NORTH CAROLINA

K-12 Environmental Literacy Plan

2024

Contents

Our Vision

Environmental literacy helps students make informed decisions that positively affect the environment, society, public health, and the economy. **The NC Environmental Literacy Plan** envisions a future where students develop environmental literacy through the integration of environmental education across the school curriculum, both in the classroom and through applied study in the outdoors and other place-based learning activities. As students analyze challenges, explore solutions, and evaluate interventions, they nurture concern, self-efficacy, and civic responsibility.

On the cover: Walnut Creek Wetland Center photo by Justin Kase Conder / WALTER magazine

Introduction and Framing

Executive Summary

North Carolina's natural resources have long been celebrated and cherished and are interwoven with the state's many cultural traditions. North Carolina's fertile soil, clean water, clear air, and rich biodiversity are the cornerstones of its vibrant economy, the health of its residents, the safety of its communities, and the development of its most precious resource: our students. To thrive and prosper, North Carolina's students must gain the skills and knowledge to make informed, equitable, and effective decisions about environmental issues.

With this critical need in mind, the North Carolina Department of Environmental Quality and the NC Department of Public Instruction partnered with the Environmental Educators of North Carolina to develop an Environmental Literacy Plan (ELP) for K-12 students in North Carolina. Although this plan's focus is K-12 students, it is important to note that environmental education can start in preschool and last a lifetime – a journey often full of profound joy, wonder, and insight.

A thriving educational network is essential to North Carolina's environmental literacy goals.

What is Environmental Education?

"Environmental education is a process that allows individuals to explore environmental issues, engage in problem solving, and take action to improve the environment. As a result, individuals develop a deeper understanding of environmental issues and have the skills to make informed and responsible decisions... **Environmental education does not advocate a particular viewpoint or course of action.** Rather, environmental education teaches individuals how to weigh various sides of an issue through critical thinking and it enhances their own problem-solving and decision-making skills."

— From the United States Environmental Protection Agency

The ELP encourages environmental experiences in formal learning spaces like schools, colleges, and universities and in nonformal spaces like parks, forests, coastal reserves, museums, laboratories, community centers, libraries, aquariums, and arboretums. In addition, the ELP recognizes that environmental literacy requires context and consideration of cultural perspectives, economic needs, and public health to meet its objectives.

The well-being of North Carolina's environment is challenged by urgent issues such as air and water pollution, hazardous waste contamination, extreme weather events, flooding, and other climate-related problems. These challenges have direct consequences for human health and our state's economy. To ensure a prosperous future, it is imperative to increase environmental literacy. The ELP envisions a North Carolina where graduates possess the knowledge and willingness to collaborate to protect and preserve our shared natural resources.

Environmental education increases understanding of how natural systems function. Environmental education is not a stand-alone subject; rather, it is a component of every subject and discipline.

Environmental education supports inquiry-based learning, incorporates outdoor experiences into the curriculum, strengthens classroom instruction, fosters real-world learning and community relationships, and enhances learning outcomes. The overarching goal of environmental education is environmental literacy.

What is Environmental Literacy?

Environmental literacy describes the combination of knowledge, skills, attitudes, and behaviors that allow people to make informed decisions, to participate effectively in civic life, and to help strengthen community and environmental health (*North American Association for Environmental Education, "Framework for Assessing Environmental Literacy"*). Building environmental literacy is a continuous, ongoing learning process.

THE NORTH CAROLINA ENVIRONMENTAL LITERACY PLAN EMPHASIZES LEARNING THAT:

INCREASES KNOWLEDGE AND UNDERSTANDING OF PAST AND PRESENT ENVIRONMENTAL ISSUES

INCREASES UNDERSTANDING OF ECOLOGICAL, SOCIOCULTURAL, AND POLITICAL SYSTEMS, INCLUDING HOW THEY WORK AND HOW THEY RELATE TO ONE ANOTHER

DEVELOPS SKILLS AND ABILITIES NEEDED TO ANALYZE CHALLENGES, DETERMINE CAUSES, INVESTIGATE SOLUTIONS, AND EVALUATE THE EFFECTIVENESS OF INTERVENTIONS

IMPARTS AN ATTITUDE OF CONCERN, SELF-EFFICACY, AND A SENSE OF PERSONAL AND CIVIC RESPONSIBILITY THAT MOTIVATES INDIVIDUALS AND GROUPS TO SEEK SOLUTIONS TO ENVIRONMENTAL CHALLENGES THROUGH CIVIC ENGAGEMENT

EMPHASIZES RESPONSIBLE ENVIRONMENTAL DECISION-MAKING BASED ON SCIENTIFIC, ECONOMIC, AESTHETIC, POLITICAL, CULTURAL, AND ETHICAL CONSIDERATIONS

USES EVIDENCE AND EXPERIENCE TO DEFEND POSITIONS AND TO EVALUATE PLANS THAT ADDRESS AND SOLVE ENVIRONMENTAL CHALLENGES

Environmental literacy increases the capacity of individuals and groups to comprehend, integrate, and apply essential information about the environment. It enables useful dialogue and effective communication, embraces a broad spectrum of viewpoints and experiences, and fosters thoughtful problem-solving of environmental issues.

