporting evidence must be considered. Thus students ultimately understand, regarding both their own work and the historical record, that predictions or explanations can be revised on the basis of seeing new evidence or of developing a new model that accounts for the existing evidence better than previous models did.

Ways of Knowing

Traditional Ecological Knowledge (TEK)

Traditional Ecological Knowledge, also sometimes known as Indigenous Knowledge, Local Knowledge, Indigenous Ecological Knowledge, and Native Science, provides a deep understanding of the natural world that has been developed over generations. The Arctic Council Indigenous Peoples' Secretariat[3] describes Traditional Ecological Knowledge as:

> … a systematic way of thinking and knowing that is elaborated and applied to phenomena across biological, physical, cultural, and linguistic systems. Traditional Knowledge is owned by the holders of that knowledge, often collectively, and is uniquely expressed and transmitted through Indigenous languages. It is a body of knowledge generated through cultural practices, lived experiences including extensive and multigenerational observations, lessons, and skills. It has been developed and verified over millennia and is still developing in a living process, including knowledge acquired today and in the future, and it is passed on from generation to generation.

Overlapping Qualities of Traditional Knowledge and Western Science

Distinctions between Western science and TEK exist. However, TEK and Western science have also been described in terms of overlapping domains, with common ground falling into four overarching areas:[4]

- **Organizing Principles:** Universe is unified; body of knowledge stable, but subject to modification
- **Habits of Mind:** Honesty, inquisitiveness, perseverance, open-mindedness
- **Skills and Procedures:** Empirical observation in natural settings, pattern recognition, verification through repetition, inference, and prediction
- **Knowledge:** Plant and animal behavior, cycles, habitat needs, interdependence, properties of objects and materials, position and motion of objects, cycles and changes in earth and sky

Acknowledging both the distinctions and commonalities in these ways of knowing, Western scientists and Native people are increasingly working together to document changes due to climate change, monitor biodiversity loss, make resource management decisions, and address other sustainability issues.

[1] International Baccalaureate Organization. Ways of Knowing. n.d. Retrieved from http://sohowdoweknow.weebly.com/ways-of-knowing.html

[2] National Research Council. A Framework for K–12 Science Education: Practices, Crosscutting concepts, and core ideas. 2012. Retrieved from https://www.nextgenscience.org/framework-k-12-science-education

[3] Arctic Council. *Ottawa Traditional Knowledge Principles.* 2015. Retrieved from https://www.arcticpeoples.com/knowledge#traditional-knowledge-1

[4] Barnhardt, R., & Kawagley, A. O. Indigenous Knowledge Systems and Alaska Native Ways of Knowing. *Anthropology and Education Quarterly*, 2005. 36(1), pp. 8-23. http://www.ankn.uaf.edu/curriculum/Articles/BarnhardtKawagley/Indigenous_Knowledge.html

1.2 Centers on equity and inclusion.

The assets and strengths of a broad array of peoples, such as people of different races, ethnic groups, cultures, sexual orientations and gender identities, abilities, ages, social groups, classes, language groups, and religious traditions, are included with respect and equity. When possible, instructional materials are co-created with stakeholders.

Indicators:

- Specialists in equity and inclusion, experts in addressing the needs of learners with differing abilities, expected users of the materials, and members of historically underrepresented groups have been involved in the development and review process. For example, perspectives of individuals with special needs and their families were considered in the development of the educational materials.
- Instructional materials contain examples, descriptions, and illustrations that were generated by and are representative of differing groups of people, including those who are traditionally underrepresented.
- Readings and other resources present perspectives from different cultures, social groups, abilities, and traditions, including Traditional Ecological Knowledge, in an asset-based, respectful, and equitable manner.
- Content and illustrations reflect relevant geographic and cultural differences, and where appropriate, depict rural, suburban, and urban settings.
- Multiple perspectives on environmental concerns and questions, including those from different cultures, social and economic groups, identities, and traditions, are presented as appropriate for the intended age level.
- Age-appropriate implications for environmental justice are considered in investigations of environmental history, conditions, issues, decisions, and impacts.
- Content, language, and illustrations are gender inclusive and avoid the use of masculine or feminine descriptors.

DID YOU KNOW?

Some Useful Definitions

Culturally Responsive Teaching

… the behavioral expressions of knowledge, beliefs, and values that recognize the importance of racial and cultural diversity in learning. It is contingent on . . . seeing cultural differences as assets; creating caring learning communities where culturally different individuals and heritages are valued; using cultural knowledge of ethnically diverse cultures, families, and communities to guide curriculum development, classroom climates, instructional strategies, and relationships with students; challenging racial and cultural stereotypes, prejudices, racism, and other forms of intolerance, injustice, and oppression; being change agents for social justice and academic equity; mediating power imbalances in classrooms based on race, culture, ethnicity, and class; and accepting cultural responsiveness as endemic to educational effectiveness in all areas of learning for students from all ethnic groups.

Geneva, G. *Culturally responsive teaching: Theory, research, and practice.* 2010. New York: Teachers College.

Diversity

… is the representation of all our varied identities and differences (race, ethnicity, gender, disability, sexual orientation, gender identity, national origin, tribe, caste, socio-economic status, thinking and communication styles, etc.) collectively and as individuals.

Ford Foundation. Our Values. 2020. Retrieved from https://www.fordfoundation.org/about/people/diversity-equity-and-inclusion/#:~:text=Equity%20seeks%20to%20ensure%20fair,and%20participation%20of%20all%20people

Environmental Justice

… refers to cultural norms and values, rules, regulations, behaviors, policies, and decisions to support sustainable communities, where all people can interact with confidence that their environment is safe, nurturing, and productive.

Bonta, M., DeFalco, T. & Taylor Smith, C. *Diversity and the Conservation Movement.* 2015. Washington, DC: Audubon. Retrieved from https://cdn.naaee.org/sites/default/files/eepro/resource/files/diversity_module.9.22.15.pdf

Equity

The guarantee of fair treatment, access, opportunity, and advancement while at the same time striving to identify and eliminate barriers that have prevented the full participation of some groups. The principle of equity acknowledges that there are historically underserved and underrepresented populations, and that fairness regarding these unbalanced conditions is needed to assist equality in the provision of effective opportunities to all groups.

USCAN. Climate Action Network. *Justice, Equity, and Inclusion.* 2020. Retrieved from https://www.usclimatenetwork.org/justice_equity_diversity_and_inclusion

Inclusion

The act of creating environments in which any individual or group can be and feel welcomed, respected, supported, and valued to fully participate and bring their full, authentic selves to work. An inclusive and welcoming climate embraces differences and offers respect in the words/actions/thoughts of all people.

USCAN. Climate Action Network. *Justice, Equity, and Inclusion*. 2020. Retrieved from https://www.usclimatenetwork.org/justice_equity_diversity_and_inclusion

Integrating Scientific Research with Traditional Ecological Knowledge to Motivate Climate Change Action

In the early 2000s, along the shores of Lake Superior, extreme storm events were on the rise. Fluctuating water levels caused problems with docks that provide lake access, affecting public safety. Fewer days of frozen roads meant fewer days winter loggers could work in the woods—a pocketbook issue. Here, in the heart of the Lake Superior Ojibwe Indian Country, tribal members saw changes affecting their treaty rights to hunt, fish, and gather, including declines in the harvest of wild rice, a staple food and cultural anchor for these native communities.

Climate change could help explain all of these phenomena, as well as others that people might notice in their daily lives. But how do you pick apart whether these are enduring changes caused by a changing climate, or whether they might be caused by shorter-term fluctuations in the weather? How do you help people connect impacts they are seeing in their cultures and communities to the larger issue of climate change in a way that builds knowledge and compels action?

One way, says Cathy Techtmann, Extension outreach specialist with the University of Wisconsin, is to blend place-based, Indigenous ways of knowing with Western ecological science. Traditional Ecological Knowledge and language reflect the generations-old relationship of Indigenous people with the environment, especially through cultural practices such as wild rice harvesting. This long-term knowledge provides a baseline for evaluating whether environmental changes we observe in our cultures may be caused by climate change or reflect short-term weather variability. "If both culture and science agree that climate change is real, and if people can see that it's affecting something they care about culturally or economically like wild rice or fishing or winter logging or gardening" Techtmann notes, "they're more likely to care enough to learn and take action."

GUIDELINES IN PRACTICE

Integrating Scientific Research with Traditional Ecological Knowledge to Motivate Climate Change Action

A group of partners turned the marriage of Ojibwe Traditional Ecological Knowledge and Western ecological science into a climate literacy model and associated curriculum called Gikinoo'wizhiwe Onji Waabaan, or G-WOW for short. In Ojibwe, this means "Guiding for Tomorrow," a name given by an Ojibwe elder and project contributor. The partners—University of Wisconsin–Extension, Great Lakes Indian Fish and Wildlife Commission (GLIFWC), Chequamegon-Nicolet National Forest–US Forest Service, and Apostle Islands National Lakeshore–National Park Service—are supported by a growing list of funders and local collaborators. GLIFWC represents the off-reservation treaty rights of 11 Ojibwe tribes in Michigan, Minnesota, and Wisconsin, providing a link to traditional knowledge, tribal elders, and research such as the Commission's "Integrating Scientific and Traditional Ecological Knowledge" climate vulnerability study.

G-WOW's learning model hinges on revealing how climate change is affecting the sustainability of species and habitats that support cultural and economic activities people value. By developing and evaluating hypotheses, learners (middle school through adult) explore whether changes affecting a cultural or economic activity they value and the environment that support it are connected to climate change. The long-term Ojibwe perspectives on environmental change are integrated with climate science research and projections of climatic variables such as temperature.

Learners may explore activities similar to those practiced by the Ojibwe people, such as winter logging. The Ojibwe know that winters are warming based on long-term observations of species requiring cold weather. When learners connect those observations with scientific projections of fewer nights below freezing, and their own observations of a shortening season for winter logging, they can evaluate how climate change is affecting this economically important practice in the Great Lakes region. By revealing how climate change is affecting cultural and economic activities people value, G-WOW encourages service-learning projects that grow out of exploring these connections.

Beyond a lived cultural experience and Traditional Ecological Knowledge, tribal collaborators from several of the Lake Superior Ojibwe communities shaped the initiative in other ways. For example, the curriculum has spawned a climate leadership institute that, like G-WOW itself, integrates Ojibwe and Western leadership practices to promote climate resilience within the Lake Superior region.

The G-WOW model can work in many cultures and locations to help learners make concrete connections between cultural practices, key species and habitats, and place-based and scientific evidence of climate change effects. Indigenous ecological knowledge from other cultures or long-term local knowledge can also provide a baseline for building climate awareness and action.

<div style="background-color:#667c2e; color:white; text-align:center;">GUIDELINES IN PRACTICE</div>

Integrating Scientific Research with Traditional Ecological Knowledge to Motivate Climate Change Action

G-WOW resources infuse Traditional Ecological Knowledge, Ojibwe language, and cultural perspectives and include:

- An interactive website and curriculum with four seasonal lifeway units, activity guides and examples for climate action to help learners develop their own climate change hypotheses and create service learning activities
- An interactive exhibit at the Northern Great Lakes Visitor Center in Ashland, Wisconsin
- Youth climate change programs
- Professional development programs for formal and nonformal educators to build confidence and leadership in using the G-WOW model to educate about climate change

For more information, visit: G-WOW, www.g-wow.org

[1] Great Lakes Indian Fish and Wildlife Commission, www.flifwc.org
[2] UW Extension G-WOW Climate Literacy and Leadership Programs, https://fyi.extension.wisc.edu/nglvc/cool-coasts

1.3 Balanced presentation of differing perspectives and theories.

Where there are differences of opinion or contested scientific or other evidenced-based explanations, perspectives are presented in a balanced way.

Indicators:
- Instructional materials communicate areas of substantial agreement among scientists or others who are knowledgeable about the topic. When science or social science content is contested, differences are presented.
- Educators are provided enough background information to draw their own conclusions about contested content. Educators are encouraged to examine their own perspectives and to consider how these might influence their interpretation of contested content.
- Perspectives and experiences of historically marginalized or underrepresented groups are reflected with respect.
- Proponents of a range of different perspectives and ways of thinking about the topic were involved in the review and development of the materials. The materials list the people involved in development and review, and their affiliations.
- Perspectives or positions taken by the authors on policies, scientific interpretations, or preferred actions are clearly identified as such.
- Opinions or policies of an agency or organization referenced are clearly identified as such.
- Materials explore how proposed solutions may affect environmental, social, and economic systems. As appropriate for the developmental level of the intended audience, materials explore critical questions about the societal status quo.

Food Matters Action Kit

Published by the Commission for Environmental Cooperation (CEC), the *Food Matters Action Kit* provides a range of educational activities designed for young people, ages 5 to 25. Background information, supported by citations and applicable website addresses, is provided on a variety of topics, including different types of food waste, the circular economy, food security, how landfills work, and the magnitude of the food waste issue. Learning activities focus on how to prevent food waste, with ten activities geared towards 5- to 13-year-olds and10 activities for 14- to 25-year-olds.

The *Food Matters Action Kit* is designed to "engage and empower North American youth from diverse backgrounds to prevent, recover, and recycle food waste at home, school and in their communities." (CEC, 2019) Detailed information about who developed the *Food Matters Action Kit* as well as the names and affiliations of members of the CEC, the CEC Steering Committee, and the Youth Advisory Committee are printed in an acknowledgements section. These committees include representatives from "leading youth-based community associations, academic and educational institutions, nongovernmental organizations, the charitable sector, and Indigenous groups," (CEC, 2019) including the Mexican Foodbanking Network (Bancos de Alimentos de México), Environment and Climate Change Canada, Ontario EcoSchools, Global Youth Biodiversity Network, US Environmental Protection Agency, and Indigenous Youth Caucus. Finally, subject matter specialists from Canada, Mexico, and the United States informed the development of the *Food Matters Action Kit.*

For more information about the CEC. Food Matters Action Kit. 2019 and to download a copy, visit: http://www3.cec.org/islandora/en/item/11817-food-matters-action-kit-inspiring-youth-across-north-america-prevent-food-waste

Environmental Justice for All

"Environmental Justice for All" is an activity from *Project Learning Tree's K–8 Activity Guide* that is geared for middle school students. In this activity, students explore the idea that everyone should have a fair say in environmental decisions that may affect them. Students examine community case studies involving environmental justice issues and propose actions to resolve them. They also interact with an online mapping tool to identify potential issues in their community.

The five case studies included in the activity represent an array of different races, cultures, social classes, geographic regions, community sizes, and issues. For example, one case examines water pollution's effect on tribal salmon fishing areas in the Pacific Northwest, while another focuses on the lack of street trees in an urban neighborhood of Dallas, Texas. By reflecting on these actual cases, students are encouraged to consider whether any group is disproportionately impacted and how to involve those affected in finding solutions.
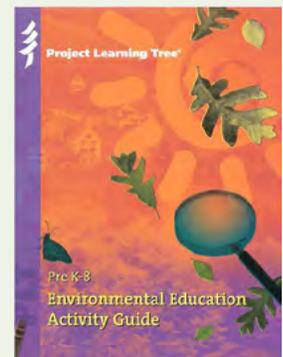
After examining the case studies, students are invited to conduct research on their own community. Using the interactive mapping tool EJSCREEN created by the US Environmental Protection Agency (EPA), students study different map overlays that depict variables such as cancer risk, hazard waste proximity, education level of residents, or locations of parks. They look for any patterns, identify what the patterns might mean, and then share their results and possible solutions with fellow students.

While the activity addresses a topic that could be emotionally triggering for some students or in some communities, the activity format—with its student-led investigation, inquiry-based approach, and open-ended questions—supports students in examining an issue that may hit close to home. In addition, the activity's background information alerts educators to be aware of students who may be more vulnerable and to help students frame the issues in terms of societal decision-making rather than individual shortcomings.

"Environmental Justice for All" is one of 50 activities in *Project Learning Tree's K–8 Activity Guide* that encourage student-led investigation and research. As with other activities in the guide, it invites students to explore a variety of perspectives and to propose solutions that may affect environmental, social, and economic systems in their own communities.

All new PLT instructional materials undergo an extensive expert review process. For this activity alone, 13 educators across the United States participated in a pilot test, using the activity with their students and providing in-depth feedback on its content and instructional effectiveness. In addition, the activity was reviewed by subject matter experts in the field of environmental justice.

To learn more about Project Learning Tree, an initiative of Sustainable Forestry Initiative, visit: www.plt.org
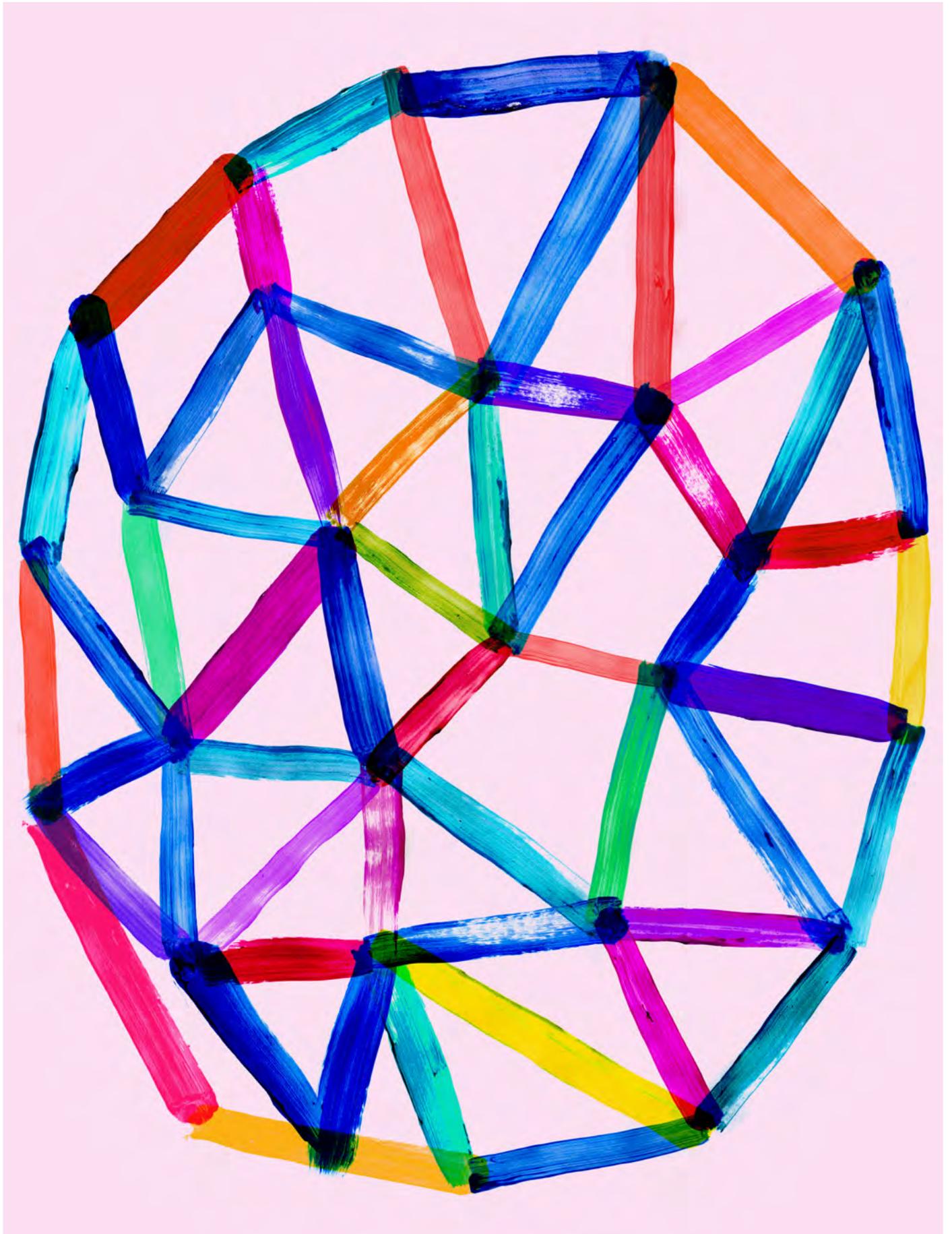
Key Characteristic #2

Emphasis on Skills Building

Environmental education instructional materials build lifelong skills that enable all learners to arrive at their own conclusions and make reasoned decisions about environmental challenges and opportunities.