ENVIRONMENTAL LITERACY IS ESSENTIAL TO THE WELL-BEING OF OUR SHARED ENVIRONMENT.

Why a State Environmental Literacy Plan?

Many states have developed Environmental Literacy Plans specific to their needs and natural resources. The North American Association of Environmental Education (NAAEE) defines these plans as **"state-specific comprehensive frameworks that support school systems in expanding and improving environmental education programs"**

(NAAEE, "State Environmental Literacy Plans")

NAAEE HAS ALSO OUTLINED SOME OF THE CORE OBJECTIVES FOR ELPs:

- Ensure that **environmental education activities** are aligned with student graduation requirements and help achieve state education goals;
- Integrate environmental education fully, efficiently, and appropriately into **formal education systems**;
- Align **teacher professional development opportunities** in environmental education with student achievement goals in environmental literacy;
- Engage **underserved communities** through an inclusive process so that all stakeholders are beneficiaries of environmental education in schools;
- Involve **nonformal environmental education providers**, state natural resource agencies, community organizations, and other partners in school environmental education activities;
- Ensure **consistency, accuracy, and excellence** in environmental content knowledge.

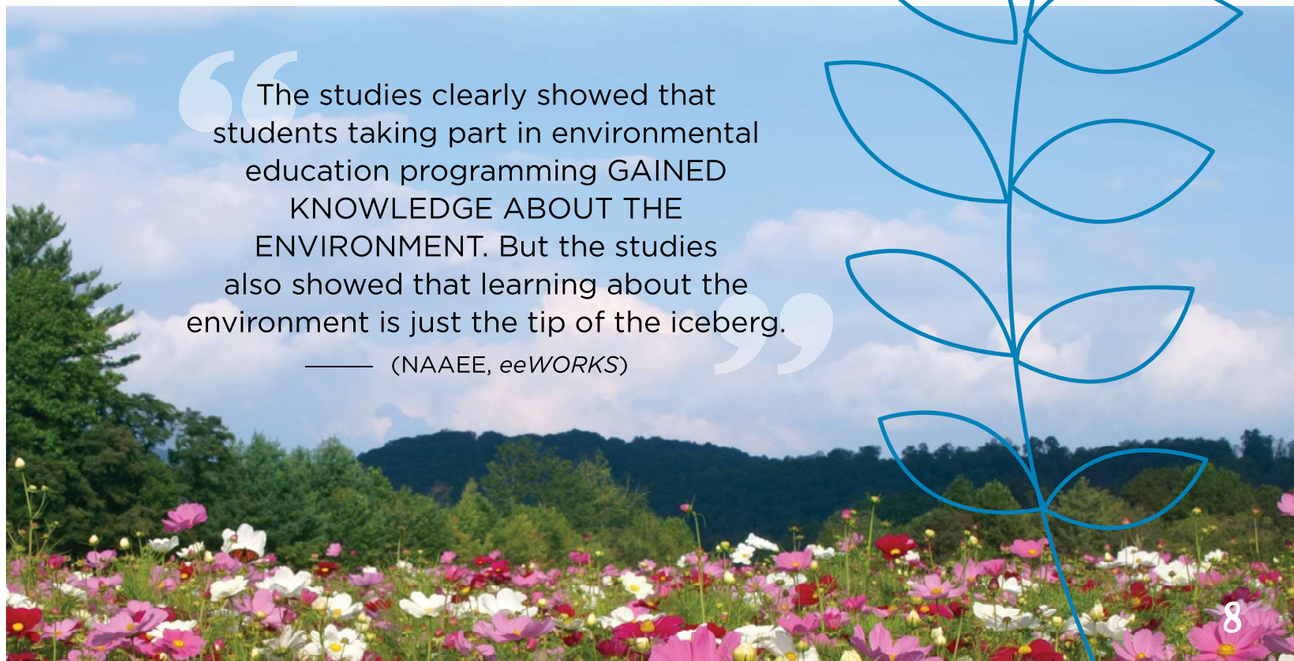
Environmental Education's Role in Increasing Environmental Literacy

Environmental education prepares students to understand, analyze, and address the environmental challenges that face our local communities, the state, and the nation. Educated community members are vital to recognizing, solving, and preventing environmental problems.

Education for environmental literacy helps students meet state academic standards while fostering the civic engagement skills needed to participate in the environmental decision-making process critical to North Carolina's public health and economy.

North Carolina's environment is not the mere backdrop for human activities. Human societies are intricately tied to natural systems. Like all life forms, humans rely on access to natural resources for survival and health. Our human systems – from agriculture and economic growth to community development – are inseparable from the health of natural systems. Individual, community, and government decisions profoundly impact the environment and, in turn, human societies.

Over the last few decades, thousands of studies have analyzed the effectiveness of environmental education.