2.1 Thinking and process skills.

Learners are challenged to use and improve a broad range of skills, including observation, communication, creative thinking, critical thinking, social-emotional learning, and systems thinking.

Indicators:

- Materials encourage creativity, and provide opportunities to compare, classify, characterize, and make connections.
- Exercises offer learners opportunities to practice skills individually and in groups, including brainstorming, arguing from evidence, and designing and carrying out environmental investigations.
- Materials present open-ended questions for exploration and discussion.
- Instructional materials provide opportunities for learners to examine systems and ask their own questions about relationships.
- Activities present opportunities for learners to practice interpersonal and communication skills, including listening, oral and written communication, group cooperation, deliberation, leadership, and conflict resolution.
- Instructional materials outline strategies that offer learners, especially young children, opportunities to develop creative and divergent thinking through participation in unstructured exploration of the environment.
- Materials encourage the development of a growth mindset (for example, seeing challenges as learning opportunities, learning from failure, and trying different learning strategies).
- Exercises encourage learners to become discerning readers and media consumers and to apply reasoning skills to evaluate the completeness and reliability of a range of environmental information and information sources.
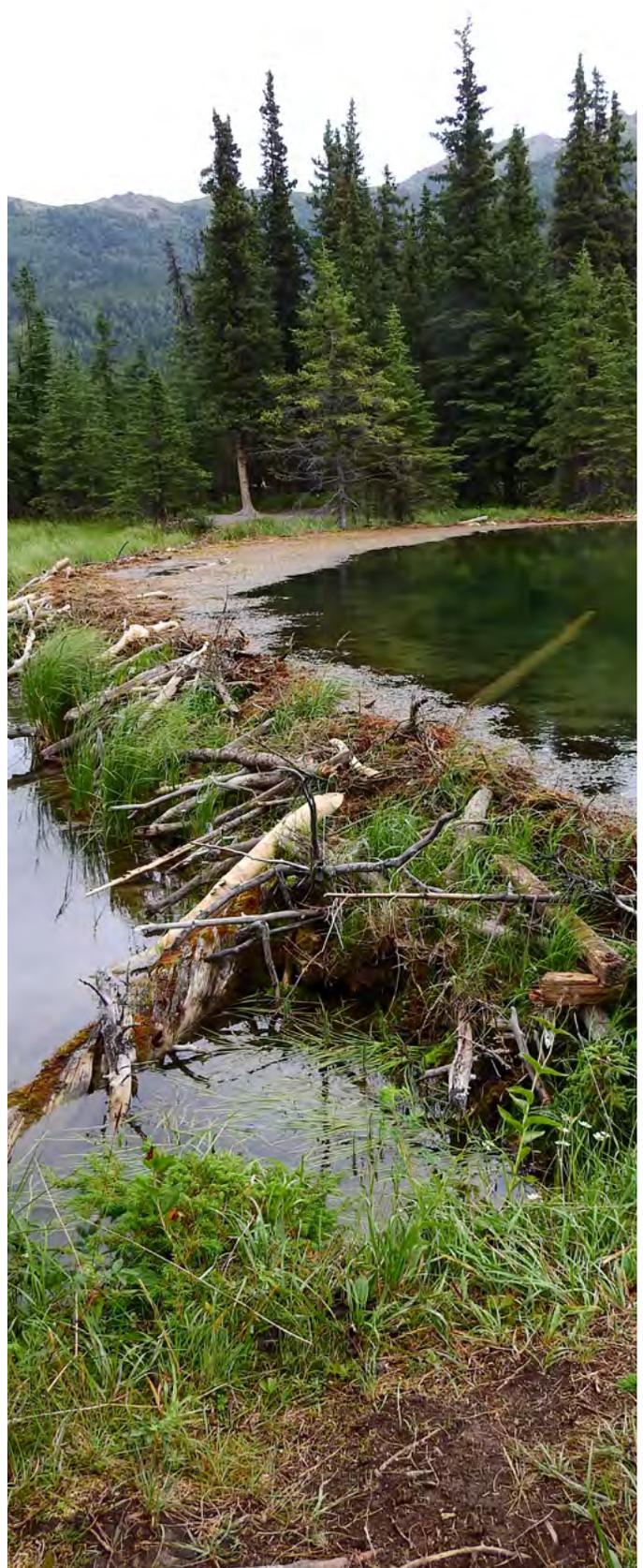
DID YOU KNOW?

Thinking Skills and Practices

There are hundreds of different frameworks defining a range of thinking skills and practices. The following provides definitions for just a few that are particularly important to environmental education.

Creative Thinking

Think Creatively: Use a wide range of idea creation techniques (such as brainstorming). Create new and worthwhile ideas (both incremental and radical concepts). Elaborate, refine, analyze, and evaluate their own ideas in order to improve and maximize creative efforts.

Work Creatively with Others: Develop, implement, and communicate new ideas to others effectively. Be open and responsive to new and diverse perspectives; incorporate group input and feedback into the work. Demonstrate originality and inventiveness in work and understand the real-world limits to adopting new ideas. View failure as an opportunity to learn; understand that creativity and innovation is a long-term, cyclical process of small successes and frequent mistakes.

Partnership for 21st Century Learning. *Framework for 21st Century Learning definition.* 2019.Battelle for Kids. http://static.battelleforkids.org/documents/p21/P21_Framework_DefinitionsBFK.pdf

Critical Thinking

Critical thinking occurs when students are analyzing, evaluating, interpreting, or synthesizing information and applying creative thought to form an argument, solve a problem, or reach a conclusion. Critical thinking entails many kinds of intellectual skills, including developing well-reasoned, persuasive arguments and evaluating and responding to counterarguments; examining concepts or situations from multiple perspectives, including different cultural perspectives; questioning evidence and assumptions to reach novel conclusions; devising imaginative ways to solve problems, especially unfamiliar or complex problems; formulating and articulating thoughtful, penetrating questions; and identifying themes or patterns and making abstract connections across subjects.

Great Schools Partnership. *Glossary of Educational Reform.* 2013. https://www.edglossary.org/critical-thinking

Deliberative Practices

Deliberation requires each person to think critically and creatively, listen attentively, examine assumptions, value differences, engage in respectful and honest dialogue, and reach well-reasoned judgments. Deliberating together is about deepening understanding of the problem in order to craft solutions, not about winning a debate or standing your ground. Deliberation can be understood as the cultivation of a set of capacities that can lead to a new construction of knowledge, one that comes out of the public's work together.

Doherty, J. *Connections.* Deliberative Pedagogy: An Education that Matters. 2012. https://www.kettering.org/sites/default/files/periodical-article/6_CONNECTIONS2012_Doherty.pdf

Design Thinking

Design thinking is a non-linear, iterative process that seeks to understand users, challenge assumptions, redefine problems, and create innovative solutions to prototype and test. The method consists of five phases: Empathize, Define, Ideate, Prototype, and Test and is most useful when you want to tackle problems that are ill-defined or unknown.

Design Thinking is a design methodology that provides a solution-based approach to solving problems. … [It is] useful in tackling complex problems that are ill-defined or unknown, by understanding the human needs involved, by re-framing the problem in human-centric ways, by creating many ideas in brainstorming sessions, and by adopting a hands-on approach in prototyping and testing.

Interaction Design Foundation. *What is Design Thinking?* n.d. https://www.interaction-design.org/literature/topics/design-thinking

DID YOU KNOW?

Thinking Skills and Practices
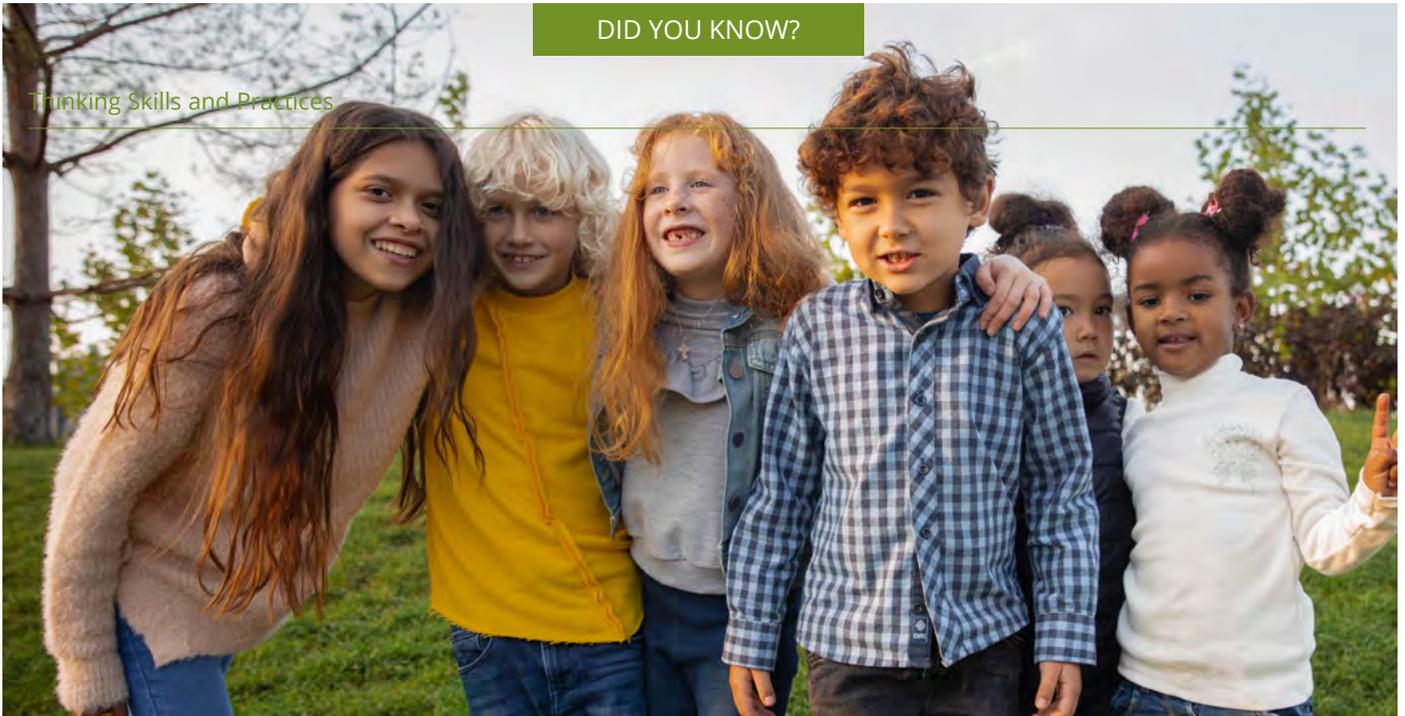
Social and Emotional Learning Skills

Social and emotional learning (SEL) is the process through which children and adults understand and manage emotions, set and achieve positive goals, feel and show empathy for others, establish and maintain positive relations, and make responsible decisions.

CASEL's widely used framework identifies five core competencies:

Self-awareness: … 0accurately recognize one's emotions and thoughts and their influence on behavior.
Self-management: … regulate one's emotions, thoughts, and behaviors effectively in different situations.
Social-awareness: … take the perspective of and empathize with others from diverse backgrounds and cultures, to understand social and ethical norms for behavior, and to recognize family, school, and community resources and supports.
Relationship skills: … establish and maintain healthy and rewarding relationships with diverse individuals and groups.
Responsible decision-making: … make constructive and respectful choices about personal behavior and social interactions based on consideration of ethical standards, safety concerns, social norms, the realistic evaluation of consequences of various actions, and the well-being of self and others.

Collaborative for Academic. Social, and Emotional Learning (CASEL). *What is SEL?* 2020. https://casel.org/what-is-sel/

Systems Thinking

Systems thinking is a cross-disciplinary approach to understanding how to think better about real-world systems and the real-world problems we face. Systems thinking emerges when learners make distinctions, recognize systems and relationships, and take perspectives, acting in and on the world around them. These four cognitive skills, or simple rules, underlie even the most complex forms of thinking:

Distinctions Rule: Any idea can be distinguished from other ideas.
Systems Rule: Any idea can be split into parts or lumped into a whole.
Relationships Rule: Any idea can be related to other ideas.
Perspectives Rule: Any idea can be the point or the view of a perspective.

Cabrera, D. and Cabrera, L. Systems Thinking Made Simple. *New Hope for Solving Wicked Problems in a Complex World.* 2015. Ithaca: Odyssean Press.

Encouraging A Growth Mindset[1]

Undergirding many effective teaching strategies is the practice of supporting a growth mindset. Pioneered by Carol Dweck, a growth mindset refers to one's belief that attitudes, dispositions, and skills are best cultivated through personal or self-effort. This contrasts with a fixed mindset, where one is led to believe that effort is not necessarily required in improving attitudes, dispositions, skills, and/or further talents. Guidance that encourages learners' development of internal motivations and personal effort beliefs related to their learning is critical for engaged learning.

For more information: Doing What Works. *Two Mindsets.* n.d. Retrieved from
https://cdoms.buncombeschools.org/UserFiles/Servers/Server_94629/File/Staff/Venturella,Amanda/lee_meg3.pdf

Dweck, C. *Mindset: The New Psychology of Success.* 2006. NY: Random House Publishing.
Midlothian Council Educational Psychology Service. Mindset. 2013. Retrieved from
https://cpb-eu-w2.wpmucdn.com/edublog.mgfl.net/dist/6/32/files/2016/03/dweck_spotlight-1la81rq.pdf

Spencer, J. *Growth Mindset vs. Fixed Mindset.* 2017. (video). https://www.youtube.com/watch?v=M1CHPnZfFmU

[1] *Did You Know? Growth Mindset* was written by Yash Bhagwanji

2.2 Skills for asking questions and exploring different perspectives.

Instructional materials encourage learners to ask questions, explore different perspectives, seek and use observational and evidence-based information, form their own points of view, and communicate their reasoning.

Indicators:

- Instructional materials provide educational opportunities grounded in the interests and previous experiences of the learners, encouraging them to ask their own questions and create their own explorations.
- Tools to help learners form and express opinions about differing theories and perspectives are provided.
- Exercises help learners explore personal and societal values, culturally sensitive perspectives, environmental and social justice implications, and differing points of view with respect and equity.
- Projects are suggested that involve learners in crafting their own questions, and collecting and analyzing their own data/information and comparing it to similar data/information from other places and times.
- Exercises promote an atmosphere of respect for differing opinions and perspectives, and an openness to new ideas, including those from historically underrepresented groups.
- Activities encourage learners to understand and listen to the perspectives of their peers and other community members.
- Educators are provided strategies for encouraging questioning and exploration, especially with young children and learners with different backgrounds from their own.
- Materials provide opportunities for learners to reflect upon and express their own attitudes and perspectives through multiple ways of representation.
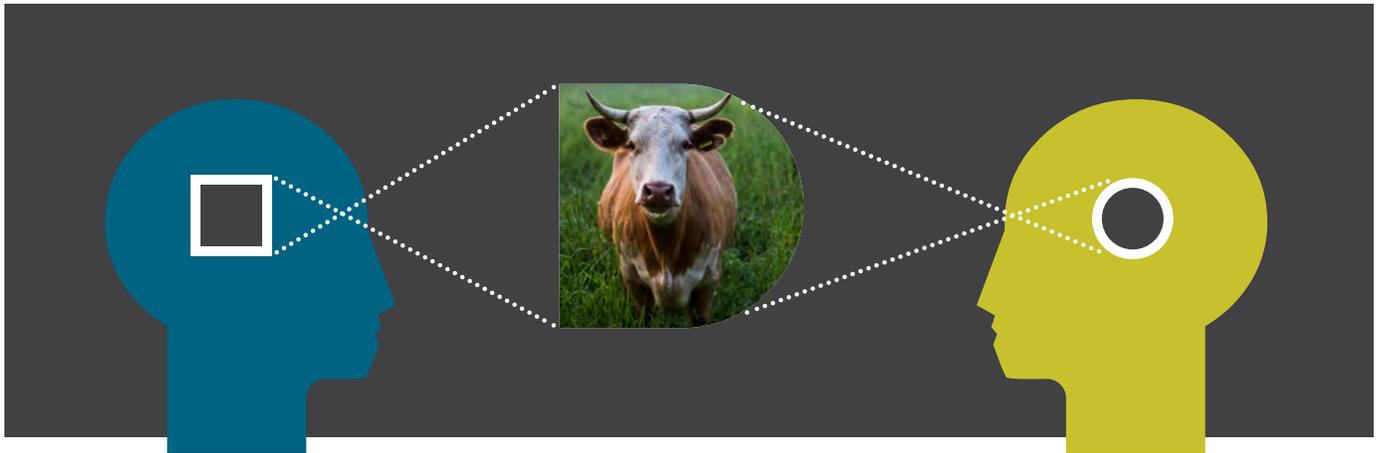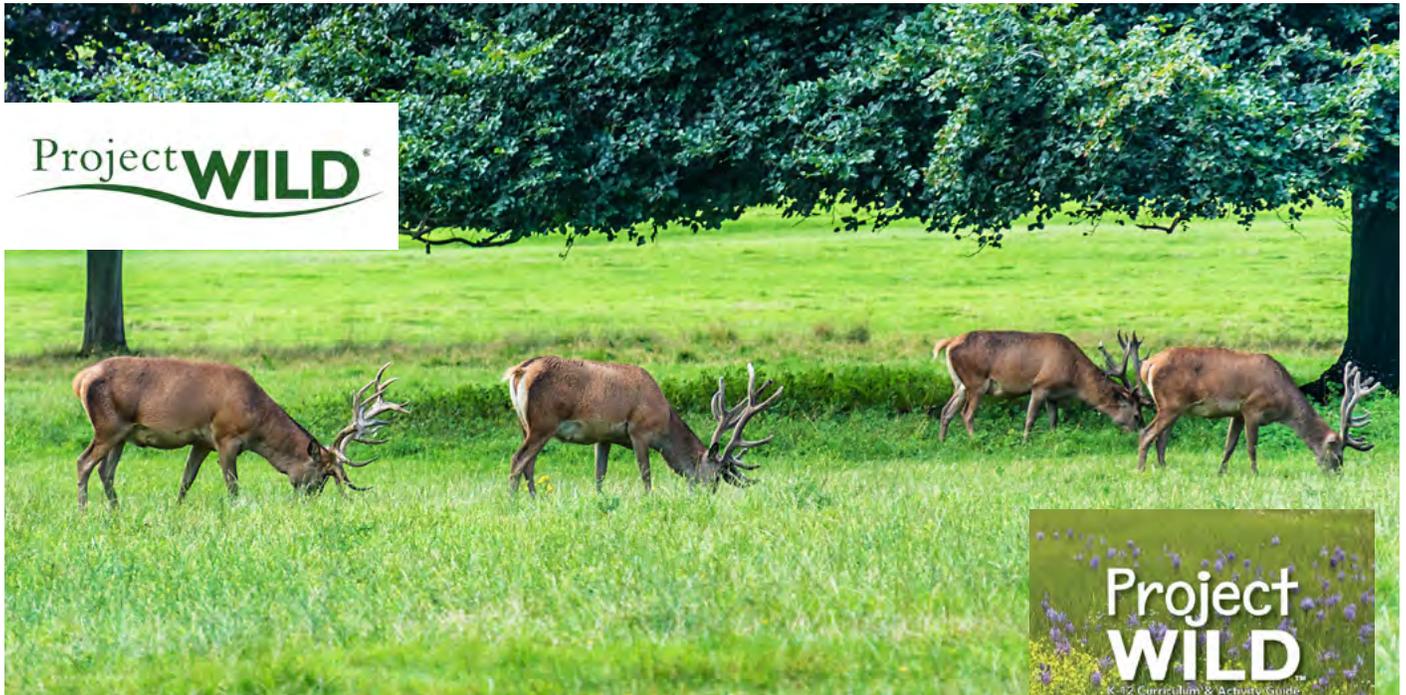
Deer Dilemma

"Too many deer!" Everyone agrees, but what to do? Listen, engage, and cast your vote.

In this simulation of a board of commissioners meeting, high school students role-play various individuals representing a wide variety of opinions on how best to respond to an ever-increasing deer population in and around a local park.

Conflicts around human interaction with wildlife are common in many communities. In "Deer Dilemma," from the Project WILD K–12 Curriculum & Activity Guide, students must consider thirteen different, and often conflicting, perspectives about the best way for the community to respond to a wildlife population that is out of balance. After reading and discussing a description of the dilemma, as well as strategies for managing deer populations, students are assigned roles, such as board members, community members, or townspeople. Prior to the meeting, students are given time to develop their position based on the role they have been given and the information from the two texts.

The diversity of perspectives on how to best respond to the challenge of too many deer include points of view represented by differing opinions and concerns, such as how the deer herd will affect agriculture, safety, the well-being of the community, and the ecosystem. Community members with diverse perspectives include a farmer, a parent, a gardener, a biologist, a member of an animal rights organization, a park ranger, a resident whose family has been impacted by Lyme disease, a hunter, and a representative of a local tribe of Indigenous people. Rather than promoting a particular point of view or strategy to managing the deer population, "Deer Dilemma" provides an opportunity for students to explore differing perspectives in a balanced way and form their own point of view while also learning communication and collaboration skills. While the focus in this activity is on a deer population, the process students undertake can apply to any environmental issue in which learners explore how different perspectives and proposed solutions can affect environmental, social, and economic systems.

Like all Project WILD materials, "Deer Dilemma" was developed, reviewed, revised, and tested in collaboration with many different stakeholders, including educators, wildlife biologists, and environmental managers.

For more information about Project WILD, visit: https://www.fishwildlife.org/projectwild

2.3 Skills for decision-making.

Learners are provided opportunities to arrive at their own conclusions based on thorough research and study, rather than being taught that a certain decision is best or the right one.

Indicators:

- Learners identify, define, and evaluate issues based on evidence and an analysis of perspectives from varying stakeholders. Ethical and value considerations, such as social and environmental justice, are included in their deliberations.
- A list of organizations and other resources that learners can use to explore the issue on their own is provided, as appropriate for their age level. This list highlights evidence-based resources and, when appropriate, includes groups and resources representing various perspectives from the local, national, and international levels.
- As appropriate for the intended developmental level, instructional materials provide opportunities for learners to evaluate, select, and use different methods of analyzing environmental questions. For example, these methods may include power mapping, risk analysis, cost/benefit analysis, root cause analysis, and social impact analysis.
- Environmental challenges and opportunities are presented with a range of possible actions as well as information about how concerns are currently being addressed. Learners are challenged to deliberate the benefits and tradeoffs of different approaches, including environmental justice and social equity implications.
- Learners are encouraged to freely express their thoughts and conclusions using multiple ways of representation.
- Materials provide examples of ways educators and other instructional leaders can facilitate learners in their decision-making process through physical, verbal, and non-verbal assistance.
- Materials facilitate the use of social science (e.g., economic analyses, interviews with community members, historical documents, firsthand accounts, polling data, housing and land use data) and applied science (e.g., laboratory and field investigations, environmental monitoring) in decision-making.
- Learners are given opportunities to use various forms of technology to develop and apply decision-making skills. These technologies might include use of computer programs, communication and social networks, data gathering equipment, and video equipment.

DID YOU KNOW?

Some Methods of Analyzing Environmental Issues

Environmental issues are often multifaceted and complex. Depending on the environmental issue being investigated and the age of the learner, varying methods of analysis might apply, including:

Cost/Benefit Analysis

Cost-Benefit Analysis estimates and totals up the equivalent money value of the benefits and costs to the community of projects to establish whether they are worthwhile. These projects may be dams and highways or can be training programs and health care systems.

San Jose State University, Department of Economics. An Introduction to Cost Benefit Analysis. n.d. Retrieved from https://www.sjsu.edu/faculty/watkins/cba.htm

Power Mapping

Power mapping is simply a way to identify who has power in the community, and to figure out what will move those individuals or institutions to do whatever it is you want them to do. Creating a power map will help you answer these important questions:
- Who are some key potential allies in your community—individuals and organizations who are likely to be on your side and who have the ability to influence others?
- Who might oppose your plan, and who is in the middle who could be brought over to your side?
- What are effective ways to communicate with your community?

NEA EdJustice. Power Mapping 101. n.d. Retrieved from https://neaedjustice.org/power-mapping-101/

Risk Analysis

[Risk analysis is a] systematic process to comprehend the nature of risk and to express the risk, with the available knowledge… Risk analysis is defined to include risk assessment, risk characterization, risk communication, risk management, and policy relating to risk, in the context of risks of concern to individuals, to public and private sector organizations, and to society at a local, regional, national, or global level.

Society for Risk Analysis. Society for Risk Analysis Glossary. 2015. Retrieved from https://www.sra.org/sites/default/files/pdf/SRA_glossary_20150622.pdf

Root Cause Analysis

Root cause analysis (RCA) is a structured method used to analyze serious adverse events. Initially developed to analyze industrial accidents, RCA is now widely deployed as an error analysis tool in health care. A central tenet of RCA is to identify underlying problems that increase the likelihood of errors while avoiding the trap of focusing on mistakes by individuals. RCA thus uses the systems approach to identify both active errors (errors occurring at the point of interface between humans and a complex system) and latent errors (the hidden problems within health care systems that contribute to adverse events). It is one of the most widely used retrospective methods for detecting safety hazards.

US Department of Health and Human Services (HHS). Root Cause Analysis. 2019. Retrieved from https://psnet.ahrq.gov/primer/root-cause-analysis

Social Impact Analysis

Social Impact Assessment includes the processes of analyzing, monitoring and managing the intended and unintended social consequences, both positive and negative, of planned interventions (policies, programs, plans, projects) and any social change processes invoked by those interventions. Its primary purpose is to bring about a more sustainable and equitable biophysical and human environment.

International Association for Impact Assessment (IAIA). Social Impact Assessment. 2020. Retrieved from https://www.iaia.org/wiki-details.php?ID=23#:~:text=Definition,processes%20invoked%20by%20those%20interventions.

GUIDELINES IN PRACTICE

Earth Force: Students for a Better Tomorrow

When Mary Breslin's seventh-grade science class at George Washington Middle School in Alexandria, Virginia met for the first time in fall 2018, several students noticed something strange: a mushroom growing out from underneath the baseboard in their classroom. No one in the class, including Ms. Breslin, had ever seen a mushroom growing out of a wall before. As the class explored this mystery further, they discovered that the mushroom was an indication of a larger problem lurking beneath the baseboard—the intrusion of water caused by rain and high humidity. The moisture created prime conditions for the growth of mold and fungus. While this discovery led the school to immediately move the class to a new room, three of Ms. Breslin's students were so fascinated by the find that they decided to make it the focus of their science fair project. The project looked at the relationship between mold and the environment.
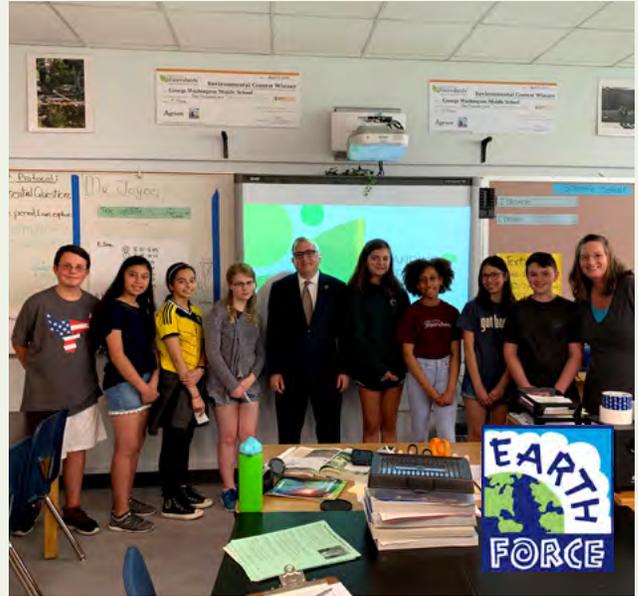
The project did not end with the science fair. Over the course of their study, a number of other students became interested in what they were learning. The original group of three convinced their classmates that they could solve their school's mold problem. From this starting point, Ms. Breslin asked her students to deepen their understanding of the environmental factors that led to the growth of mold and the social, regulatory, and political structures that led to this particular environmental problem.

Ms. Breslin's experience with student excitement driving deeper learning is not unique to the Earth Force model. Many approaches to project-based learning create a feedback loop where the student's investment in solving a problem becomes the driving force for further learning and engagement. Veronica Houlguin, one of Ms. Breslin's seventh-grade students, summed up this feedback loop as it applied to the classroom mold project: "The project started as a school assignment, but as we continued to research and meet with stakeholders, our eyes were really opened to this huge problem that no one was doing anything about. All of us are so dedicated to the project now."

What is unique about the Earth Force model is its explicit focus on students taking civic action to solve the environmental problems they have identified. Ms. Breslin's students started their project by attempting to understand why mold was growing in their classroom. As their study of the issue progressed Ms. Breslin directed her students to deepen their understanding of the policy context that governs indoor air quality. Once they understood that policy context, she asked them to create a plan to change the policies and practices that govern school safety to ensure all students would have the benefits of a healthy environment.

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GUIDELINES IN PRACTICE

Earth Force: Students for a Better Tomorrow

Once they had developed their ideas, students met with people in positions of power (school administrators and city officials) to advocate for their solutions, a change in policies that regulate indoor air quality and a funding increase from the City of Alexandria to address mold remediation. As they moved out into the community to discuss the problem, the students met with members of Virginia's House of Delegates. The House members were moved by the students' passion and knowledge of the issue. These students worked with a member of the Virginia House of Delegates to develop legislation that would require mold testing and remediation in schools throughout Virginia. The students' work culminated with the introduction of SB845 which was passed by the Virginia House in February 2020 and signed by the governor in June 2020.

Ms. Breslin's students learned valuable lessons while working to fix the mold problem at their school. They learned that they have a voice in how their community responds to environmental issues. They learned how the civic process works and how their voices can have an impact on that process. Because of this experience civic participation is now a tool in their problem-solving toolbelt, one that they can turn to for the rest of their lives.

For more information: Earth Force, EarthForceResources.org

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2.4 Skills for addressing environmental challenges and opportunities
Learners gain basic skills needed for action taking.

Indicators:
- The materials provide opportunities for learners to apply action skills, such as those outlined in the *K–12 Environmental Education: Guidelines for Excellence*, for addressing environmental challenges and opportunities.
- Opportunities for learners to apply systems thinking and design thinking when addressing environmental challenges and opportunities are provided, as appropriate for the concern and the learners' developmental level.
- Age-appropriate activities encourage learners to hone their ability to forecast and plan for the long term, including possible social and environmental justice consequences of their proposals.
- Opportunities to evaluate the intended and unintended consequences of their own civic actions and actions taken by other individuals and groups, including environmental, social, and economic implications for long-term sustainability are provided.
- Based on research and analysis, learners are given opportunities to develop, individually and with others, solutions and action strategies for environmental questions. As appropriate, action is taken collaboratively with others in their community.
- Instructional materials offer learners opportunities to apply skills such as deliberation, listening, suspending judgment, working across differences, collaboration, cooperation, and communication while addressing environmental challenges and opportunities.
- Opportunities to develop a variety of civic skills, including participation in the political or regulatory process, consumer action, community service, and using the media, including social media, are provided.
- Instructional materials outline ways educators can use storytelling, reading, direct play in natural environments, and other activities to guide young learners as they generate their own questions problem-solve, and develop action strategies.

GUIDELINES IN PRACTICE

Building Civic Skills

CIVIC (Community Voices, Informed Choices) is an Extension initiative co-led by faculty at Florida A&M University and the University of Florida. CIVIC is building capacity for communities to better understand their challenges, deliberate about different approaches and tradeoffs for addressing them, and work together toward solutions. These challenges include issues for which there are no clear, scientifically best solutions, such as sea level rise, disaster preparedness, affordable housing, and water quality. Such issues are not solved by individual action, but by community decisions.

Martha Monroe, University of Florida/IFAS professor and CIVIC Team Leader, says the power of the program lies in a four-part commitment: "CIVIC programs are firmly rooted in research and the best available science. All programs include values-based deliberative discussions to engage a variety of perspectives and build understanding. We launch CIVIC programs through partnerships with community leadership and encourage small groups to convert discussions to local recommendations or actions through these partnerships. Finally, CIVIC is dedicated to respecting and engaging all members of a community in opportunities to improve their well-being. Our programs do that through inclusion and diversity in leadership, issue framing, solution forming, and community engagement."
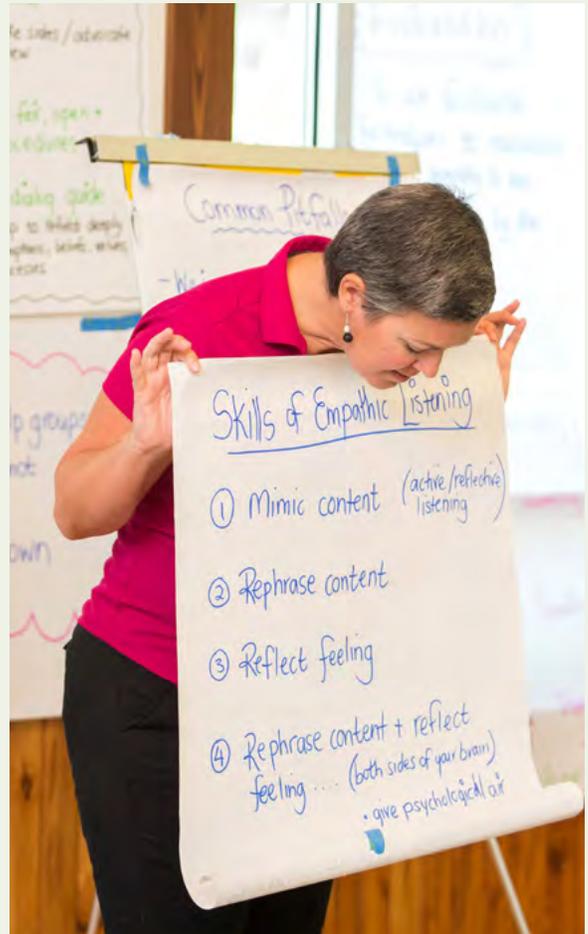
CIVIC is a skill- and capacity-building endeavor as much for Extension professionals as it is for community members. Programs are often developed in collaboration with experienced deliberation practitioners. A growing roster of trainings encourages participation from throughout the state Extension network. These trainings reinforce essential skills for partnership building, assessing community perspectives, adapting materials to meet local needs, implementing place-based programs to deliberate about issues, supporting community leaders in facilitating movement toward solutions, and contributing back to the development of the CIVIC program.

According to Linda Seals, Regional Specialized Agent, "One example of CIVIC's collaborative approach is a program to encourage public dialogue on water pollution and other issues affecting the health of the Indian River Lagoon—one of the most biodiverse estuaries in the northern hemisphere, and the source of $7.6 billion in economic value for the six-county region on the Atlantic coast."

To kick off the Indian River Lagoon program, Reverend Gregg Kaufman helped guide a CIVIC project team through the process of framing, revising and testing a discussion guide on community and ecosystem health around the Lagoon. Kauffman is a Jacksonville, Florida, resident and long-time deliberation practitioner with connections to the National Issues Forums Institute.[1]Together, the team developed an issue framework, added perspectives from often-unengaged parts of the community, and tested the resulting draft discussion guide with regional educators, experts and community members.

GUIDELINES IN PRACTICE

Building Civic Skills

Using this issue guide, CIVIC offered a skill-building training for Extension professionals and community members in August 2020. In four half-day sessions, the participants reviewed the discussion guide, discussed the community perspectives that informed its development, and practiced facilitating. After this training, teams of Extension staff and community members are convening local forums, virtually as needed to accommodate the coronavirus pandemic, and ultimately in person.

Evaluation plays a role in all Extension programs, and the Indian River Lagoons deliberative forum project is no exception. The final session of the training focused on evaluation strategies and tools. Pre- and post-surveys are used to evaluate each forum, and all agents will be using the same template to allow coordinators to compile responses.

CIVIC is a young program. The values-based deliberative model that is at CIVIC's heart, however, has been used for decades. Research conducted through NAAEE's Environmental Issues Forums[2] program and, separately, through Extension suggests that deliberative dialogues such as these can have a range of personal and community impacts. For example, after forums on whether to use wood for electricity production in Gainesville, Florida, a significant proportion of participants reported increased knowledge about using wood for energy. Among the forum characteristics that participants valued highly were opportunities to ask questions of credible experts, learn about issues, and share ideas with community leaders. A post-forum survey asked participants to rate options regarding a wood-to-energy facility (e.g., wood sources, transportation, management). If the favored options were included in the plan for the wood-to-energy facility, 81 percent of respondents felt positive or highly positive about the proposal.[3] This information was shared with the city commission during their debate of such a proposal.

CIVIC is developing a curriculum that will include eight chapters, each focused on one aspect of program development and implementation. Each chapter will include background justification, training exercises to build skills and competence, case studies, handouts, and references.

For more information: CIVIC (Community Voices Informed Choices) Martha Monroe mcmonroe@ufl.edu

[1] National Issues Forums Institute, www.nifi.org.
[2] Environmental Issues Forums, www.naaee.org/eif.
[3] Martha C. Monroe, Annie Oxarart, Lauren McDonnell and Richard Plate. Using Community Forums to Enhance Public Engagement in Environmental issues. Journal of Education for Sustainable Development 3:2 (2009): 171–182

<div align="center">RESOURCES YOU CAN USE</div>

K–12 Environmental Education: Guidelines for Excellence

K–12 Environmental Education: Guidelines for Excellence offers a vision of environmental education that promotes progress toward sustaining a healthy environment and quality of life. Four organizing strands represent broad aspects of environmental literacy. These strands are further defined by guidelines that articulate knowledge and skill benchmarks in key areas for the end of each of three grade levels—fourth (age 10), eighth (age 14), and twelfth (age 18).

STRAND 1: Questioning, Analysis, and Interpretation Skills
Environmental literacy depends on learners' ability to ask questions, speculate, and hypothesize about the world around them, seek information, and develop answers to their questions. Learners must be familiar with inquiry; master fundamental skills for gathering and organizing information; and interpret and synthesize information to develop and communicate explanations.