> "The studies clearly showed that students taking part in environmental education programming GAINED KNOWLEDGE ABOUT THE ENVIRONMENT. But the studies also showed that learning about the environment is just the tip of the iceberg."
>
> —— (NAAEE, *eeWORKS*)

The current body of research has demonstrated that environmental education:

- ☑ Has widespread public support (*NEEF*)
- ☑ Improves standardized test scores and academic performance (*Bartosh et al.*)
- ☑ Supports physical, mental, and emotional health (*National Wildlife Federation*)
- ☑ Promotes 21st-century skills such as critical thinking, oral communication, analytical skills, problem-solving, and higher-order thinking (*Lloyd, Truong, and Gray*)
- ☑ Supports STEM topics and is interdisciplinary (*Bodzin*)
- ☑ Bolsters civic engagement and empowerment (*Birdsall*)
- ☑ Sparks stewardship behavior and environmental actions (*Birdsall*)
- ☑ Encourages students' personal growth by building teamwork, confidence, autonomy, and leadership skills (*Volk and Cheak*)
- ☑ Increases motivation and interest in learning (*Stone*)
- ☑ Is an "equalizer," allowing educators to cater to multiple student interests, skills, abilities, and needs (*Ernst and Monroe*)
- ☑ Helps improve teacher skills and classroom engagement (*National Environmental Education & Training Foundation*)
- ☑ Is a cost-effective investment, promoting multiple environmental and societal benefits (*Ardoin and Merrick*)
- ☑ Strengthens communities by connecting schools to local organizations and agencies (*Silverman and Corneau*)

Guiding Principles and Best Practices for Environmental Education

Environmental Education in Schools

Environmental education should not be approached as a separate school subject. Rather, it is an essential component of each school subject area, including English language arts, math, science, and social studies. Environmental content can be woven into lessons in all subjects to help students develop critical-thinking skills essential to STEM-based jobs. Environmental education requires asking and defining questions, planning and carrying out investigations, analyzing and interpreting data, constructing explanations, and designing solutions.

Incorporating nature-based learning in school settings benefits all children.

Nature-based learning boosts students' interest in learning, improves some grades, and reduces disruptive episodes and dropouts among students (*Kuo, Barnes, and Jordan*). Current evidence also indicates that experiences with nature help children acquire some of the skills, attitudes, and behaviors most needed in the 21st century as identified in NCDPI's Portrait of a Graduate, including adaptation, collaboration, and communication.

Lessons that include hands-on, place-based experiences encourage scientific inquiry, critical thinking, and problem-solving. Environmental education supports local, project-based investigations that are culturally relevant and inclusive. Partnerships between teachers, community-based organizations, and other agencies can enhance learning and provide real-life experiences that expose students to STEM careers and pathways (*Gupta et al.*). In addition, studies show that teachers and students benefit from outdoor learning (*Education Commission of the States*).

Environmental Education Outside of Schools

Environmental education programs and learning also occur outside of the school setting. Several agencies and organizations partner directly with teachers to provide authentic learning experiences for students on the school grounds, in the local community, and on field trips.

Additionally, in North Carolina more than 200 facilities offer extensive environmental education programming for students and professional development opportunities for teachers. These "environmental education centers" employ many trained nonformal educators who share resources and work together through the NC Association of Environmental Education Centers to build collective capacity.

When combined with formal classroom education, nonformal environmental education these experiences and lessons create meaningful learning opportunities and strengthen the learning ecosystem.

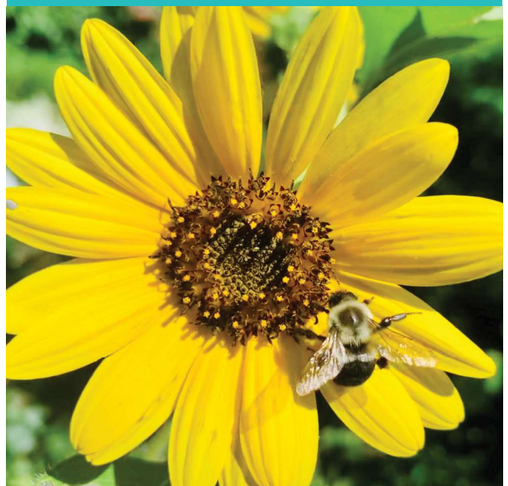
Linking Learning to the Sustainable Development Goals

Advancing environmental literacy at the state level also aligns with global initiatives. **The United Nations Sustainable Development Goals (SDGs) articulate 17 goals for global action to improve health and well-being for all people and the Earth by 2030.** Environmental literacy efforts in North Carolina complement the goals for quality education, specifically Target 4.7: "By 2030, ensure that all learners acquire the knowledge and skills needed to promote sustainable development, including, among others, education for sustainable development and sustainable lifestyles, human rights, gender equality, promotion of a culture of peace and non-violence, global citizenship and appreciation of cultural diversity and culture's contribution to sustainable development" (*United Nations*).

By linking to the SDGs, environmental educators can help students make connections between local and global issues, creating opportunities for students to develop critical systems thinking and learn how to take civic action (*Chung and Park*).

Reducing Barriers and Increasing Access For All Students

A primary goal of this plan is to increase environmental literacy among all students in North Carolina so they are prepared for future careers and challenges when they leave school. Accordingly, **environmental education in North Carolina must be equitable and inclusive.** Environmental education has been shown to provide diverse learning opportunities that support all learners (NAAEE, *eeWORKS*). Because educators need specific skills and knowledge to meet the needs of diverse learners and students with disabilities when using environmental education activities and resources, professional development opportunities focused on diversity and inclusion topics are needed. **Environmental education facilities and programs also play an important role in providing environmental education for all.** These facilities and programs need support and strategies so students of all abilities and from all of North Carolina's counties can access programming and resources.