Guidelines for Excellence
K–12 Environmental Education

A. Questioning
B. Designing investigations
C. Collecting information
D. Evaluating accuracy and reliability
E. Organizing and analyzing information
F. Working with models and simulations
G. Drawing conclusions and developing explanations

STRAND 2: Environmental Processes and Systems
Environmental literacy is dependent on an understanding of the processes and systems that comprise the environment, including human social systems and influences. Students develop an understanding of how changes in one system (hydrosphere, atmosphere, geosphere, and biosphere) results in changes in another. They develop an understanding of how human activities affect environmental quality and long-term sustainability at local, tribal, national, and global levels. These understandings are based on knowledge synthesized from across traditional disciplines. The guidelines in this section are grouped in three sub-categories:

2.1 Earth's physical and living systems
    A. Earth's physical systems
    B. Earth's living systems

2.2 Human systems
    A. Individuals, groups, and societies
    B. Culture
    C. Political systems
    D. Economic systems

2.3 Environment and society
    A. Human-environment interactions
    B. Resource distribution and consumption
    C. Places
    D. Change and conflict
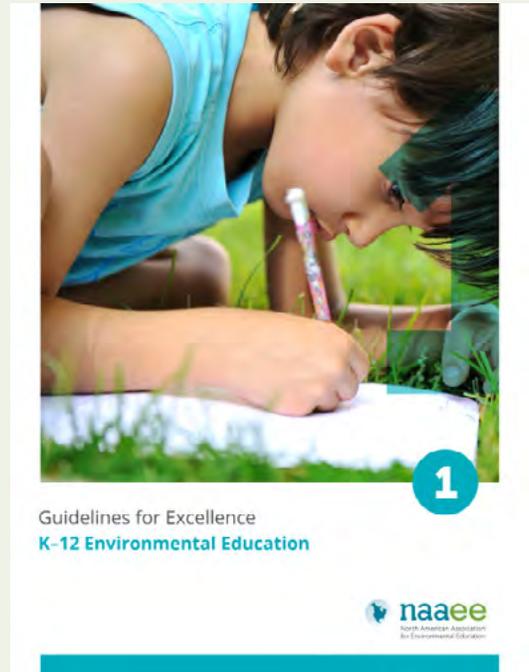
K–12 Environmental Education: Guidelines for Excellence

STRAND 3: Skills for Understanding and Addressing Environmental Issues

Skills and knowledge are refined and applied in the context of environmental issues at varying scales. Environmental literacy includes the abilities to define, learn about, evaluate, and act on environmental issues. Students investigate environmental issues; consider evidence and differing viewpoints; and evaluate proposed action plans, including likely effectiveness in specific environmental, cultural, social, and economic contexts. They analyze the intended and unintended consequences of their own actions and actions taken by other individuals and groups, including long-term environmental, social, and economic implications for sustainability. In this section, the guidelines are grouped in two sub-categories:

3.1—Skills for analyzing and investigating environmental issues
   A. Identifying and investigating issues
   B. Sorting out the consequences of issues
   C. Identifying and critiquing alternative solutions and courses of action
   D. Working with flexibility, creativity, and openness

3.2—Decision-making and action skills
   A. Forming and evaluating personal views
   B. Evaluating the need for action
   C. Planning and taking action
   D. Evaluating the results of actions

STRAND 4: Personal and Civic Responsibility

Environmentally literate community members are willing and able to act on their own conclusions about what should be done to ensure environmental quality, social equity, and economic prosperity. As learners develop and apply concept-based learning and skills for inquiry, analysis, and action, they also understand that what they do individually and in groups can make a difference.

   A. Recognizing rights and responsibilities
   B. Recognizing efficacy and developing agency
   C. Accepting personal responsibility

For more information and to download a copy, visit: www.naaee.org/guidelines

Key Characteristic #3

Depth of Understanding

Environmental education instructional materials aim to foster the development of the personal awareness and deep conceptual understandings necessary for environmental literacy.

3.1 Awareness.

Instructional materials foster a basic awareness or consciousness of environmental interrelationships and recognize that history, feelings, experiences, prior knowledge, and attitudes shape environmental perceptions.

Indicators:

- Experiences increase learners' awareness of the interrelationships between the natural and built environments, and the way those interrelationships influence our everyday lives.
- Opportunities for learners to explore, on a regular basis, the world around them are described.
- Learners explore the interdependence of all life forms, including humans, and are given opportunities to increase their awareness of how environmental, social, and economic systems are interconnected.
- Learners are encouraged to consider others' experiences with the environment, including those from different races, ethnic groups, cultures, sexual orientations and gender identities, abilities, ages, social groups, classes, language groups, and religious traditions.
- Exercises and activities invite learners to identify, clarify, and express their own attitudes and values regarding the environment and environmental challenges.
- Experiences are provided that increase learners' awareness that people are a part of, depend on, change, and are affected by the environment.
- Instructional materials suggest strategies for providing learners with opportunities to develop positive connections with nature by spending time in and exploring natural environments.
- Age-appropriate awareness-building experiences encourage learners to explore how the negative impacts of environmental actions may not be borne equally by members of different communities.

DID YOU KNOW?

Depth of Knowledge

Categorizing levels of knowledge, from recall and reproduction to extended thinking, can help educators determine the degree to which depth of understanding is being addressed. The following framework, based on Norman Webb's Depth of Knowledge Levels, provides one way of classifying the level of thinking or understanding required of the learner to answer questions.

Level 1. Recall and Reproduction: Defining, recognizing, describing, locating, identifying
Level 2. Skills and Concepts: Summarizing, comparing, contrasting, categorizing, estimating
Level 3. Strategic Thinking: Justifying, problem solving, elaborating, analyzing, predicting
Level 4. Extended Thinking and Complex Reasoning: Synthesizing, analyzing impact, transferring knowledge, designing an investigation, interpreting results

For further information:

Hess, K. *A Guide for Using Webb's Depth of Knowledge with Common Core State Standards.* 2013. Common Core Institute. http://www.casciac.org/pdfs/Webbs-DOK-Flip-Chart.pdf

Aungst, G. Using Webb's Depth of Knowledge to Increase Rigor. *Edutopia.* 2014. https://www.edutopia.org/blog/webbs-depth-knowledge-increase-rigor-gerald-aungst

GUIDE

Cycles of Learning and Healing with BEETLES

When he started as director of Camp Bovey, an overnight camp for urban children from Minneapolis-St. Paul, Minnesota, James Taborda-Whitt was motivated to use summer camp as a way to help kids find healing through nature. The community organization that runs Camp Bovey was motivated to strengthen STEM education across camp programming. Discovering BEETLES, Taborda-Whitt notes, has allowed them to make great strides toward both goals.

BEETLES (Better Environmental Education, Teaching, Learning and Experience Sharing) is a program of the Lawrence Hall of Science at the University of California at Berkeley. BEETLES develops environmental education professional learning materials, student activities for use in the field, and other resources for field instructors, leaders and classroom teachers. Around these resources—all based on current research and understandings about how people learn and tested by dozens of programs in diverse settings all over the country—BEETLES has built a collaborative, resource-sharing network of environmental educators.

Designed for residential outdoor science schools, BEETLES materials have been used successfully in a wide variety of outdoor science education settings. Taborda-Whitt discovered that the BEETLES approach was a perfect match for engaging the youth campers and young adult employees at Camp Bovey. Many have trauma and toxic stress backgrounds, affected by specific traumatic incidents or ongoing stresses like poverty, racism, and severe learning disabilities.

"As educators and team leaders," Taborda-Whitt explains, "it's important to know that when it comes to emotional responses, uncertainty or new situations—including learning new tasks—toxic stress and trauma work a little bit like a magnifying glass….[A]ll the emotions associated with newness and uncertainty may result in a really big, magnified behavioral or emotional response."

Cycles of Learning and Healing with BEETLES

Through BEETLES, Taborda-Whitt discovered that taking kids into nature is not sufficient to promote nature-based learning and the healing Camp Bovey aspired to provide. "The BEETLES strategies help educators teach the art of *thinking* in nature and I believe this is the strongest connection between the BEETLES and trauma-informed program practices. Sequenced and scaffolded strategies allow for educators to facilitate learning moments that go far beyond environmental literacy and move into the realm of strengthening a child's cognitive infrastructure necessary for growing into a caring, empathetic, critically engaged member of society."

BEETLES has built its strategies around the learning cycle,[1] a five phase, sequential process that deeply engages learners throughout, from "invitation" (step 1) through "reflection" (step 5). Educators are facilitators in the process of student

Based on the original learning cycle developed by Robert Karplus in the early 1960s.

discovery and meaning-making through the three intervening stages (exploration, concept invention, and application). Camp Bovey has implemented the learning cycle across all of its programming, and Taborda-Whitt finds it just as useful in staff training, teaching canoeing, and leading a group through the team challenge course. "[T]he learning cycle steps, when followed in order with more time invested in exploration than anything else, yield personal buy-in and all-group engagement." As an educator, he reports his most rewarding moments of "seeing someone 'get it' have come after giving learners plenty of time to explore independently and put together the pieces for themselves." For Taborda-Whitt, the learning cycle has given him the patience to see the light at the end of a lot of exploration.

For more information:
Camp Bovey, https://www.esns.org/campbovey

BEETLES (Better Environmental Education, Teaching, Learning and Experience Sharing), http://beetlesproject.org

[1] BEETLES Project. *The Learning Cycle Explained.* n.d. Retrieved from http://beetlesproject.org/cms/wp-content/uploads/2015/12/The-Learning-Cycle-Explained.pdf

3.2 Focus on concepts.

Rather than presenting a series of facts, materials emphasize unifying themes, discernable patterns, interconnections, and conceptual understanding associated with environmental literacy.

Indicators:

- Ideas are introduced logically and are connected throughout the activities, emphasizing depth of understanding rather than encyclopedic breadth.
- A clearly articulated conceptual and skills framework or set of overarching questions is included, describing the concepts and skills to be learned, how they relate to each other and environmental literacy, and learning progressions.
- Concepts from environmental science fields—life science, earth science, physics, chemistry—that support the development of environmental literacy are presented, as appropriate for the intended audience.
- Concepts from social science fields—history, economics, psychology, sociology, anthropology, political science—that support the development of environmental literacy are presented, as appropriate for the intended audience.
- Traditional Ecological Knowledge that supports the development of environmental literacy is presented, as appropriate for the intended audience.
- Instructional materials offer well-documented facts from reliable sources and vocabulary that is defined to support conceptual development.
- Systems thinking approaches are used to facilitate an understanding of the relationships amongconcepts.
- Thematic units, phenomena-based instruction, and other interdisciplinary teaching strategies are used to introduce concepts from various disciplines, including environmental sciences, social sciences, and the humanities.
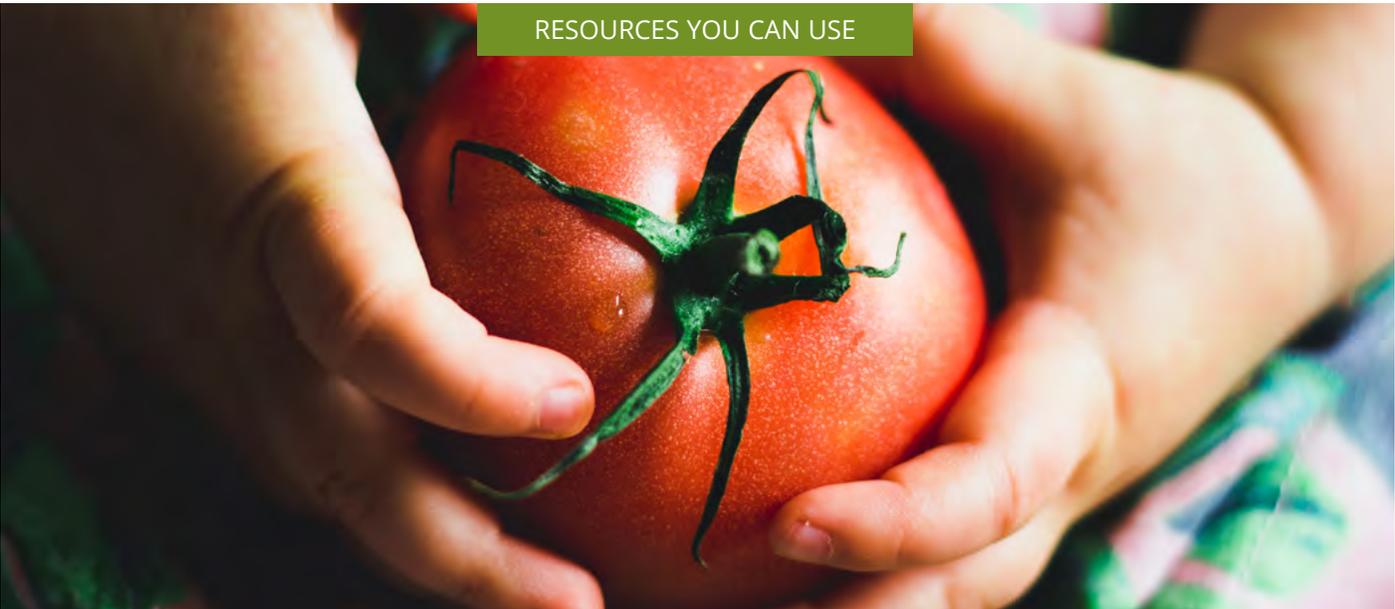
RESOURCES YOU CAN USE

What Do Children Already Know?

Effective instructional materials help educators gauge participants' readiness for learning. Concepts are introduced through experiences relevant to learners' lives. Exercises help learners make connections and construct their own understandings. Consequently, understanding something about what your participants are ready to understand and what might be too abstract for them is essential, especially for young learners. The following, from *Nature-Based Learning for Young Children*, provides educators with an excellent starting point for water-related experiences:

What Preschoolers are Ready to Understand
- Water is wet. Water can be compared to other wet substances.
- Water dries. It takes some children a lot of firsthand experiences with getting their clothes wet to believe that water will dry.
- When water is frozen, it is hard and is ice. This seems obvious, but even if children learn to say the words, they need firsthand experiences to truly understand the transformation.
- Frozen water melts. Children in ecosystems that regularly drop below freezing learn this transformation more quickly.

What is Too Abstract for Preschoolers to Understand
- Understandings about water that are learned other than through hands-on experiences. For example, in Tucson, children learn that water seeks its own level much later than children who live in wetter ecosystems and have opportunities to see rain more often.
- Transformations that are hard to follow (stream, vapor, fog, etc.). It is clear to adults that steam, vapor, and fog are forms of water, but young children struggle with these "invisible" transformations. Even absorption is challenging for preschoolers to understand, but they enjoy experimenting with wet sponges and other materials.

Nature-Based Learning for Young Children provides similar advice for a variety of topics, including birds, mammals, reptiles and amphibians, pollinators, predators, decomposers, and aquatic life. In addition, for each topic, suggestions for the inclusion of all children, cultural considerations, health and safety issues, songs and chants, and other resources that aid in designing successful instruction are offered.

For more information: Powers, J. and Williams Ridge, S. *Nature-Based Learning for Young Children: Anytime, Anywhere, on Any Budget.* 2018. St. Paul, MN: Redleaf Press.

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Reliable Sources

Background Information and facts, including information that provides context for the concepts being developed (e.g., information about social, cultural, political, historical, economic, and ecological systems and their interrelationships), may well be presented in instructional materials. But how do you know if that information and source of information is reliable? The following criteria, developed by Cathy Timmer, a university research librarian, may be valuable as you work to decide whether or not to trust the information source:

1. **Accuracy.** Verify the information you already know against the information found in the source. Look also for disclaimers as to the accuracy of the content. You may also want to double-check the information against a source that you already know is trustworthy. Even though a source may use technical language, the content may be misleading.
2. **Authority.** Make sure the source is written by a trustworthy author and/or institution. If you are using webpage, you can usually identify the owner/publisher by the URL or check for a copyright statement near the bottom of the page. Make sure the author has the proper credentials on the subject matter. Be aware of the objectivity of the author and [their] viewpoints.
3. **Currency.** Depending on your subject, your currency needs will vary. For topics related to recent breakthroughs in medicine and technology, you will need to find up-to-date sources. If, however, you are researching a historical topic, older resources may still be useful. For webpages, you can often find a copyright date near the bottom. Also, look for the words "revised" or "updated" to find the date of the website.
4. **Coverage.** You will also want to examine the content of the source and how it fits your information needs. Identify its relevancy to your topic and whether or not it addresses the subject matter. Also, make sure it provides enough information if you are looking for a source that discusses the matter in-depth.

For more information:

Kiely, E. and Robertson, L. *How to Spot Fake News.* FactCheck.Org. 2016. https://www.factcheck.org/2016/11/how-to-spot-fake-news/

Timmer, C. *How Do I Know if a Source is Reliable?* 2020. Retrieved from https://libanswers.tcl.edu/faq/6286

University Libraries, University of Georgia. *Criteria for Evaluating Reliability*. 2019. https://guides.libs.uga.edu/c.php?g=571070&p=3937349

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3.3 Concepts in context.

Environmental concepts are set in a context that includes social, cultural, political, and economic as well as ecological systems and their interrelationships.

Indicators:

- Concepts are introduced through experiences relevant to learners' lives, beginning with the immediate community surroundings, especially for younger children, and expanding to larger contexts as age-appropriate. Connections to real life are made, including the learners' cultural, social, economic, and environmental experiences.
- Historical, ethical, cultural, geographic, economic, and sociopolitical relationships are addressed, as appropriate, to further conceptual understanding.
- Age-appropriate opportunities are provided to explore the complexity of issues and decisions, including environmental justice and social equity implications.
- Investigations help learners probe the interrelationships among ecological, social, cultural, political, and economic systems.
- Exercises help learners make connections among concepts and varying environmental conditions, issues, and actions, and expose them to the experiences of others.
- Extended thinking is encouraged with learners constructing knowledge and synthesizing their understanding through exploration, investigation, discussion, application, communication, and reflection.
- Strategies are provided for using learners' interests, ways of knowing, and previous experiences to enhance conceptual development.
- Learners are offered opportunities to explore Traditional Ecological Knowledge and to consider how understandings of the environment are formed.

RESOURCES YOU CAN USE
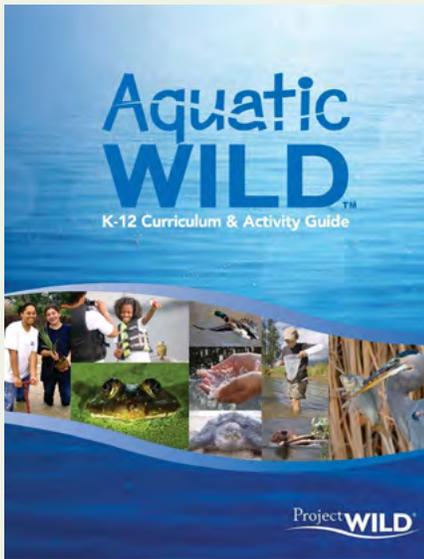
Plastic Voyages

How can you help keep the plastic out?

This question helps set the stage for this upper elementary (grades 3–5) activity with an emphasis on actions each of us can take to address the environmental crisis of plastic pollution. Students examining the "voyage" in the lifecycle of plastics monitor plastic waste in their own households, learn about the effects on marine life, and propose ways to address the problem. Like all activities in the Project WILD and Aquatic WILD activity guides, the concepts in "Plastic Voyages" are connected to a larger set of unifying principles known as the *Project WILD Conceptual Framework* (https://www.fishwildlife.org/application/files/1115/3790/7174/Project_WILD_Conceptual_Framework2017.pdf).

More than 200 principles that make up the conceptual framework are organized into three broad categories: **Ecological Knowledge**, **Social and Political Knowledge**, and **Sustaining Fish and Wildlife Resources**.

Each activity then goes into depth on a few principles (typically 3–8) from one or more of these categories. "Plastic Voyages," for example, connects closely to two principles relating to human impacts on fish and wildlife resources.

These underlying principles can be considered as the theme of the activity. They are:
• Human effects on fish and wildlife and their habitats are a driving force affecting environmental quality worldwide.
• Humans have the capacity to sustain themselves and wildlife.

This second principle includes a sub-principle that also applies to the activity:
• The development and adoption of sustainable human lifestyles and social decisions can change the negative effects of human activity on wildlife.

Under this principle are yet more sub-principles:
• Individual lifestyle decisions including recreational choices, transportation options, housing selections, vocation, food, clothing, and energy use affect wildlife directly and indirectly.
• Community conservation practices, plus social, cultural, and economic values affect environmental programs and activities.

The Project WILD Conceptual Framework helps tie together individual concepts—which are often listed as "Terms to Know" in an activity—into unifying themes, patterns, and interconnections associated with environmental literacy. The framework also helps educators connect the activity to social, cultural, and ecological contexts relevant to their students or audience. In Plastic Voyages, students must think systematically to examine plastic waste from their households, within their community, and from industry. Students are prompted to ask questions and examine how plastic pollution moves into the ocean, the challenges of keeping plastic out of the environment, the damage plastic pollution causes, and how their actions can reduce plastic pollution. These questions and discussion points help students explore actions at the levels of the individual, the community, nationally, and globally.

For more information about Project WILD, visit: https://www.fishwildlife.org/projectwild

3.4 Attention to different scales.

The environment and environmental topics are explored using a variety of scales, such as short to long time spans, magnitude, and local to global. The instructional materials foster an understanding of the interconnectedness within the different scales.

Indicators:

- Learners are encouraged to consider communities and community connectedness at different geographic scales, such as local, regional, tribal, national, and global levels, as appropriate for their age.
- The instructional materials acknowledge that concepts such as scale, including geographic and time scales, may be understood differently across cultural traditions.
- Local, regional, continental, and global geographic scales are used to help learners recognize how issues are interrelated and that they can be complex, widespread, or localized.
- Geographic and temporal scales are used to encourage learners to investigate how environmental decisions can impact different communities, especially communities of color and lower socioeconomic status communities, disproportionately.
- When exploring scales, especially geographic scale, the instructional materials encourage learners to use their systems thinking skills to consider that the system under study is also part of a larger system.
- Instructional materials examine issues over a variety of temporal scales so short-term and long-term conditions, actions, and impacts are considered.
- As appropriate for their age, learners investigate the relationship between spatial scale, including spatial distribution, so environmental conditions near and far can be considered.
- Instructional materials encourage learners to consider environmental interrelationships by examining different geographic scales and by exploring past, present, and future.

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GUIDELINES IN PRACTICE

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Adult Learning Vacations In Denali

For 30 years, the Denali Education Center (DEC) has hosted groups on its campus on the banks of the Nenana River, offering participants an opportunity to learn about and experience Alaska through deep, personal engagement. During three- or six-day experiences, Denali Education Center field educators and onsite support staff weave educational presentations, reflection, fellowship, and guided outdoor experiences into immersive "learning vacations" for more than 450 adults each year.

DEC's learning vacations use a programmatic scaffolding that explores key conceptual themes—dynamic landscapes, succession and adaptation, ecological systems, migration, and personal relationships with nature—using Denali's landscapes as a classroom. Built around daily guided hikes, this scaffolding also includes content-rich presentations, cultural experiences and time for personal exploration and reflection. The programming mix is designed to take participants deeper into the content themes each day, using the boreal forest in and around Denali National Park as the main learning environment.

Written hike outlines and class outlines are the backbone of this educational approach, providing robust guides for educators to use in the field. Each outline includes an instructional theme, a set of learning objectives, key concepts, and interpretive universals. Universals are broad themes such as change and community that help learners connect the different experiences they have during their learning vacation at a broad level.

<div style="text-align:center;">GUIDELINES IN PRACTICE</div>

Adult Learning Vacations In Denali

For example, the Horseshoe Lake hike explores drivers of change—especially beavers, but also humans and fire—that create, maintain, and destroy environments in which people, animals and plants have adapted to survive. This hike circumnavigates the lakes; along the way, hikers explore forest succession, the creation of an oxbow lake from a river meander, and the ecological role of beavers. In this hike, the universals are change, community, preservation, and survival.

The Horseshoe Lake hike outline includes a hike map that identifies main stops along the trail, a stop-by-stop guide to key content points, suggested group engagement activities and questions, and an at-a-glance overview of wildlife, botany, geology, and history key points. Trail-specific suggestions include how to deal with elevation gains during the hike (let hikers go at their own pace and use that time for reflection) and a warning to watch for moose cows and calves near the lake and to be prepared to detour or backtrack to avoid dangerous encounters.

The materials also emphasize that the boreal forest and subarctic tundra surrounding Denali Education Center were not uninhabited prior to the national park's creation. Alaska Native people have lived throughout Alaska for more than 10,000 years and there are 229 federally recognized Alaska Native tribes today. Our national parks have complicated histories, and DEC's programs help affirm the pre-colonial history of the area instead of viewing the land as "untouched" wilderness.

Denali Education Center's hike outlines help field educators dig deep into the ecology, geology, and history of the landscape to fulfill the hike's role in the multi-day educational program while providing an experience that takes advantage of all available learning opportunities that arise. Jodi Rodwell, Denali Education Center executive director, says, "We rely on our expert field staff to put their distinctive spin on these hikes, blending their own interests, perspectives, and experience with where the hike fits into the thematic arc of the program."

In Rodwell's view, Alaska provides a dramatic setting for discovering or honing habits of observation, questioning, and appreciation. "Our hope," she says, "is that people take this experience back home with them and find a new level of appreciation for the national parks and other wild places near where they live. Our programs concentrate on the boreal forest because that's what surrounds us, but we could just as easily focus on glaciated landscapes or tundra or any other ecosystem in any other park."

For more information: Denali Education Center, https://www.denali.org

Key Characteristic #4

Personal and Civic Responsibility

Environmental education instructional materials promote personal and civic responsibility, encouraging learners to use their knowledge, skills, and assessments of environmental, social, political, cultural, and economic systems as a basis for environmental decision-making and action.

4.1 Sense of personal stake and responsibility.

Learners examine the possible environmental, social, and economic consequences of their and others' behaviors and evaluate choices they can make to address environmental challenges and opportunities now and in the future.

Indicators:

- Learners are provided with opportunities to reflect on the effects of their actions, consider unintended consequences, and to sort out their opinions about what, if anything, they should do differently.
- Learners identify and describe the relationships between exercising individual rights and responsibilities and addressing environmental quality and long-term sustainability.
- Examples of people of different races, ethnic groups, cultures, sexual orientations and gender identities, abilities, ages, social groups, classes, language groups, and religious traditions who have made a difference by taking responsible action are offered.
- Instructional materials provide learners with opportunities to reflect on how laws and policies impact their lives, the lives of others, environmental quality, and community well-being. They are given opportunities to consider how individuals and groups influence how laws and policies are made, including implications for environmental justice.
- The idea that many individual actions have cumulative effects, both in creating and addressing environmental challenges and opportunities, is conveyed.
- Age-appropriate opportunities are provided to evaluate the broad environmental, social, and economic consequences of their actions, and to accept responsibility for recognizing those effects and changing their actions when warranted.
- Instructional materials promote intergenerational and global responsibility, environmental justice, and social equity, linking historical and current actions with future and distant consequences.

DID YOU KNOW?

Defining Self-Efficacy and Personal Agency

Self-efficacy and personal agency are essential components of environmental literacy. An individual who is confident in their ability to learn new content or new skills is displaying self-efficacy. That is, self-efficacy reflects the individual's belief in how well they can do something. An individual with personal agency believes that they are responsible for their thoughts and actions. They are in control of what they do.

Self-Efficacy

Self-efficacy refers to an individual's belief in [their] capacity to execute behaviors necessary to produce specific performance attainments. … Self-efficacy reflects confidence in the ability to exert control over one's own motivation, behavior, and social environment. These cognitive self-evaluations influence all manner of human experience, including the goals for which people strive, the amount of energy expended toward goal achievement, and likelihood of attaining particular levels of behavioral performance.

American Psychology Association (APA). *Teaching Tip Sheet: Self-Efficacy.* 2009. Retrieved from
https://www.apa.org/pi/aids/resources/education/self-efficacy

Personal Agency

[Personal agency] refers to the feeling of control over actions and their consequences…. When we make voluntary actions we tend not to feel as though they simply happen to us, instead we feel as though we are in charge. The sense of agency refers to this feeling of being in the driving seat when it comes to our actions.

Monroe, J.W. 2016. What is the Sense of Agency and Why Does it Matter? *Frontiers in Psychology.* Retrieved from https://www.ncbi.nlm.nih.gov/pmc/articles/PMC5002400/

GUIDELINES IN PRACTICE

Supporting Families as Earth Agents™

In 2019, the Rogers Williams Park Zoo in Providence, Rhode Island, received a $2,000 grant from the Association of Zoos and Aquariums (AZA) to engage families in earth-friendly activities, as part of AZA's Spring into Action program. Looking for big leverage out of a small grant, zoo staff focused on the idea of creating ripple effects by engaging families to engage their own communities.

Having just attended an *NAAEE Community Engagement: Guidelines for Excellence* training, zoo staff turned to the guidelines' five key characteristics as a roadmap to developing their project. That's how Earth Agents™ started. "It's not often you get to attend a professional development workshop and put virtually everything you learned into practice," observes Shareen Knowlton, the zoo's director of education.

Out of that process grew a simple program focused on supporting families who are interested in becoming leaders of change for wildlife and wild places. In Earth Agents' inaugural year, the environmental focus aligned with a new rainforest exhibit at the zoo, exploring how the choices that families make in southeastern New England affect the rainforest, which can seem like a world away. Zoo staff recruited ten Earth Agents™ families, each of whom committed to participate in a half-day kickoff rally and to plan and host an event within their community to inspire rainforest-friendly action.

During the kickoff rally, the families met each other and the zoo team. Purple T-shirts and superhero capes for the young Earth Agents™ created a "we're in this together" atmosphere and helped develop an "insider" connection to the zoo. While the younger children spent time meeting rainforest animals, playing games, and learning about the rainforest, older children and parents discussed ecological challenges facing the rainforest and learned about simple tools to help people make better choices for the rainforest. They also explored some of the community engagement best practices from NAAEE's guidelines.

Then, families regrouped, gave themselves fun team names like Siena's Sloths and the Super Girls, and dove into planning their events. The zoo team offered ideas and feedback, and provided resources for families to use with event attendees, including "Take Action" cards, Earth Agent™ pins, and "I don't know" postcards to submit questions to zoo staff. The "Take Action" cards suggested four specific ways that New England families can help protect rainforests: shop using the Cheyenne Mountain Zoo Palm Oil App to identify products with sustainably sourced palm oil; look for the Rainforest Alliance little green frog logo on farm and forest products; buy furniture, flooring, and paper products certified by the Forest Stewardship Council; and buy local, grass-fed beef.

GUIDELINES IN PRACTICE

Supporting Families as Earth Agents™

"We didn't want our Earth Agent™ families to feel overwhelmed," Knowlton says, "so we worked hard to help them position themselves as co-learners with the people at their events and to give them materials and tools that would help them focus on simple actions." During the rally, families were also given background material on rainforests and rainforest issues based on the zoo's new exhibit.

Zoo staff followed up with the families regularly and attended each event to help celebrate and support the Earth Agents, reinforcing the message that the families and their events were connected to the zoo. Knowlton explained that program organizers purposely left the definitions of "family," "community" and "event" open, helping participants identify which of the circles they moved in was the best fit for an event, and what kind of event was the best fit for the family and their chosen community.

Family events included a rainforest story hour hosted by the family of a librarian and a rainforest display in the window of an independent bookstore. One Earth Agent™ team hosted a community yard sale where a daughter with food allergies sold homemade rainforest- and allergy-friendly muffins with proceeds supporting the Rainforest Alliance. Another family organized letter-writing campaigns with home-school families and organized play dates with rainforest games they developed.

Knowlton says the Rogers Williams Park Zoo team was thrilled with the program's first year. "Our evaluation confirmed what we could sense from working with these families—that they increasingly see themselves as change agents, and that their confidence has grown in bringing up conservation topics with people they know and people they don't know."

The key to success? According to Knowlton: "Our main approach was building community and creating a sense of belonging. 'Together, we've got this,' was something we heard more than once from our families. Several of the families went on to host additional events and have increasingly become resources for conservation civic action within their communities."

As part of Party for the Planet®: Spring into Action, AZA, with support from the Disney Conservation Fund, provided funding to pilot Earth Agents™ at two other zoos in 2020: the Oakland Zoo in California and the Miami Zoo in Florida.

For more information: Rogers Williams Park Zoo Earth Agents program earthagents@rpwzoo.org or https://www.rwpzoo.org/take-action#:~:text=Become%20an%20Earth%20Agent%20and,ways%20to%20help%20our%20planet

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4.2 Self-efficacy and personal agency.

Instructional materials aim to strengthen learners' perceptions of their ability to influence the environmental, social, and economic outcomes of a situation.

Indicators:

- Learners are challenged to apply their thinking and act on their conclusions as appropriate for their age level.
- Instructional materials provide opportunities for learners to take individual and/or collective actions in collaboration with community stakeholders to bring about positive, community-based change that addresses environmental quality and long-term sustainability.
- A variety of individual and community strategies for civic engagement are described. Learners are provided opportunities to practice these strategies through projects they generate individually or in collaboration with others in their community. They use feedback from their peers and their larger community.
- Instructional materials provide opportunities for learners to exhibit self-efficacy and personal agency by acting individually and collectively to bring about change in their community, including change in policies, that addresses environmental quality and long-term sustainability.
- Examples of people of different races, ethnic groups, cultures, sexual orientations and gender identities, abilities, ages, social groups, classes, language groups, and religious traditions who have made a difference through individual, collective, and policy-oriented actions are provided. Learners are encouraged to examine what made these actions successful. Where actions were not successful, they are encouraged to examine where improvements may be needed.
- Learners share and celebrate the results of their actions with peers and other members of their community.
- For early childhood audiences, instructional materials outline educational strategies that help guide young children through the process of making their own decisions.
- Instructional materials provide guidance to educators on the relationship between self-efficacy and language skill development, especially in young children.

NAAEE's Environmental Issues Forums (EIF)

Individuals and groups continually wrestle with the ramifications of environmental issues. As members of communities, we have important choices to make—from individual and community actions to corporate policies and government regulations. Each of these choices will impact our community's well-being, sustainability, and resilience. But, how can we go about the work of making responsible decisions? How can we encourage communities to come together, avoid polarization, and instead build room for common ground?

With the goal of creating safe, productive places for individuals and communities to deliberate, NAAEE, in partnership with the Kettering Foundation, created the Environmental Issues Forums (EIF). EIF provides tools, training, and support for engaging adults and youth in meaningful, productive discussions about sticky issues that affect the environment. EIF is modeled on the National Issues Forums (NIF)—a nonpartisan, nationwide network of locally sponsored public issues forums. NIF is rooted in the simple notion that democracy requires an ongoing deliberative public dialogue. People need to come together to reason and talk—to deliberate about common problems. Understand together. Decide together. Act together.

Through EIF, community members actively engage in essential environmental issues through deliberation and participation in democratic practices. They listen to one another and consider alternative perspectives. They deliberate about the choices they can make and the actions they can take in their own communities to address controversial issues. They discuss in a nonpartisan, non-confrontational manner. In productive deliberation, community members examine the advantages and disadvantages of different options for addressing a difficult public problem, weighing these against the things they hold deeply valuable. EIF issue guides provide a framework for these discussions, describing three or four options and providing a means for avoiding polarizing rhetoric to keep the discussion moving forward. Each option is rooted in a shared concern, proposes a distinct strategy for addressing the problem, and includes roles for community members to play. Equally important, each option presents the drawbacks inherent in each action. Highlighting these drawbacks allows the participants to see the trade-offs they need to consider in pursuing any action. It is these drawbacks, in large part, that make coming to shared judgement so difficult—but ultimately, so productive.

For more information and to download issue guides and supporting materials, visit: https://naaee.org/eif.

GUIDELINES IN PRACTICE

Building Capacity for Sustainable Action

Student Action for a Sustainable Future (SASF) is a comprehensive environmental education program for middle school students that takes place in the city of Saskatoon, the largest city in the Canadian province of Saskatchewan. SASF engages grade 5–8 classrooms in action and inquiry projects in the areas of waste, water, energy, food, biodiversity, and transportation. Twelve teachers are accepted each year that represent a balance of school divisions, grades, and school locations. Participating teachers are provided with support, resources, professional development, planning time, networking opportunities, action project funds, and access to sustainability and environmental experts. At the end of the year, the students highlight their experiences and results at a student showcase, which provides an exciting and celebratory event for everyone involved.

In order to support teachers and students to work towards outcomes that impact their classrooms, schools, households, and the community at large, SASF focuses on:

- Providing a framework that is adaptable to the participants' needs, interests, and context
- Including youth in the decision-making process
- Using inquiry to guide both the process and results of the program
- Planning environmental action projects, and then acting on those plans
- Striving towards environmental outcomes that are measurable, experiential, and place-based
- Making connections and developing partnerships with community members and organizations
- Integrating multiple ways of knowing, with a particular focus on Indigenous ways of knowing and being
- Engaging youth and teachers in politics
- Making strong links to curriculum
- Responding to the goals set out in the City of Saskatoon's Strategic Plan

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Building Capacity for Sustainable Action

The SASF partnership includes formal educators, nonformal educators, local government, and community-based organizations. Through a shared interest in both education and sustainability, the partnership was formed in 2012 with the purpose of developing a pilot program that would help the City of Saskatoon achieve its environmental mandate and greenhouse gas reduction targets, while also building student and teacher capacity to take action. Partners include the City of Saskatoon, Saskatoon Public School Division, Greater Saskatoon Catholic Schools, Saskatchewan Environmental Society, Sustainability Education Research Institute (SERI, University of Saskatchewan), Saskatoon Light & Power, and 14 community-based organizations. The City of Saskatoon remains the primary funder, while the Saskatchewan Environmental Society plays a leading role in program delivery.

SASF draws upon the strengths of its partners to offer diverse opportunities, knowledge, ways of understanding, and skills, which brings relevance and meaning to student and teacher learning.

One of the partners, the Saskatchewan Environmental Society, works with each classroom to conduct environmental audits, which have been developed for six program areas (waste, water, energy, food, biodiversity, and transportation). The audit process has been an effective way of engaging students in real-world solutions and experiential learning. Some of the resulting action projects include:

- Developing a bike generator to charge cell phones
- Reducing idling in front of their schools by talking to drivers and putting up Idle Free Zone signage
- Growing vegetables and micro-greens in their classrooms
- Creating an Indigenous Healing garden in their school yard
- Installing LED lights
- Doing home water and energy audits and conserving water and energy at home
- Holding schoolwide lights-out competitions

So far, the program has reached 43% of the elementary schools within the Saskatoon Public School Division, and 38% of the elementary schools within the Greater Saskatoon Catholic School's jurisdiction. Through SASF, students and teachers have a voice that can influence the direction of their communities. As they discuss their ideas and knowledge with other people and model sustainable behaviors in their day-to-day lives, they are leading to a shift in their classrooms, homes, schools, and communities.

Adapted with permission from the Global Environmental Education Partnership (GEEP) *Case Studies.* Dyck, S. and McKenzie, M. Building Capacity for Sustainable Action Through Inquiry, Experiential Learning, and Collaboration: Student Action for a Sustainable Future. 2019.
To read the full case study, visit: https://thegeep.org/learn/case-studies/building-capacity-sustainable-action-through-inquiry-experiential-learning-and

[1] The GEEP is a partnership of the U.S. Environmental Protection Agency, the Environmental Protection Administration of Taiwan, and the North American Association for Environmental Education. For more information, visit: www.thegeep.org

Key Characteristic #5

Instructional Effectiveness

Environmental education materials rely on instructional principles and techniques that create effective, culturally responsive, and inclusive learning environments for all learners.

5.1 Learner-centered instruction.

Whenever feasible, instruction is based on learner interest, ways of knowing, and ability to develop skills and construct conceptual understanding.

Indicators:

- Activities provide opportunities for learners to develop deeper understandings by building from previous knowledge, experiences, and ways of knowing. These may include use of Know-Wonder-Learn charts, graphic organizers, brainstorming, concept maps, and other related tools and support.
- Learners hone their skills and gain understanding through exploration, firsthand discovery, research, discussion, application, service learning, and practical experiences.
- Instruction encourages and assists learners in undertaking their own inquiry.
- Where appropriate, activities and projects use learner questions and concerns about real world phenomena as a starting point.
- Instruction facilitates learner participation in planning and assessing their own learning.
- Learner reflection on the process and content of learning is promoted.
- Learner voice is supported and encouraged by offering different ways for learners to influence and make choices about the learning process, express themselves, interact with others, and provide leadership.

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RESOURCES YOU CAN USE

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Student-Led Eco-Action Teams: National Wildlife Federation's Eco-Schools USA

Developed in 1994 by the Foundation for Environmental Education (FEE), Eco-Schools is a response to the needs identified at the 1992 United Nations Conference on Environment and Development. Today Eco-Schools is the largest global sustainable schools program, spanning 69 countries that together reach more than 50,000 schools worldwide. The National Wildlife Federation launched Eco-Schools USA in 2009.

The Eco-Schools program combines environment-based education with hands-on experiences and sparks action in classrooms and schools that ripples out into the greater community. Using a Seven Step Framework, students from pre-kindergarten through 12th grade engage in making their community and world a more equitable and sustainable place to live.