North Carolina has a strong connection to the history of environmental justice in the United States, dating back to community activism efforts surrounding the Warren County landfill in the early 1980s.

It is important that teachers and students understand and can analyze the historical and cultural context of past environmental problems and issues. **Teachers and environmental education practitioners play an important role** in creating opportunities for students to apply the knowledge and skills gained through environmental education to current and ongoing environmental challenges. Resources and professional development for teachers and nonformal environmental educators that incorporate environmental justice history and topics are also essential to achieving environmental literacy in North Carolina.

"Environmental justice is the fair treatment and meaningful involvement of all people **regardless of race, color, national origin, or income,** with respect to the development, implementation, and enforcement of environmental laws, regulations, and policies."

— U.S. ENVIRONMENTAL PROTECTION AGENCY

The Arts and Science Communication

Art education can enrich environmental education, providing an additional means to enhance learners' ecological literacy (*Inwood*). Arts classes like visual arts, dance, theater, and music equip students with vital tools for success, while also nurturing self-expression and encouraging students to explore their creativity. The arts also offer teachers innovative strategies to engage students in creative learning, leading to improved test scores and reduced dropout rates (*Ruppert*).

Art education strengthens creativity, problem-solving, and collaboration, while also fostering environmental literacy by helping environmental topics resonate with students on both cognitive and emotional levels.

Effective science communication also plays a critical role in furthering environmental literacy. Science communicators help students comprehend complex environmental issues and policies, and introduce students to scientists from various backgrounds and fields, which opens doors to diverse career opportunities and helps students understand current trends (*Clark et al.*).

Career Pathways and Workforce Development

Environmental education helps students comprehend the impact of human activities on Earth's natural systems and encourages them to create solutions to prevent and mitigate environmental problems. As rapidly emergent technology changes our way of life, North Carolina will increasingly rely upon a workforce familiar with environmental issues to stay competitive and resilient. **Engineering, computer science, environmental science, sustainable energy, ecotourism, geosciences, digital arts, biotechnology, forestry, farming, and other Science, Technology, Engineering, and Mathematics (STEM) fields are essential to our state's economic future and are needed to solve our complex environmental challenges.**

The place-based nature of environmental education makes it a natural first step in introducing younger students to STEM careers and can actively engage older students in Career and Technical Education (CTE) programs in high schools, community colleges, and universities. These connections are essential to developing a workforce that can meet the environmental challenges and opportunities of the modern world through work in public policy, education, climate resiliency, clean energy, and other environmental technologies.

Protecting the state's environment is also crucial to our natural resources-based tourism industry. North Carolina's diverse ecology and natural resources put it among the top ten most visited states in the US. Tourism is vital to our economy and generates employment for over 225,000 North Carolinians (*North Carolina Department of Commerce*). Environmental education is an effective means to instill a sense of environmental stewardship. It helps students develop the skills and knowledge needed for various environmental management, conservation, and natural and cultural tourism-related careers.

Education for environmental literacy supports existing and emerging career pathways in STEM fields necessary for North Carolina's resiliency and economic growth.

Development of the Plan

The North Carolina ELP was first published in 2010. It has served as a guiding framework for teachers, schools, and school districts to improve the environmental literacy of their students.

In 2022, the Department of Environmental Quality (DEQ) and the Department of Public Instruction (DPI) partnered with Environmental Educators of North Carolina (EENC), the state's nonprofit professional development organization for environmental education, to revise the original plan. **The goal of the revision was to update the plan to meet the current needs of K-12 students and include goals and recommendations that reflect the many places and spaces where environmental education occurs.**

The plan underwent multiple revisions, guided by feedback and recommendations from a review committee with a wide range of experience, expertise, and perspectives within the environmental education sector. Following a public review, the final document represents the collective vision to advance environmental literacy across the state.

THE REVISED ELP IS STRUCTURED AROUND **SIX GOALS**

1

INCREASE THE NUMBER OF STUDENTS WHO PARTICIPATE IN ENVIRONMENTAL EDUCATION ACTIVITIES THAT STRENGTHEN ENVIRONMENTAL LITERACY AND PREPARE THEM FOR FUTURE CAREERS AND CHALLENGES

2

IMPROVE ACADEMIC ACHIEVEMENT FOR ALL K-12 STUDENTS

3

INCREASE THE NUMBER OF TEACHERS WHO HAVE THE KNOWLEDGE AND SKILLS TO INTEGRATE ENVIRONMENTAL EDUCATION ACROSS SUBJECTS AND HAVE ACCESS TO PROFESSIONAL DEVELOPMENT IN ENVIRONMENTAL EDUCATION

4

INCREASE THE USE OF PLACE-BASED LEARNING, FIELD EXPERIENCES, AND PUBLIC AND CITIZEN/ COMMUNITY SCIENCE

5

PREPARE STUDENTS FOR CAREERS IN STEM AND OTHER FIELDS THAT REQUIRE THE 21ST CENTURY SKILLS OF COMMUNICATION, COLLABORATION, CRITICAL THINKING, AND CREATIVITY

6

INCREASE FUNDING FOR ENVIRONMENTAL LITERACY INITIATIVES AND INCREASE SUPPORT FOR THESE INITIATIVES AMONG LEADERS IN THE STATE

THE PLAN OUTLINES
A VARIETY OF STRATEGIES
FOR ACHIEVING THESE GOALS, INCLUDING:

PROVIDE GUIDANCE AND RESOURCES

Provide guidance and resources to integrate environmental education into the K-12 curriculum and to align environmental education activities and programs with science and other school standards.