Through student-led Eco-Action Teams, students develop strong leadership skills, think creatively and critically about sustainability challenges, and develop and implement place-based solutions. Embracing student voice ensures instruction is based on what students care about—their passions. It offers ways for learners to influence others and make choices about the learning process by expressing themselves and communicating with their peers and members of the community.

Throughout the Eco-Schools program, Eco-Action Teams delve into twelve Pathways, or environmental focus areas (e.g., biodiversity, climate change, consumption and waste, energy), to address school sustainability. To further support the implementation of the Eco-School program through the Seven Steps, Pathway-specific guides, audits, action plans, and curriculum resources are provided.

For more information, visit: https://www.nwf.org/Eco-Schools-USA/Framework

RESOURCES YOU CAN USE

Student-Led Eco-Action Teams: National Wildlife Federation's Eco-Schools USA

Seven Steps to Success

The Seven Step Framework is your guide to implementing the Eco-Schools USA program at your school. Steps 1-4 are best completed in order, as each one builds upon the previous step. Steps 5-7 are woven throughout the framework, and are essential to program success.

FORM AN ECO-ACTION TEAM
The student-led committee is the driving force behind environmental education and action, representing the larger school community.

CONDUCT A PATHWAY AUDIT
Start the team's work with an audit of your school's sustainability performance.

CREATE AN ECO-ACTION PLAN
Using the results of the audit and community input, develop goals, identify actions, and set a timeline for achieving results.

MONITOR AND EVALUATE PROGRESS
Conduct a post-action audit and develop a process for checking your plan's progress, revising as needed.

LINK TO EXISTING CURRICULUM
Connect your learning and action to adopted curriculum.

INVOLVE THE COMMUNITY
Include the school community in meaningful and lasting ways, utilizing their diverse skill sets and perspectives.

CREATE AN ECO-CODE
Develop a mission statement—a call to action the whole school can get behind.

SEVEN STEPS

PATHWAY PROGRESS

5.2 Different ways of learning.

Instructional materials offer opportunities for different modes of teaching and learning.

Indicators:

- Educators are encouraged to employ a range of instructional strategies to support different ways of knowing and learning. These may include strategies such as experimentation, observation, lecture, discussion, creative expression, service learning, field studies, use of technology, role playing, independent work, civic science, cooperative learning, and cross-age teaching.
- Important concepts are conveyed through a variety of sensory modes (e.g., visual, auditory, tactile) and in more than one format (e.g., text, video, experiential) so that all learners can engage in them.
- Strategies are suggested for creating a supportive environment that is culturally and linguistically responsive.
- Materials and activities are developmentally appropriate for the range of learners within the designated age groupings.
- Ways of adapting and differentiating instruction and assessment to address learner differences including linguistic, physical ability, neurological (e.g., Alzheimer, multiple sclerosis), hearing impairment, visual impairment, and developmental differences (e.g., Autism spectrum, ADHD), are suggested.
- Learners are given opportunities to make choices about preferred ways of learning, expression, and assessment.
- Opportunities are provided for individuals to learn from expression and experience—for example, using music, art, poetry, drama, and social media/technology or involving parents, families, caregivers, and the community in learning activities.
- Language accommodations or adaptations are made for people who are learning English.

DID YOU

Teaching Young Children: Developmentally Appropriate Practice

It's not too surprising—young children (birth to age 8) have different learning needs than older children, youth, and adults. Young children are active and inquisitive. Everything is worth exploring with all their senses. Their minds and bodies are growing at a phenomenal pace, developing neural connections they will use for the rest of their lives. Learning is everything, experience is everything. Young children are making discoveries and creating connections. They are beginning to understand their individuality and the individuality of others. They are beginning to build relationships between themselves and others and between themselves and the world around them. Providing opportunities for the growth and development of the whole child, opportunities to develop a sense of wonder about nature, and earnest engagement in discovery about the real world are the foundation for learning in early childhood.

DID YOU KNOW?

Teaching Young Children: Developmentally Appropriate Practice
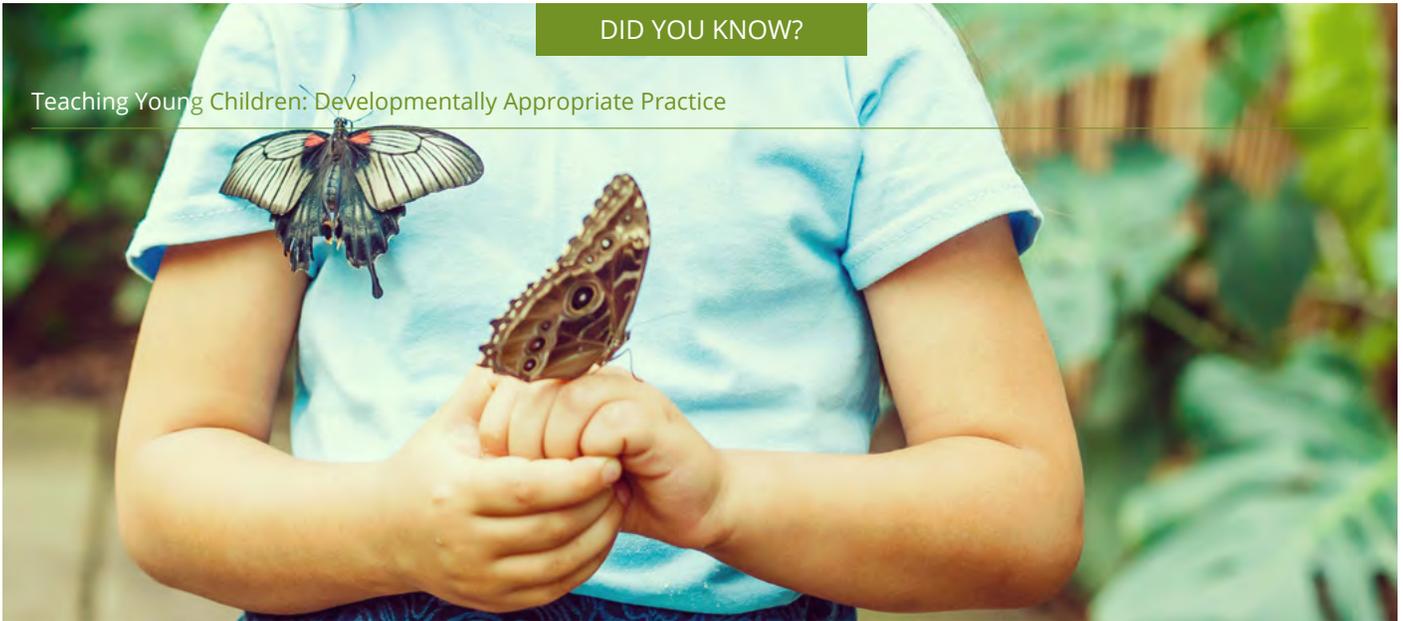
It's vital that educational activities geared for young children are based on Developmentally Appropriate Practice (DAP). According to NAEYC (2009):

> Developmentally appropriate practice (DAP) is an approach to teaching grounded in the research on how young children develop and learn and in what is known about effective early education. Its framework is designed to promote young children's optimal learning and development. DAP involves teachers meeting young children where they are, both as individuals and as part of a group; and helping each child meet challenging and achievable learning goals.

> As they make decisions teachers consider these three areas of knowledge:

> • **Knowing about child development and learning**
> Understanding typical development and learning at different ages is a crucial starting point. This knowledge, based on research, helps us predict which experiences will support children's learning and development.
> • **Knowing what is individually appropriate**
> What we learn about specific children helps us refine decisions about how to teach and care for each child as an individual. By continually observing children's play and interaction with the physical environment and others, we learn about each child's interests, abilities, and developmental progress.
> • **Knowing what is culturally important**
> We must make an effort to get to know the children's families and learn about the values, expectations, and factors that shape their lives at home and in their communities. This background information helps us provide meaningful, relevant, and respectful learning experiences for each child and family.

> Taken together, all three considerations result in developmentally appropriate practice.

For more information:
NAAEE. *Early Childhood Environmental Education Programs: Guidelines for Excellence.* 2016. Washington, DC: NAAEE. https://cdn.naaee.org/sites/default/files/final_ecee_guidelines_from_chromographics_lo_res.pdf

NAEYC. *3 Core Considerations of DAP.* 2009. Retrieved from https://www.naeyc.org/resources/topics/dap/3-core-considerations

NAEYC. *10 Effective DAP Teaching Strategies.* n.d. Retrieved from https://www.naeyc.org/resources/topics/dap/10-effective-dap-teaching-strategies

5.3 Connection to learners' everyday lives.

Instructional materials present information and ideas in a way that is relevant to learners.

Indicators:

- Concepts to be taught relate directly to and build from learners' experiences.
- Case studies, examples, and metaphors are relevant to the learner.
- If the instructional materials are designed for use in a specific area of the country, the content and illustrations are appropriate and localized for that area.
- Ways to use technology, including social media, to connect to learners' everyday lives are provided.
- Instructional materials, including technology resources, are accessible, adaptable, and easy for learners to use and understand.
- Activities and associated materials are culturally relevant and reflect linguistic, physical ability, neurological (e.g., Alzheimer, multiple sclerosis), hearing impairment, visual impairment, developmental (e.g., Autism spectrum, ADHD), and age differences.
- Strategies for continuing involvement by the learner, both at home and in the learning setting, are offered. Materials acknowledge that living situations and the level of support available outside of the learning setting vary. Suggestions for accommodating all learners are offered, including accommodating individuals with disabilities, those who are learning English, those with few financial resources, and learners who are experiencing homelessness.
- Suggestions for involving learners' families or caregivers in educational activities are made. Recognizing that living arrangements vary, strategies for involvement reflect these differences, including accommodations for linguistic, physical ability, neurological (e.g., Alzheimer, multiple sclerosis), hearing impairment, visual impairment, developmental (e.g., Autism spectrum, ADHD), and age differences of families or caregivers.

DID YOU KNOW?

Motivating Adults, Reducing Barriers, and Employing Effective Teaching Strategies

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 percent of an average person's learning over a lifespan. More than 90 percent 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.

Motivating Adults, Reducing Barriers, and Employing Effective Teaching Strategies

Adults as Learners

Historically, adult education has been committed to the practical application of learning, personal transformation, and 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.

Some Teaching Ideas Informed by Andragogy[1]

- 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.

Adults are largely intrinsically motivated: the primary unsatisfied needs they have relate to self-esteem, competence, achievement, self-confidence and personal growth. …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.

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. … 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.

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.

Excerpted by permission from: McCann, L. & Heimlich, J. Aged to Perfection: Environmental Education for Adults in Monroe, M.C. & Krasny, M.E. (eds.) *Across the Spectrum: Resources for Environmental Educators.* 2016. North American Association for Environmental Education, Washington, DC. pp 181-197. https://cdn.naaee.org/sites/default/files/acrossthespectrum_8-1-16.pdf

[1] 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.

5.4 Expanded learning environment.

Learning takes place in environments that extend beyond the boundaries of the traditional classroom.

Indicators:

- Learning takes place in a variety of environments, including laboratories, online, vest pocket parks, school yards, vacant lots, forests, neighborhoods, school courtyards, business districts, nature centers, and community gardens. Materials address equity concerns by offering suggestions on how to locate suitable out-of-classroom learning environments in resource-poor communities.
- Strategies are suggested for creating a supportive, safe, culturally relevant, accessible, and welcoming environment that is responsive to linguistic, physical ability, neurological (e.g., Alzheimer, multiple sclerosis), hearing impairment, visual impairment, developmental (e.g., Autism spectrum, ADHD), and age differences.
- Learners share their knowledge and their work with peers and members of the community.
- Materials suggest or use partnerships with local civic organizations, businesses, religious communities, or government agencies to explore local issues and/or to introduce possible career paths.
- Partnerships with local universities, colleges, or technical schools allow learners to participate in such activities as research, environmental monitoring, and creative projects.
- Experiential learning activities, such as service learning, in which learners immerse themselves in an activity in their communities are described.
- Lists of written, audiovisual, internet-based, and other resources that facilitate further study are included.

<div style="text-align:center">RESOURCES YOU CAN USE</div>

Inclusion of All Children

Environmental education instruction is welcoming and respectful to all learners and is designed to employ and engage the talents of people with different backgrounds, experiences, and abilities. Effective instructional materials foster an equitable and inclusive learning environment that welcomes people with different abilities. *Nature-Based Learning for Young Children* (Powers and Williams Ridge, 2018) provides educators a wealth of information on creating a respectful, safe, and supportive learning environment for all children:

> Talking about differences with children and encouraging dialogue about what it looks like to meet each child's needs is important. For example, some children may need to have gum to focus or not put toys in their mouths, while some may need to sit on a special seat at group time. Acknowledging human differences also supports understanding of nature with all its differences, and nature in its turn helps children honor differences between people.

> Below is a list of a few physical or cognitive conditions that may limit a person's movements, senses, or activities, and examples of how you can improvise to make it work in your setting.

Children Who are Deaf or Hearing Impaired

- Be sure to communicate with the other staff in your program about any hearing difficulties a child may experience; this is for safety as well as guidance concerns.
- If a child has a cochlear implant, be sure they are able to use the playground slide; sometimes the static can damage the processors.
- Share information about an implant with all children in the group in a matter-of-fact way. Curious peers have been known to grab or pull on implants.

Children Who are Blind or Have Low Vision

- Before enrolling new children with vision issues, tour the program, especially the outdoor spaces, with the family before they accept so that they fully understand what their child will experience.
- Provide as many sensory experiences as possible throughout the classroom and outdoors.
- On your daily checks of the school, remember to look for new items, such as fallen logs or puddles, and walk children with low vision through these areas to acquaint them with the changes.

Children Who are Nonverbal or Mute

- Offer experiences that do not rely on the child participating orally (writing is a form of verbalization according to reading specialists), such as writing in journals, story dictations, and acting, or listening and moving music experiences. This allows the child to continue to build community without verbal interactions.
- Teach the other children in the class ways they can communicate with the child, and help them understand that they can hear and understand them, but just isn't able to respond to them with words.

Nature-Based Learning for Young Children provides similar advice for additional physical and cognitive conditions such as children with behavioral issues and children with limited mobility. Throughout, the authors offer references for further investigation and learning, as well as low cost and no cost resources for safely accommodating children with disabilities.

For more information: Powers, J. and Williams Ridge, S. *Nature-Based Learning for Young Children: Anytime, Anywhere, on Any Budget.* 2018. St. Paul, MN: Redleaf Press.

5.5 Equitable and inclusive learning environments.

Instructional materials foster an equitable and inclusive learning environment that welcomes people of different races, ethnic groups, cultures, sexual orientations and gender identities, abilities, ages, social groups, classes, language groups, and religious traditions.

Indicators:
- People first language (e.g., people with disabilities, people who are visually impaired, people with a learning disability) is used.
- As appropriate, a statement that acknowledges and respects local Indigenous peoples as the traditional stewards of the land is included.
- Personal pronouns used in instructional materials respect differen gender identities.
- Educational strategies and instructional materials support all learners within the learning setting, including people with disabilities and those who are learning English. Materials are written in the language(s) spoken by the participants, respecting their cultural and linguistic backgrounds.
- Materials emphasize methods of setting norms that promote inclusion and openness within the learning setting, including respectful ways of sharing values, ideas, and opinions.
- Asset-based approaches to communicating across differences are included.
- Readings, media, and other instructional resources highlight the contributions of traditionally underrepresented people.
- Instructional materials provide strategies that ensure access to high-quality educational experiences by all learners.

DID YOU KNOW?

Differentiated Instruction

You are tasked with developing a set of environmental education activities that will be used with a group of sixth graders who are attend the same small, rural school. On the surface, one size fits all, right? Indeed, it's quite the opposite. Even within a group of children with a "similar" background, their learning needs will be quite different. Differentiated instruction can be used to help meet the educational needs of all learners.

Why is Differentiated Instruction Important?

Kids of the same age aren't all alike when it comes to learning any more than they are alike in terms of size, hobbies, personality, or food preferences. Kids do have many things in common, because they are human beings and because they are all young people, but they also have important differences. What we share makes us human, but how we differ makes us individuals. In a classroom with little or no differentiated instruction, only student similarities seem to take center stage. In a differentiated classroom, commonalities are acknowledged and built upon, and student differences also become important elements in teaching and learning.

At its most basic level, differentiating instruction means "shaking up" what goes on in the classroom so that students have multiple options for taking in information, making sense of ideas, and expressing what they learn. In other words, a differentiated classroom provides different avenues to acquiring content, to processing or making sense of ideas, and to developing products so that each student can learn effectively.

Tomlinson, C.A. Chapter 1. What Differentiated Instruction Is – and Isn't. *How to Differentiate Instruction in Academically Diverse Classrooms.* 2017. Alexandria, VA: ASCD.

DID YOU KNOW?

Differentiated Instruction

What is Differentiated Instruction?

... differentiated instruction is an approach whereby teachers adjust their curriculum and instruction to maximize the learning of all students: average learners, English language learners, struggling students, students with learning disabilities, and gifted and talented students. Differentiated instruction is not a single strategy but rather a framework that teachers can use to implement a variety of strategies, many of which are evidence-based. These evidence-based strategies include:

- Employing effective classroom management procedures
- Grouping students for instruction (especially students with significant learning problems)
- Assessing readiness
- Teaching to the student's zone of proximal development

IRIS Center, Peabody College Vanderbilt University. *Differentiated Instruction: Maximizing the Learning of All Students.* 2020. https://iris.peabody.vanderbilt.edu/module/di/cresource/q1/p01/

For more information:

ASCD. *Differentiated Is-Is Not Infographic.* 2015.
http://www.ascd.org/ASCD/pdf/siteASCD/publications/Differentiation_Is-IsNot_infographic.pdf

IRIS Center, Peabody College Vanderbilt University. *Differentiated Instruction: Maximizing the Learning of All Students.* 2020. https://iris.peabody.vanderbilt.edu/module/di/cresource/q1/p01/

Sousa, D. A. and Tomlinson, C. A. *Differentiation and the Brain: How Neuroscience Supports the Learner-Friendly Classroom* (2nd edition). 2018. Alexandria, VA: ASCD.

Tomlinson, C.A. Chapter 1. *What Differentiated Instruction Is – and Isn't. How to Differentiate Instruction in Academically Diverse Classrooms.* 2017. Alexandria, VA: ASCD.

[1] **The Zone of Proximal Development** ... is a concept developed by Soviet psychologist and social constructivist Lev Vygotsky (1896 - 1934). Vygotsky stated that a child follows an adult's example and gradually develops the ability to do certain tasks without help or assistance. Vygotsky's often-quoted definition of zone of proximal development presents it as "the distance between the actual developmental level as determined by independent problem solving and the level of potential development as determined through problem solving under adult guidance, or in collaboration with more capable peers.
Quoted from: Innovative Learning. *Zone of Proximal Development,* http://www.innovativelearning.com/educational_psychology/development/zone-of-proximal-development.html#:~:text=Vygotsky's%20often%2Dquoted%20definition%20of,in%20collaboration%20with%20more%20capable

5.6 Interdisciplinary.
Instructional materials recognize the interdisciplinary nature of the environment and environmental education.

Indicators:
- Instructional materials address the whole individual, suggesting ways learners can develop cognitive, fine/gross motor, language, self-help, and social-emotional skills.
- Instructional materials clearly list the disciplines or areas of study integrated into each lesson, and suggest tie-ins with other areas, such as science disciplines, social studies, math, geography, English, art, music, physical education, and occupational education.
- Skills such as reading comprehension, math, writing, map reading, and analysis are developed.
- Where appropriate, activities are keyed to international, national, tribal, state/provincial, or local standards.
- Activities are aligned to an interdisciplinary framework for environmental literacy, such as *K–12 Environmental Education: Guidelines for Excellence,* and support the Sustainable Development Goals.
- Suggestions for the use of interdisciplinary approaches such as phenomena-based learning, environmental issue investigation, action civics, or problem-based learning are included.
- Ways of working with interdisciplinary teams, including speech, occupational, social, and behavioral therapists, families and other caregivers, instructional specialists (e.g., ESL, music, physical education, and/or technology teachers), and other service providers are suggested to enhance instruction for people with special needs, including those who are learning English.

GUIDELINES IN PRACTICE
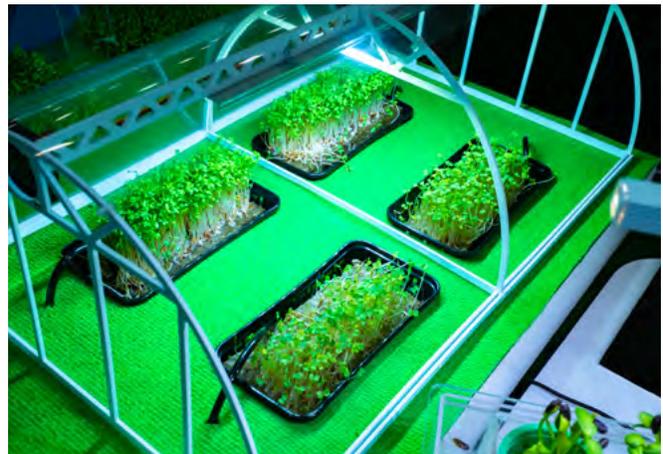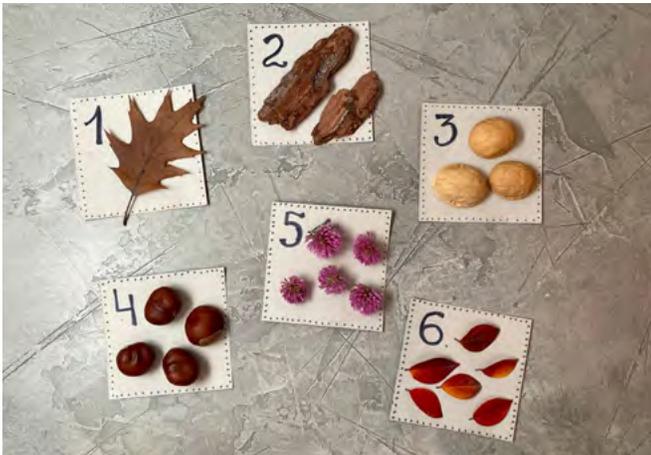
Science + Art + Kayaks = Learning

What happens when a dozen middle school students embark on their first coastal kayaking adventure carrying boxes packed with lunch, watercolors, brushes, and paper? Hint: the answer is not chaos and a bunch of wet kids and art supplies.

What happens, says Karissa Laffey, is engagement, learning, and art that comes from the simple but often glossed-over act of noticing. Laffey, a marine biologist and working artist, is education coordinator at Artist Boat, a nonprofit organization in Galveston, Texas, that promotes awareness and preservation of the coastal margins and marine environment through science and the arts.

In Artist Boat's signature Eco-Art Kayak Adventures, students engage in "hands-on and feet-in" experiential learning, exploring estuarine ecology, water quality, and paddling safety capped off with plein-air painting. Laffey calls the painting, which students do from their kayaks, "the most profound part of the day." During this reflective time, she says, "the animals move closer, and students will start noticing things they hadn't seen before. More questions come from the painting time—sometimes 'what's that?' sometimes, 'how do I make the purple color on that cloud?' This solo act of seeing and making helps students integrate what they have learned."

Evaluations of Artist Boat programs suggest the integration works: students leave with increased knowledge of the estuary ecosystem and key scientific terms, more positive opinions about Galveston Bay, better stewardship practices, and stronger perceptions about how they could make a difference. More than half agreed they want a career in science, technology, math and engineering. And teachers love it.

Science + Art + Kayaks = Learning

These outcomes result from careful preparation and a few basic rules. The first rule, says Artist Boat executive director Karla Klay, is to hire degreed science and art professionals. "Our goal is to create people who want to explore and discover the world and be artists and scientists. The best way to do that is to hire artists and scientists."

While the workshops and adventures may not look structured from the outside, behind the scenes, a core of carefully prepared and detailed instructional plans guides the process.

Artist Boat conducts a two-hour classroom module before each adventure—an hour on coastal ecology education with hands-on demonstrations and an hour on watercolor instruction and a student painting activity. The instructional plan includes materials list, vocabulary words, set-up steps, and detailed timing and instructions.

In the field, guides follow similarly detailed course outlines that walk, step-by-step, through the entire half-day experience including directions, parking and gear set-up; on-land group preparation and demonstrations; kayak route including maps, stopping points and ecological background; and even landmarks to locate the launch site on the return trip.

Because of variables like group stamina and paddling speed, weather conditions, and where animals appear, the kayak adventure is less tightly scripted than the classroom workshop. But Artist Boat guides have a structure and content background to adapt for each group.

Klay and Laffey point out four pillars of success in Artist Boat's kayak-based science and art programs.

Hire degreed professional scientists and artists who are avid learners. Provide training and a structure that allows them to interpret the world as they see it and model exploration and curiosity for the students.

Keep group size to 12 or 13 learners per guide. This reduces the noise level so learners can hear, ask questions, and reflect. Depend on teachers and chaperones to model good behavior, but not to help with group management.

Emphasize basic, easily remembered rules. Artist Boat uses the three Es: respect for the environment, equipment, and everyone. Laffey says these rules, which apply to a wide range of situations, make it easy for students to know when they're out of line and for guides to remind them with a simple question: "Which 'E' are we not respecting?"

Use painting time to provide positive feedback that encourages students to imagine possibilities for themselves in science and art. Students may be reluctant to paint, Klay notes, "because they don't see themselves as artists. Our message is that we are all artists and that talent is developed, it's not a gift." Guides offer feedback not about the quality of the paintings, but about something learners noticed and depicted—the way they used different colors of green, or drew a bird so you know it's a pelican, or showed that the marsh is full of tiny snails.

Artist Boat packs a lot of science and art content into its instructional programs, and uses language grounded in both disciplines. Klay says this approach comes from the belief that "love for the environment comes from learning, and more than anything that is what our instructors are sharing with students."

For more information: Artist Boat, https://www.artistboat.org

5.7 Goals and objectives.

Goals and objectives for the materials are clearly spelled out.

Indicators:

- Goals and objectives for learner outcomes are clearly stated and relevant.
- The content is appropriate for achieving the objectives, and steps for accomplishing the objectives are identified in written lesson or activity plans.
- Instructional methods are in alignment with research-based best practice and appropriate to the learning goals.
- Objectives are in keeping with the goals of general education and, when appropriate, in alignment with learning standards such as the Next Generation Science Standards; Common Core State Standards for English Language Arts; Common Core State Standards for Mathematics; and College, Career, and Civic Life (C3) Framework for Social Studies State Standards.
- Goals and objectives support the development of environmental literacy and are aligned with published frameworks such as *K–12 Environmental Education: Guidelines for Excellence.*
- Goals and objectives address the Sustainable Development Goals.

DID YOU KNOW?

Gender Equity: Supporting Girls and Women as Learners[1]

Pioneering works such as *How Schools Shortchange Girls* (AAUW, 1992) and *Failing at Fairness: How Our Schools Cheat Girls* (Sadker and Sadker, 1995) documented gender inequity in schools in the 1990's. Unfortunately, from uneven teacher attention regarding use of gender stereotypes to male dominated curricular materials, gender disparity remains unabated (Alber, 2017; Ricks, 2014) over two decades later.

How can we begin to address gender inequity? Educators can consider how gender-based roles and responsibilities develop and are perpetuated in communities, schools, and homes. Alber (2017) suggests that educators examine their own classrooms and classroom practices:

1. Do any texts I use omit girls and/or women, or tokenize their experiences? How are boys and/or men stereotyped?

2. Are females or males presented in stereotypically gendered roles in any texts I have selected? If these are historical texts, how might I teach students to be critical of the limitations in the gender roles presented in these texts?

3. Do I encourage empowering and nonsexist behaviors among my students? Do I discourage both female and male gender stereotypes?

4. If I have a classroom library, is there a balance in male and female authors? Are there plenty of books with strong female protagonists? Do the nonfiction books feature notable women and girls?

5. In what ways do I encourage gender equity of voice and participation?

6. Do I ask girls as well as boys complicated questions? During discussions, do I inquire as diligently and deeply with female students as I do with male students?

DID YOU KNOW?

Gender Equity: Supporting Girls and Women as Learners

Educators can create learning climates that are fair, inspiring, and safe for all learners. SciGirls (n.d.) details six research-based strategies for engaging girls in STEM:

1. Connect STEM experiences to girls' lives.
2. Support girls as they investigate questions and solve problems using STEM practices.
3. Empower girls to embrace struggle, overcome challenges, and increase self-confidence in STEM.
4. Encourage girls to identify and change STEM stereotypes.
5. Emphasize that STEM is collaborative, social, and community-oriented.
6. Provide opportunities for girls to interact with and learn from diverse STEM role models.

Effective strategies for supporting the engagement of learners, especially girls and women, also focus on developing mentorships and fostering intrinsic motivation, self-efficacy, and a feeling of academic and cultural pride.

For more information:

AAUW. *How Schools Shortchange Girls.* 1992. Retrieved from https://wcwonline.org/images/pdf/how-schools-shortchange-girls-executive_summary.pdf

Alber, R. Gender Equity in the Classroom: Some ideas on how to minimize gender bias in our teaching practice and curriculum. 2017. *Edutopia.* Retrieved from https://www.edutopia.org/blog/gender-equity-classroom-rebecca-alber

Ricks, S.A. Falling Through the Cracks: Black Girls and Education. *Interdisciplinary Journal of Teaching and Learning.* 2014. Vol 4 (1). Retrieved from https://files.eric.ed.gov/fulltext/EJ1063223.pdf

Sadker, M. and Sadker, D. *Failing at Fairness: How Our Schools Cheat Girls.* 1995. NY: Scribner.

SciGirls. *SciGirls Strategies: How to Engage Girls in STEM.* n.d. Retrieved from http://www.scigirlsconnect.org/wp-content/uploads/2019/06/SciGirls-Strategies-Guide.pdf

Sperling, G.B. and Winthrop, R. *What Works in Girls' Education: Evidence for the World's Best Investment.* 2016. Brookings Institute, Washington, D.C. Retrieved from https://www.brookings.edu/wp-content/uploads/2016/07/What-Works-in-Girls-Educationlowres.pdf

[1] *Did You Know? Gender Equity: Supporting Girls and Women as Learners* was written with the assistance of Yash Bhagwanji

5.8 Appropriateness for specific learning settings.

Claims about the material's appropriateness for the targeted learners are consistent with the experience of educators.

Indicators:

- Content and skills, with necessary accommodations, match the level and language of the targeted learners. The examples, terminology, graphics, and comparisons used are within the probable vocabulary and experience of learners. Vocabulary is defined and related to the content.
- Questioning strategies suggested for the instructor, with necessary accommodations, are appropriate for the targeted learners.
- Expectations of the level of questions to be generated by the learners are appropriate for the targeted learners.
- Activities can be accomplished in the time specified, with resources provided or easily available.
- Instructional methods, including experiments, service learning, and community investigations, are relevant, accurate, and suitable for the learners.
- Instructional materials include suggestions for appropriate variations, extensions, and ways of getting learners outside.
- Activities are efficient. The amount of time required is consistent with the importance of what is to be learned.
- Environmental responsibility is modeled in the design, underlying philosophy, and suggested activities of the lessons and materials.

DID YOU KNOW?

Universal Design for Learning

What's the goal of Universal Design for Learning?

Universal Design for Learning (UDL) is a framework to guide the design of learning environments that are accessible and challenging for all. Ultimately, the goal of UDL is to support learners to become "expert learners" who are, each in their own way, purposeful and motivated, resourceful and knowledgeable, and strategic and goal driven. UDL aims to change the design of the environment rather than to change the learner. When environments are intentionally designed to reduce barriers, all learners can engage in rigorous, meaningful learning. (CAST, 2018)

Key Questions to Consider When Planning Lessons

Think about how learners will engage with the lesson.
Does the lesson provide options that can help all learners:
- Regulate their own learning?
- Sustain efforts and motivation?
- Engage and interest all learners?

Think about how information is presented to learners.
Does the information provide options that help all learners:
- Reach higher levels of comprehension and understanding?
- Understand the symbols and expressions?
- Perceive what needs to be learned?

Think about how learners are expected to act strategically and express themselves.
Does the activity provide options that help all learners:
- Act strategically?
- Express themselves fluently?
- Physically respond? (Gordon, Meyer, and Rose, 2016)

For more information: CAST. *Universal Design for Learning Guidelines* (version 2.2). 2018.
Retrieved from http://udlguidelines.cast.org

Fisher, D. & Frey, N. Differences, Not Disabilities. *Educational Leadership.* 2017. Vol. 74, No. 7, pp 81-82.

Gordon, D., Meyer, A., & Rose, D. *Universal Design for Learning: Theory and practice.* 2016. Wakefield, MA: CAST Professional Publishing. http://udltheorypractice.cast.org

5.9 Assessment.

A variety of means for assessing learner progress are included.

Indicators:

- Expected learner outcomes are stated and examples of how to use specific performance-based assessments such as portfolios, open-ended questions, group or independent research, or other appropriate ways to indicate mastery are provided.
- Learner outcomes for both concepts and skills are tied to the stated goals and objectives and integral to the instructional approach and activity sequence.
- Means of assessing learners' prior experiences, perspectives, knowledge and skills, and ways of knowing are included at the beginning of each lesson.
- Suggested assessment techniques for both content and skills are practical, efficient, meaningful, and appropriate. Scoring rubrics are included as appropriate.
- Assessment is ongoing, tied to learning, and serves as a tool for the instructor to plan, modify, and adapt teaching and learning. Assessment is integral to the instructional approach.
- Assessment strategies are developmentally appropriate, culturally and linguistically responsive, and accommodate people with special needs, including those with differing physical abilities.
- Expectations are made clear to learners at the onset of an activity. As appropriate, scoring rubrics are shared with learners.
- Learners assess their own and other learners' work. They are given choices of how best to demonstrate their learning.
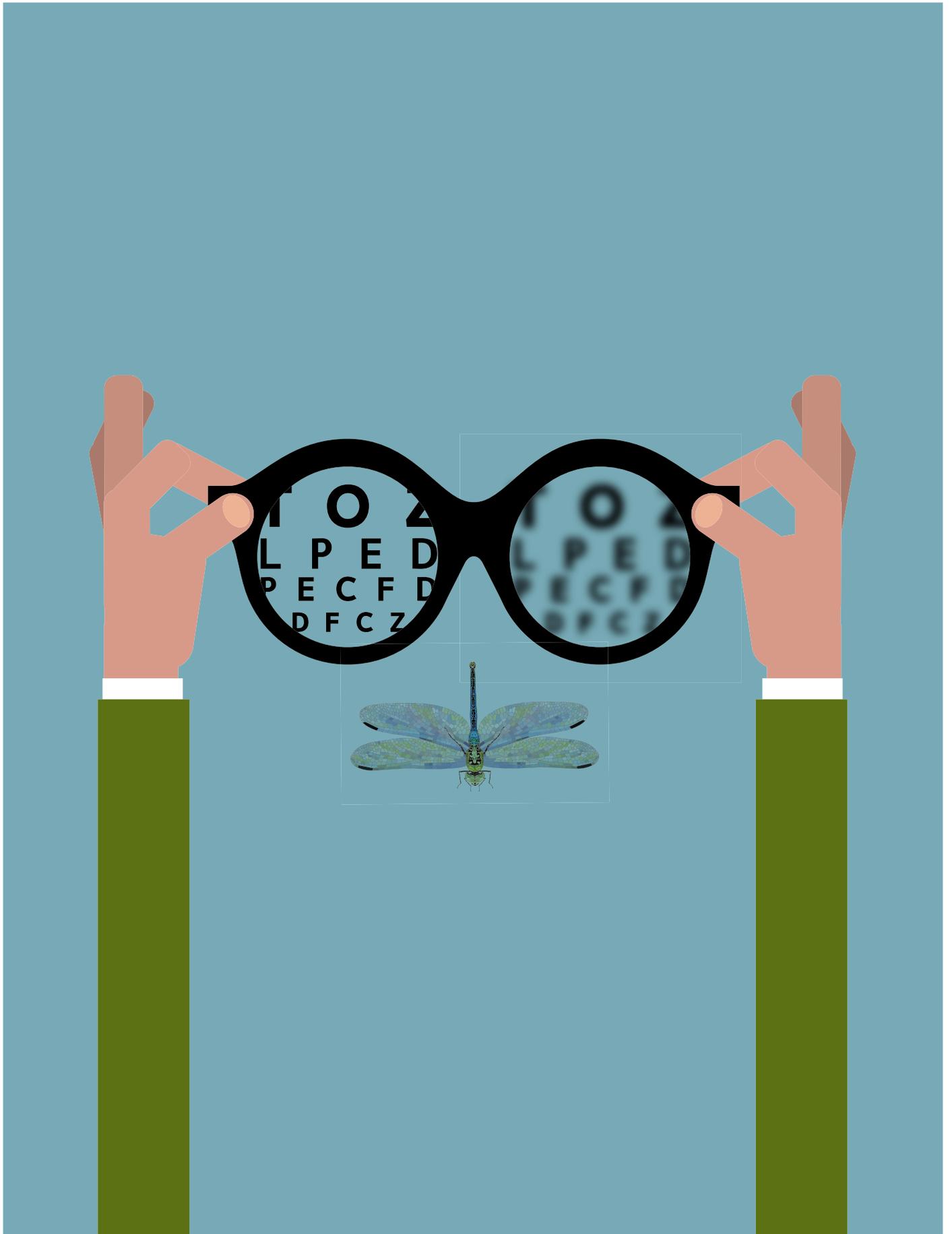
Key Characteristic #6

Usability

Environmental education materials are well designed and easy to use.

6.1 Clarity and logic.
The overall structure (purpose, direction, and logic) of the instructional materials is clear.

Indicators:
- Materials are clearly and engagingly written. Main concepts are well articulated. Examples in the text are appropriate to the content and easily understood.
- Instructions for educators are clear and concise.
- The following information is included in a straightforward manner:
  - Intended audience/age level
  - Instructional setting and optimal number of learners
  - Disciplines and concepts covered
  - Intended learning outcomes
  - Skills and practices addressed
  - Equipment needed
  - Safety precautions and clean-up if appropriate
  - Time needed for activity
  - Brief overview of the activity
  - Instructions for conducting the activity
  - Suggestions for formative and summative assessment tied to instructional goals and objectives
  - Pre- and post-lesson activities, including suggestions for enrichment activities, if appropriate
- Background information for the educator is adequate and accurate, and additional resources are listed.
- Materials are organized sequentially and in an easy-to-use fashion.
- Laboratory and field work, and other activities, are clearly linked to related content material.

6.2) Easy to use.
Materials are inviting and easy to use.

Indicators:
- The layout of materials is interesting and appealing.
- Illustrations, photographs, maps, graphs, and charts are useful, clear, and easy to read.
- The material is easy to access, store, and use.
- Masters for handouts and electronic media are easily duplicated.
- Copyright is spelled out or permission to copy is granted.
- Where appropriate, materials are available in electronic form.

6.3 Long-lived.
Materials have a lifespan that extends beyond one use.

Indicators:
- Information on where replacements, updates, equipment, and special supplies can be obtained is included.
- Equipment and materials are listed, reasonably accessible, inexpensive, and simple to use. Suggestions for low/no-cost alternatives are provided.
- Materials needed by the learner are sufficiently supplied to support the objectives.
- Amount and type of consumable materials used is appropriate given the objectives of the activity.
- Suggestions are included for accessing consumables made of recyclable, sustainably resourced, and/or post-consumer recycled materials.
- Non-consumable materials can be reused by another educator.