PROVIDE TEACHERS WITH RESOURCES

Provide teachers with access to high-quality environmental education resources and professional development.

PROVIDE TRAINING

Provide resources and training to teachers on how to use school grounds and facilities for teaching the curriculum.

FACILITATE COLLABORATION

Facilitate collaboration between formal and nonformal educators to create opportunities for students to learn about the environment outside of the classroom.

SUPPORT COLLABORATIONS

Support collaborations and partnerships between schools and community organizations, nonformal educators, state-level agencies, environmental education centers, institutes of higher education, and conservation organizations.

PROVIDE ENCOURAGEMENT

Encourage educators, parents, policymakers, and community leaders to use the ELP as a framework for developing environmental literacy among our state's students.

PRIORITIZE FUNDING

Identify and prioritize funding opportunities that support environmental literacy initiatives identified in this plan.

How to Use the Environmental Literacy Plan

The North Carolina ELP provides a guiding framework for integrating environmental literacy into K-12 education. It supports schools and teachers in using the natural environment to engage students and enrich and improve academic performance. **The plan is not intended to add to the workload of educators; rather, it is a resource for implementing environmental literacy into formal and nonformal education.** It can also be used to identify nonformal educators and institutions for support and to justify incorporating environmental literacy into student learning.

The plan provides a roadmap for increasing environmental literacy among our state's students and preparing them for STEM careers. It showcases how environmental literacy is essential to a well-rounded and equitable education and can be integrated across all disciplines. **The plan can help students meet state academic standards through an interdisciplinary approach that encourages systems thinking, real-world problem-solving, work readiness skills, and community-based learning opportunities.**

This plan serves as a guiding document for all North Carolina educators supporting K-12 learning within and beyond schools. **It offers recommendations and general strategies, not a list of mandated, specific actions. It is nonpartisan and does not advocate for specific environmental issues.** It looks at environmental learning holistically across grades and subjects; it does not include a list of environmental standards by grade, nor does it provide a recommended pacing sequence of content within a grade. This plan covers the breadth of environmental literacy and, as such, does not recommend specific curricula or activities.

> This plan seeks to support all North Carolina's students, not just students enrolled in a single type of school, academic program, or course.

The plan is structured into five focus areas: K-12 Formal Education, School Grounds and Facilities, Place-based and Outdoor Learning, Community Collaborations and Partnerships, and Professional Development. Each focus area section includes an overview, a brief explanation of its importance, and overarching goals. Specific strategies for achieving these goals are described in the companion "Implementing the ELP" guides, which are tailored to specific audiences, such as "Schools and Classrooms" and "Nonformal Educators." Teachers, parents, policymakers, and nonformal educators are essential to developing student environmental literacy; therefore, additional guides will continue to be developed after this publication.

Here are some specific examples of how the plan can be used:

Teachers can use the plan to identify environmental literacy resources and activities that are aligned with their curriculum

Schools can use the plan to develop a school-wide environmental literacy initiative

Communities can use the plan to identify opportunities for collaboration and partnerships on environmental education projects

Nonformal educators can use the plan to develop programs and activities that increase environmental literacy in grades K-12

Educators, parents, policymakers, and nonformal educators can use it as a framework for developing environmental literacy among our state's students

State leaders can use it to identify and prioritize funding for environmental literacy initiatives

FOCUS AREA:

K-12 EDUCATION

Engaging in science encourages students' curiosity, interests, and prepares them for the broadest range of postsecondary opportunities, be it college, career, or military service. The 2023 K-12 Science Standards are designed to allow students to become active participants in science - building their understanding of the natural world through observations and investigations.

Overview

The North Carolina 2023 K-12 Science Standards are intended to foster conceptual understanding and help develop scientifically literate students. **The standards provide foundational knowledge and practices within each grade band and course.** The Science and Engineering Practices (SEP) are embedded in the standards to support a greater emphasis on how students develop science knowledge and the durable skills defined within the NC Portrait of a Graduate.

The K-12 Science Standards also support the development of environmental literacy through a required Earth/Environmental course for graduation, and the inclusion of environmental literacy concepts throughout the K-12 Science Standards. **Having the graduation requirement and the opportunity to teach science through an environmental lens has increased the number of students exposed to environmental content and outdoor learning opportunities.**

Why This Matters

Integrating environmental education into K-12 curricula benefits all students, promoting equitable access to high-quality instruction and providing all of our state's students the opportunity to reap the academic, physical, mental, and health benefits that environmental education provides (NAAEE, *eeWORKS*). **Research shows this approach levels the playing field, especially for those facing challenges in traditional academic contexts, such as students with disabilities** (*Schneller et al.*), girls (Stevenson et al.), and those from low-income communities (*Sprague, Berrigan, and Ekenga*).

North Carolina's environmental education and professional development programs provide teachers with activities, field experiences, and resources aligned with the NC Standard Course of Study. **Students benefit from hands-on activities, including outdoor learning, project-based learning, and citizen/community science projects,** that foster essential scientific skills such as observation, identification, demonstration, modeling, comparison, classification, and mapping.

Teaching through an environmental lens promotes personal and civic responsibility. By integrating environmental concepts into the curriculum, educators actively involve students in environmental topics, enabling them to grasp and address environmental issues effectively. This approach encourages critical thinking and fosters skill development across disciplines, providing deeper insights into subjects including history, geography, civics, current affairs, economics, and political science.

In addition to the science classroom, the social studies classroom offers an excellent platform to explore connections between human activities and environmental quality, and to investigate current political, economic, legal, and civic developments related to the environment.

As environmental historian Dr. Shelley Brooks has noted,

> "[t]he history–social science classroom is, therefore, an excellent place to teach students about the connections between human activities and environmental quality and to investigate the current political, economic, legal, and civic developments that shape and are shaped by the environment."
>
> *(— Schneller et al.)*

To fully integrate environmental literacy, collaboration is vital among science, math, humanities, social studies, and arts teachers, as well as school counselors, career and technical education (CTE) teachers, and career coordinators. **These professionals play a crucial role in making students aware of various career and college options that emphasize environmental literacy, showcasing a wide array of STEM and environmental careers and their connections to the environment.** CTE courses provide valuable real-world experiences in environmental and related fields. Environmental and STEM careers require diverse skill sets, including effective communication with colleagues, clients, customers, and the public. All careers benefit from understanding environmental science, which can be strengthened by incorporating environmental literacy concepts into the curriculum.

Integrating environmental education in K-12 curricula engages students, improves academic achievement, and fosters personal and civic responsibility. Through collaboration, and by utilizing quality resources and professional development opportunities, educators can effectively incorporate environmental literacy concepts into all subject areas, equipping students with essential skills for their future careers and for civic involvement in important environmental issues.

Goals FOR K-12 EDUCATION

1. Increase the number of schools that provide connected and sustained opportunities for students to participate in direct outdoor learning experiences and hands-on classroom activities at every grade level and across disciplines (math, science, English language arts, social studies, and art).
2. Increase the number of students actively engaged in environmental issues in the local community through service learning, citizen/community science, and project-based learning experiences.
3. Prepare students to work in STEM fields related to environmental challenges that directly impact human health and economic prosperity.
4. Provide opportunities for students to develop competencies from NCDPI's portrait of a graduate: adaptability, collaboration, communication, critical thinking, empathy, learner's mindset, and personal responsibility.
5. Increase funding for K-12 schools to provide environmental education, STEM, and outdoor learning opportunities for their students, prioritizing schools in counties with limited funding and resources.

FOCUS AREA:

SCHOOL GROUNDS AND FACILITIES

School grounds and facilities are essential to the effort to increase students' environmental literacy. Schools can be real-life models for sustainable living practices by demonstrating how to reduce a building's environmental footprint through sustainable energy, waste, and water management. Outdoor classrooms on school campuses may include restored natural habitats, gardens, bogs, amphitheaters, and other natural learning areas.

Overview

Outdoor classrooms can be used as living laboratories for STEM-based problem-solving and citizen/community science programs that provide real-world connections and the use of accurate data.

Green building practices in new school constructions and green retrofits for older buildings can each play a vital role in promoting student environmental literacy. New constructions create tangible examples of sustainability, fostering environmental awareness and hands-on learning opportunities for students. Retrofitting demonstrates the impact of eco-friendly measures, involving students in activities like audits and problem-solving for a sustainable future. By integrating green practices, schools empower students to become responsible community members who are equipped with essential concepts and career skills for the future.

Gardening programs and farm-to-table lunch programs increase academic learning tied to science and nutrition and can help students understand food systems, from growing food to reducing food waste (*Blair*). Food waste from the cafeteria can become compost used to amend the soil in the school garden (*Barr et al.*). **Garden education can also enhance education about the cultural history of the land and Indigenous traditional ecological knowledge.**

Many schools need more access to outdoor space. Outdoor teaching materials and professional development help teachers better use their school grounds, but are often not reflected in school budgets. Thus, the schools that have the greatest access to these resources are generally those that leverage community support. To advance environmental literacy for all students in our state, this must change.

Why This Matters

The benefits of creating more sustainable school grounds and facilities are numerous and significant. Benefits include:

- Building technical job skills among students
- Developing environmentally responsible behavior among community members
- Improving physical and mental well-being
- Reducing school spending on utilities (Center for Green Schools)

Connecting classroom learning with nearby nature areas and outdoor campus features such as gardens, solar installations, and rainwater harvesting stations can make learning more relevant. Outdoor excursions into the surrounding natural environment can improve students' knowledge of local ecology (*Sobel*). Such applied learning experiences reinforce and supplement lessons learned in the classroom and afford students and teachers access to extended real-world learning opportunities. Schools can also use their grounds to provide opportunities for students to learn about the local environment across multiple disciplines.