RESOURCES YOU CAN USE

Project Learning Tree E-Units: *Treemendous Science, Energy in Ecosystems, Carbon & Climate*

Project Learning Tree's E-Units are self-contained units of instruction that are housed fully online. They are multidisciplinary lessons designed to be easy for teachers to access and use. The three E-Units include *Treemendous Science!* for grades K–2, Energy in Ecosystems for grades 3–5, and *Carbon & Climate* for grades 6–8.

The E-Units are hands-on and engaging activities that help teach students how—not what—to think about the environment and their place within it. They also make teaching and learning fun.

One of the key features of PLT's E-Units is that they support learning as a developmental progression. The activities are designed to help students build on and revise their existing knowledge and skills, starting with their initial conceptions about the E-Unit topic and moving toward deeper and broader understanding.

Each E-Unit was designed from—rather than simply correlated to—targeted performance expectations of the Next Generation Science Standards (NGSS). That means that the activities within the E-Unit build on one another to foster students' understanding and skills for meeting the specific standards. The E-Units also align with Common Core–English Language Arts, Common Core–Math, and the College, Career, and Civic Life (C3) Framework for Social Studies. These connections are clearly denoted within the online platform: A "pop-up" tool shows where and how the lesson teaches toward a standard.

Another feature of the E-Units is that they are organized around the 5E Instructional Model, which fosters science learning through a planned sequence of instruction. The five phases of the 5E model—engage, explore, explain, elaborate, and evaluate—help students develop their own understanding of science concepts. Each phase of the 5E model is clearly labeled within the E-Unit activities.

Above all, PLT's E-Units are designed to be flexible. Teachers who subscribe to a PLT E-Unit have anytime, anywhere access to quality learning activities. They may use individual activities as stand-alone investigations or move through all the E-Unit activities from beginning to end. And, in addition to step-by-step procedures, the E-Units provide a range of resources for customizing the lessons to particular students or classes, including downloadable student pages; assessment tools; suggestions for fiction and non-fiction books to enhance the activities; and links to websites, videos, and other supplementary resources.

To learn more about Project Learning Tree, an initiative of Sustainable Forestry Initiative, visit: www.plt.org

Born Accessible

Rather than trying to retrofit print and digital materials to meet the needs of all learners, born accessible educational materials are "… designed to be usable across the widest range of individual variability." (AEM, n.d.) The National Center on Accessible Educational Materials (AEM) suggests a set of design principles, known by the acronym POUR, to meet this need:

Perceivable: All learners can hear and see the content.
Perceivable content is presented in a way that it can be accessed with more than one sense in order to account for both the needs of people with disabilities and those who are accessing the content in less than optimal environmental conditions.

Operable: All learners can interact with the content.
Operable content provides flexible navigation options and can be accessed with a variety of input methods.

Understandable: All learners can understand the content and enjoy a predictable experience.
When content behaves in an intuitive, logical, and predictable way, learners can focus more of their energy and attention on understanding rather than on the mechanics of the user interface.

Robust: Content works well with current and future technologies.
Learners who have grown up in the era of mobile devices and cloud computing expect to be able to access learning materials from a variety of devices and platforms.

For more information: American Institutes for Research, Center on Technology and Disability. *Born accessible learning resources: What state and district education leaders need to know.* n.d. Retrieved from http://www.ctdinstitute.org/sites/default/files/file_attachments/Born_Accessible_QuickGuide_508.pdf

National Center on Accessible Educational Materials (AEM). *Accessibility Standards, Specifications & Guidelines.* n.d. Retrieved from http://aem.cast.org/creating/designing-for-accessibility-pour.html

Pun, K. *Dos and don'ts on designing for accessibility.* 2016. Retrieved from. https://accessibility.blog.gov.uk/2016/09/02/dos-and-donts-on-designing-for-accessibility

6.4 Adaptable.
Instructional materials are adaptable to a range of learners and learning situations.

Indicators:
- Suggestions are provided for adapting lessons and activities for learners from differing ethnic, cultural, ability, and linguistic backgrounds.
- Activities and associated handouts are available in more than one language, if appropriate.
- Strategies are suggested for adapting instruction for mixed age, ability, and experience levels (e.g., family groups).
- Where appropriate, easy adaptations for different environments, such as indoor and outdoor environments, changes in weather, formal and informal settings, large and small groups, mixed level classes, or rural, suburban, and urban settings are suggested.
- Suggestions for finding low/no-cost alternatives for the equipment and materials needed and/or suggestions for obtaining the needed equipment from community partners (e.g., universities, utilities, industries, local government) are made.
- Strategies for adapting instruction for people with special learning, sight, language, neurological, and physical needs are offered.
- Materials offer ideas for adapting to different age and experience levels.

GUIDELINES IN PRACTICE

Students and Teachers Restoring a Watershed (STRAW)[1]

The Students and Teachers Restoring a Watershed (STRAW) Program of Point Blue Conservation Science is a collaborative network of K–12 students and teachers leading their communities to restore their local ecosystems. In addition to providing all the benefits of any professional-quality habitat restoration, STRAW has the added benefit of bringing in community ownership and integrated science education. STRAW has decades of proven success providing in-class lessons and field studies for students and professional development for teachers that bring greater understanding, meaning, and commitment to habitat restoration work. Today STRAW is addressing climate change through innovative restoration practices that students implement through cutting-edge restorations proven to increase ecosystem health and resilience.

STRAW, managed by Point Blue Conservation Science, organizes and supports a large network of schools, landowners, environmental organizations, restoration specialists, and community members to pursue environmental studies and restoration projects on a large scale in local watersheds. STRAW students are immersed in a yearlong study of restoration science education. STRAW uses innovative strategies, sound scientific information, and wide-ranging partnerships to sustain a community-based education network focused on protecting and restoring critical ecosystem functions in San Francisco Bay creeks and wetlands, which greatly improves the health of the Bay. STRAW brings rigorous scientific content into the classroom and provides hands-on restoration activities for students that provide critical thinking and problem-solving skills. One of the program's greatest strengths is that the students and teachers, along with STRAW partners, are doing "real" work, actively restoring watersheds. This singular focus brings a sense of importance to the project and the work being accomplished. STRAW participants develop commitment to their work and to each other.

Through its collaborative partnerships, STRAW links ranchers, rangers, restoration scientists, biologists, and other professionals to teachers and students resulting in about 50 habitat restoration projects implemented annually by over 3,500 K–12 students and about 150 teachers. STRAW staff maintain and monitor all restoration sites for 3 to 10 years to ensure success. In addition, STRAW provides regular professional development training for teachers and restoration science education for students, with every class receiving at least one to four lessons a year.

GUIDELINES IN PRACTICE

Students and Teachers Restoring a Watershed (STRAW)

STRAW evaluates its restorations to determine short-term and long-term successes. For the short-term, STRAW measures plant survival by species and percentage of cover. STRAW also uses photo monitoring to visually assess success and inform future projects through an adaptive management process. A subset of STRAW sites are monitored for changes in wildlife response over time, using birds as indicators of ecological function and overall health.

STRAW continues to develop and refine its curricula, depending on teacher and partner feedback, as well as information from various assessments. Each year STRAW assesses the educational value of its programs through some of the following methods:

Assessing student learning:
- Pre and post oral or written assessments for the pre-restoration presentations
- Pre and post oral or written assessments for the restoration days
- Oral responses to questions at restorations
- STRAW Multi Visit Program (MVP) students complete a "share project" to represent their personal connection to the restoration and share their learning with their communities

Assessing teacher learning:
- Watershed Week surveys
- Pre and post school year surveys
- Occasional meetings with STRAW teachers individually or in small school groups

The STRAW program brings learning alive for students and creates enthusiastic engagement and long-term knowledge retention. Students are learning to be leaders by leading their communities in cutting-edge restorations. STRAW shows that students of all ages can do professional quality restoration work and can contribute to their communities.

Adapted with permission from the Global Environmental Education Partnership (GEEP)[2] Case Studies. Rogers, L., Parodi, J., and Potter, G. Students and Teachers Restoring a Watershed (STRAW). 2017.
Retrieved from https://thegeep.org/learn/case-studies/students-and-teachers-restoring-watershed-straw

[1] For more information about Students and Teachers Restoring a Watershed (STRAW) visit their website:
http://www.pointblue.org/ourscience-and-services/conservation-science/conservation-training/straw-program

[2] GEEP is a partnership of the U.S. Environmental Protection Agency, the Environmental Protection Administration of Taiwan, and the North American Association for Environmental Education. For more information, visit: www.thegeep.org

6.5 Accompanied by instruction and support.

Additional support and instruction are provided to meet educators' needs.

Indicators:

- Professional development programs/training are accessible to educators who will use the materials.
- Continuing technical support for educators or other strategies for ongoing engagement are provided (e.g., contact information, website address, webinars, or a list of local or regional points of contact for questions about the materials).
- Instructional programs provide follow-up activities and help develop a network of practitioners.
- Lists of essential resources and supporting materials, such as agency contacts, references to videos, and information on computer databases, are included.

RESOURCES YOU CAN USE

CLEAN: Climate Literacy & Energy Awareness Network

Accessing quality teaching resources is not always an easy task. And, once you manage to find seemingly appropriate classroom activities, how do you know that they are reliable, scientifically accurate, and educationally sound? The CLEAN Collection is a curated compilation of over 700 teaching resources focused on climate and energy education. All the teaching materials posted in the CLEAN Collection have been rigorously vetted through a peer-review process by scientists and educators.

The CLEAN Collection includes an array of activities, videos, visualizations, simulations, and more that are:

- Accessible online through a searchable database
- Free
- Classroom ready
- Aligned with the Next Generation Science Standards[1], the Climate Literacy Framework[2], and the Energy Literacy Framework[3]
- Designed for K–12 teachers, college instructors, and informal educators

Before they can be included in the database, CLEAN Collection resources go through a multistage expert review process, conducted by scientists and educators, that examines:

- Scientific accuracy (e.g., valid/accurate concepts, models, and skills; supporting references and background materials; clearly identified assumptions and observations/facts distinguished from interpretation/hypothesis)
- Pedagogic effectiveness (e.g., appeal of the resource to a diverse audience, learning objectives, assessment, engagement, focus on inquiry, valid/accurate and grade-level appropriate concepts, models, and skills)
- Classroom readiness (e.g., ease of use, clarity, availability of a teacher guide, required supplies are commonly found in science classrooms)

In addition, CLEAN offers instructional support, guidance for teaching the climate and energy science principles, resources for families, unit planning tools, and strategies for managing controversial issues in the classroom.

For more information about CLEAN, visit: https://cleanet.org/index.html

NRC. The Next Generation Science Standards: For States, By States. 2013. https://www.nextgenscience.org
NOAA. Climate Literacy: The Essential Principles of Climate Literacy. 2009.
https://www.climate.gov/teaching/essential-principles-climate-literacy/essential-principles-climate-literacy
U.S. Department of Energy. Office of Energy Efficiency and Renewable Energy. Energy Literacy: Essential Principles for Energy Education. 2017. https://www.energy.gov/eere/education/energy-literacy-essential-principles-energy-education#:~:text=What%20is%20the%20Energy%20Literacy,Concepts%20to%20support%20each%20principle

6.6 Make substantiated claims.

Instructional materials accomplish what they claim to accomplish.

Indicators:

- Claims of learning outcomes are substantiated by systematic evaluation rather than merely by letters of endorsement and anecdotal comments from users.
- Evaluation strategies are culturally responsive and reflect the principles of equitable evaluation, accelerating progress towards equity and positioning equity at the center of evaluation efforts.
- Activities are field-tested with learners who represent the diversity of the target audience under conditions similar to their intended use, and evaluated in terms of the stated goals and objectives prior to wide-scale implementation As appropriate, evaluation results are reported by learner demographics, implementation, instructional setting, and such.
- If part of a larger program, continuous feedback and modifications are provided.
- Educators and environmental/natural resource professionals who work in the settings in which the material is intended to be used participated on the development team and/or reviewed drafts.
- As appropriate, members of the intended audience participated on the development team, reviewed drafts, and/or provided feedback during pilot testing.
- Specialists in learning theory, cultural competency, evaluation and assessment, and other applicable fields were involved on the development team or reviewed drafts of materials.
- Specialists in the environmental topics addressed by the instructional materials, including those with Traditional Ecological Knowledge, were involved in the development team and/or reviewed drafts.

GUIDELINES IN PRACTICE

Integrating a School Curriculum into a Community

Looking back at more than 20 years of using the Investigating and Evaluating Environmental Issues and Actions (IEEIA) curriculum on the Hawaiian island of Moloka'i, Vicki Newberry observed, "Our community has grown because of our students' work.

In 2003, Newberry helped found the Aka'ula School, a small independent academy currently serving some 40 fifth through twelfth graders, most of whom are native Hawaiian. Its academic program was built on the foundation of the PRISM Project (Providing Resolutions with Integrity for a Sustainable Molokai), which Newberry started with fellow Aka'ula teacher Dara Lukonen when both were teaching in the town's public elementary school. Based on the IEEIA curriculum, PRISM—and thus Aka'ula as a whole—uses environmental issue investigations to integrate instruction and learning across every discipline.

Aka'ula middle school students spend about half the school year engaged in their investigations, using modules adapted from the nationally recognized IEEIA curriculum. At the beginning of the term, local speakers are invited to talk to students about issues of concern to the community. Listening, collecting information, and asking questions helps prepare students to collaboratively select topics for small group investigation. Students develop research questions, conduct further inquiry, and collect data from community surveys, physical investigations, and other sources. After analyzing the data collected and drawing conclusions, the primary outcome is a written report, which students present to the community in an annual PRISM symposium.

GUIDELINES IN PRACTICE

Integrating a School Curriculum into a Community

Student ideas and action plans are often taken up by community groups. Over the years, Newberry says, student muscle has contributed to significant changes at the school, in the community, and even across the state. Among a long list of accomplishments, student investigations helped revive and ultimately pass legislation to require deposits on bottles to encourage recycling, organized an alternative fuel vehicle car show for the island, raised awareness about invasive mangroves on the shoreline, helped create a cat sanctuary, and explored whether Maui County should have an Adopt-a-Beach program.

One student, whose investigation topic focused on whether single use polystyrene should be banned in Hawai'i, has been instrumental in getting such bans enacted at Aka'ula School and, after she graduated, at the University of Hawai'i. She has now turned her attention to working on a statewide ban. Newberry says, "These investigations make a lasting difference for the students, not just in school, but in their lives and careers. Our program has produced many college graduates who have gone on to work in fields related to conservation." Years, even decades later, Newberry said, "most kids can tell you what their project was, what it meant in the community, and how it affected them." Many of them use the same approach to future research projects.

National and Moloka'i-specific research shows that students in issue investigation programs, including PRISM, are motivated to develop advanced critical thinking and communication skills, learn academic fundamentals, investigate cultural, social, and environmental issues, and develop and use leadership and citizenship skills.

What has made this curriculum so successful over the long haul? Newberry calls out four characteristics:

- It makes cultural connections easy, which is important in a community and school that are largely native Hawaiian.
- It lends itself to integration across disciplines, provided the instructor is willing to do the work.
- Kids are respected as learners, so they perform better.
- It focuses on communications and critical thinking, which are the essential threads in learning.

Most important to the longevity of the program: students love it and thrive on it.

For more information: Aka'ula School. http://www.akaula.org

[1] Hungerford, H., et al. *Investigating and Evaluating Environmental Issues and Action: Skill Development Program.* 2003. Chicago, IL, Stipes Publishing LLC.

[2] Volk, Trudi and Marie J. Cheak. The Effects of an Environmental Education Program on Students, Parents, and Community. Journal of Environmental Education, Vol. 34, No. 4, 12-25, 2003. https://citeseerx.ist.psu.edu/viewdoc/download?doi=10.1.1.630.2619&rep=rep1&type=pdf

6.7 Supports accepted recommendations and requirements.

Environmental education materials support international, national, tribal, state/provincial, and/or local educational standards, frameworks, curricula, or goals.

Indicators:

- Materials have been aligned with a published environmental literacy framework such as *K–12 Environmental Education: Guidelines for Excellence*.
- The materials demonstrate how they support the United Nations Sustainable Development Goals.
- Activities have been or could be easily aligned with national, tribal, state/provincial, and/or local requirements or learning objectives.
- Materials can be readily integrated into established curricula.
- As appropriate, instructional materials support recognition or badge programs (e.g., scouting).
- The materials demonstrate how they fit with the learning frameworks for ocean, energy, and climate literacy, as appropriate.
- Alignment with health and safety standards is included.

RESOURCES YOU CAN USE

eePRO

eePRO is NAAEE's online platform for environmental education professional development, offering a searchable bank of Resources (lesson plans, journal articles, reports, videos), a listing of Learning opportunities (webinars, on-line courses, workshops, conferences), a higher education database and much more. eePRO also includes:

eeBLUE

A partnership between NOAA and NAAEE to increase environmental and science literacy

eePRO Groups

A discussion platform where individuals can join special interest groups, network, and discuss key issues related to environmental education

Advocacy, Policy, and Civic Engagement | Affiliates | Climate Change Education | Connecting to Nature | Conservation & Behavior Change | Data Literacy | Early Childhood EE | EE Central

EE in Urban Settings | EQuiTY and Inclusion | E-STEM Education | Global EE | Guidelines for Excellence | Higher Education | K–12 EE | Research & Evaluation

eeLEARN

A series of online learning modules exploring the foundations of environmental education

eeNEWS

A biweekly e-newsletter, providing the latest news, opportunities, and resources for the environmental education community

eeRESEARCH

A searchable library of environmental education research

eeWORKS

Research reviews and tools for illustrating the benefits of environmental education

PRO Picks

A curated listing of educational resources recommended by experts in environmental education

Access all these eePRO resources by visiting https://naaee.org/eepro

RESOURCES YOU CAN USE

Guidelines for Excellence
K-12 Learning
naaee

Guidelines for Excellence
Environmental Education Materials
naaee

Guidelines for Excellence
Preparation & Professional Development
naaee

Guidelines for Excellence
Nonformal EE Programs
naaee

Guidelines for Excellence
Early Childhood EE Programs
naaee

Guidelines for Excellence
Community Engagement
naaee
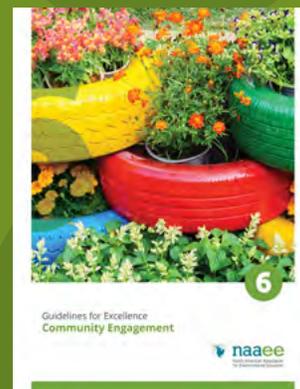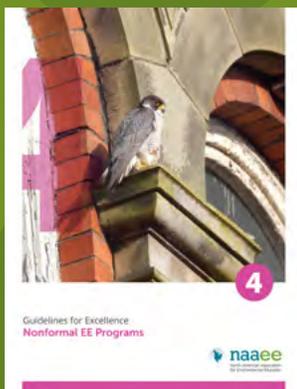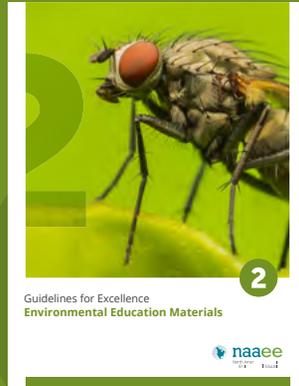
The National Project for Excellence in Environmental Education

The National Project for Excellence in Environmental Education, initiated by NAAEE in 1993, has developed a series of guidelines that set the standards for high-quality environmental education. Each of these publications was developed by a diverse team of professionals, and each has undergone substantive review by hundreds of professionals prior to its publication.

Through the National Project for Excellence in Environmental Education, NAAEE has taken the lead in establishing guidelines for the development of balanced, scientifically accurate, and comprehensive environmental education programs and materials. Quality environmental education programs help develop an environmentally literate global citizenry that can compete in our economy; has the skills, knowledge, and inclinations to make well-informed choices; and exercises rights and responsibilities as community members.

Learn more and access the Guidelines for Excellence series at:
www.naaee.org/our-work/programs/guidelines-excellence

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for Environmental Education

Education We Need for the World We Want

NAAEE uses the power of education to advance environmental literacy
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