Learning about sustainable energy, water, and food systems on school campuses opens career pathways and increases student adaptability, collaboration, communication, and critical thinking skills needed in the sustainability industry (*Bell*).

For example, hands-on learning about solar power could potentially increase a student's marketability for skilled jobs related to renewable energy. Possibilities exist to extend environmental education to sustainable skilled trades related to construction, design, and facilities operations, positioning students for careers in emerging sustainability industries.

When sustainable practices are implemented at school, students develop environmentally responsible behavior. Gardening programs have long been documented to improve students' environmental attitudes (*Skelly and Bradley*). Native habitats on school grounds, such as pollinator waystations, can also be important spaces for students to learn about protecting local wildlife and plant communities, while at the same time supporting greater conservation efforts. This can create deeper investment in one's learning journey, a greater sense of place-based belonging, and increased knowledge of the skills necessary for the stewardship of our natural resources. These benefits extend across subject matter and cultures.

Studies indicate that outdoor learning also has numerous physical and mental health benefits. Not only do nature-based educational programs increase physical activity, but they also stimulate intellectual development, academic motivation, and psychological well-being (*Solomonian et al.*). People who participate in gardening programs tend to eat more fresh produce, which improves human health (*Barnidge et al.*). When students examine their own food choices, they see how human behavior impacts the environment (*Barr, Cross, and Dunbar*).

In addition to the benefits for students, there are also budgetary benefits. Sustainable practices such as adopting energy and water reduction practices, composting and recycling programs, more energy-efficient lighting, and installing solar panels can save money and enhance student learning. Using photovoltaic panels and proper wall and roof insulation can contribute significantly to school energy savings. Insulation improvements can produce energy savings compared to minimal construction codes (*Hutton*). An additional strategy for improving energy performance involves sustainable heating, ventilation, and air conditioning, which use more energy in schools than any other single component (*Hutton*).

Goals FOR SCHOOL GROUNDS AND FACILITIES

1. Increase school staff knowledge, skills, and abilities related to creating and maintaining on-campus outdoor learning spaces and resources.
2. Increase the number of schools with outdoor classrooms, native habitats, outdoor learning materials and resources, and campus-wide sustainability plans.
3. Increase the number of schools participating in national and regional recognition programs for sustainability efforts.
4. Improve access to funding pathways to assist schools with limited resources in obtaining support for staff education and on-site improvements for outdoor learning.

FOCUS AREA:

PLACE-BASED AND OUTDOOR LEARNING

Place-based learning focuses on how something is taught. Outdoor learning focuses on where it is taught. Outdoor learning can occur in local, state, or national parks, and in gardens, farms, forests, and arboretums. Inquiry-based learning can also take place in more common surroundings, including playgrounds, sidewalks, gardens, and lawns. From onsite streams to sidewalk cracks, a wide variety of outdoor spaces can be used for outdoor instruction. Beyond the mental and physical health benefits of being outside, place-based learning is a way to foster connections to the environment and engage students in immersive and dynamic real-world learning experiences.

Overview

One of the foundational principles of environmental education as a practice is the importance of where one lives: placed-based, outdoor learning (NAAEE, *K-12 Environmental Education Guidelines*). Place-based and outdoor learning are essential for developing environmental literacy. Both can occur on or off the school grounds. Place-based experiences ground learning in the local community, including the physical environment, people, cultures, history, and more. This learning is authentic, inquiry-based, and student-centered. It encourages students to explore community needs and issues and to seek solutions to community, regional, and world problems.

Why This Matters

While effective place-based and outdoor learning requires professional development and appropriate resources, there are simple and cost-effective ways that educators can help students connect their classroom learning with the world around them. **Place-based learning connects with all students, which helps close achievement gaps and provides opportunities for students to experience green spaces and feel comfortable outdoors.** Youth of Color are often limited to schools with little green space, and place-based learning suggests how students can learn using those school grounds.

Professor David Sobel notes that place-based education "uses the local community and environment as the starting place for curriculum learning, strengthening community bonds, appreciation for the natural world, and a commitment to citizen engagement" (*Sobel*).

Similarly, outdoor learning provides teachers and students with a laboratory to observe and test hypotheses. It engages them in the natural world and helps them make real-world connections to what they learn in the classroom. "As children observe, reflect, record, and share nature's patterns and rhythms, they are participating in a process that promotes scientific and ecological awareness, problem-solving, and creativity" (*Hensley*). **Outdoor learning is not just for science education – for example, mathematics concepts can be taught using real-life applications from forestry, social studies classes can use the schoolyard for teaching maps and landforms, and students can use outdoor observation journals for writing.** As author Cathy James observes, "Anything you can teach in an indoor classroom can be taught outdoors, often in ways that are more enjoyable for children" (*James*).

Goals FOR PLACE-BASED AND OUTDOOR LEARNING

1. Increase the number of students who regularly participate in place-based and outdoor learning.
2. Increase teachers' skills, comfort, confidence, and frequency in leading place-based and outdoor learning experiences.
3. Improve funding and resources to increase access to curriculum resources, local content experts, and equipment needed for place-based and outdoor learning.

FOCUS AREA:

COMMUNITY COLLABORATIONS AND PARTNERSHIPS

Creating connections to the local community and partnering with nonformal educators and organizations takes students beyond the classroom and creates project-based and place-based experiences essential for environmental literacy. Connections to the community and the local environment make instruction relevant to students and provide real-world experiences. These experiences help students connect to STEM career pathways.

Overview

North Carolina has one of the strongest nonformal environmental education communities in the country (*North Carolina Department of Environmental Quality*). It includes colleges and universities, after-school programs, nonprofit organizations, conservation organizations, land trusts, public libraries, and environmental education centers such as parks and forests, nature and science centers, arboretums and public gardens, museums, coastal reserves, community centers, aquariums, and many others. **Environmental education centers and nonformal educators are critical for the education and inspiration of students: they contribute significantly to local economies and local communities throughout North Carolina, and they help to preserve land, habitats, cultural access, and ecological heritage for generations to come.**

One pathway for collaboration is the NC Environmental Education Certification program. A component of this program requires educators to complete a community-based partnership project to earn their certification. **Teachers and nonformal educators enrolled in the certification program often partner with schools and other education organizations to create wildlife habitats, interpretive trails, ponds, weather stations, species maps, citizen/community science projects, and other community-based projects.** Such projects can benefit the local environment and invigorate communities while providing outdoor learning environments for students.

Nonformal educators connect schools with the local environment and place-based learning.

EXAMPLES INCLUDE:

- **Monitoring local waterways for macroinvertebrates and learning about water quality.**
- **Installing and studying a native plant habitat on the school grounds.**
- **Creation of mini-bogs to study the importance of wetlands.**

Nonformal education programs also support healthy lifestyles and mental health through outdoor engagement and activity (NAAEE, *eeWORKS*). Nonformal educators support teaching all disciplines through an environmental lens that instills scientific inquiry, critical thinking, and problem-solving through hands-on experiences. Nonformal environmental education is adaptive to all learners regardless of their ability.

In 2011, the North Carolina's Department of Public Instruction and the Department of Environmental Quality's Office of Environmental Education and Public Affairs embarked on a simple yet effective model to build integral connections between formal and nonformal educators to support student learning. This partnership has strengthened efforts to engage students in both in-school and out-of-school opportunities and to develop learning communities that advance science education in the state (*Hall et al.*).

This collaboration has brought hundreds of educators together through an annual nonformal educators' meeting that encourages partnerships among nonformal and formal educators, schools, and school districts.

Why This Matters

Meaningful collaborations between teachers and nonformal educators help develop environmental literacy by extending and enhancing environmental education for K-12 students beyond the classroom. The hands-on and immersive experiences often led by nonformal educators increase motivation and interest in learning. **These experiences often serve as an "equalizer," allowing educators to cater to multiple student interests, skills, abilities, and needs** (*Ernst and Monroe*). Learning science in nonformal environments also encourages students to pursue careers in science fields (*National Research Council*).

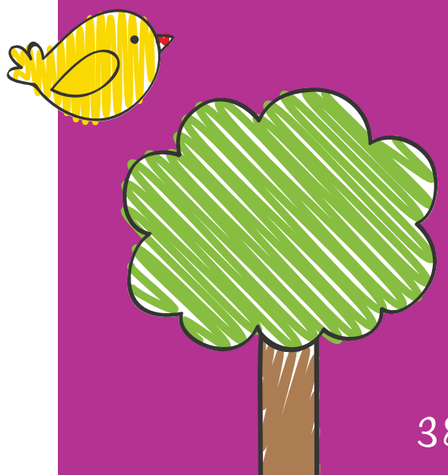
Through partnerships, diverse and community-based environmental programming is available to students, benefiting the formal and nonformal education community. Partnerships between nonformal science organizations and diverse community-based organizations can contribute to inclusive and equitable science learning. **When experiences for students are designed in partnership with diverse communities that are also focused on local issues, learning becomes more engaging, relevant, and inclusive for students.** Participation in nonformal experiences can improve science learning for students from groups who are historically underrepresented in science (*National Research Council*).

Many nonformal educators partner with teachers and schools to utilize natural areas and trails that allow students to experience the state's unique ecology firsthand, and provide the physical and mental health benefits of outdoor learning. Nonformal educators are often content experts on various environmental topics, including individual plant and animal biology, local ecosystems, ecosystem threats and protections, soil science, urban stream ecology, and stormwater.

Environmental education also frequently spurs interest and participation in public service and leadership projects with multiple beneficiaries, e.g., schools, faith-based organizations, public parks, low-income neighborhoods, and seniors. Community members are essential for addressing, preventing, and solving local environmental problems.

Goals FOR COMMUNITY COLLABORATIONS AND PARTNERSHIPS

1. Increase partnerships between teachers, schools, school districts, and nonformal educators to better support student learning during and beyond the school day.
2. Increase students' exposure to careers in science and environmental STEM fields.
3. Prepare students with the skills and tools to solve the most challenging environmental issues impacting human health and economic prosperity.
4. Provide funding to support collaborations and partnerships between schools, nonformal educators, science professionals, businesses, organizations, and agencies.



FOCUS AREA:

EDUCATOR PROFESSIONAL DEVELOPMENT

Many programs in North Carolina provide quality professional development (PD) programs to help teachers and nonformal educators improve their environmental content knowledge, their ability to teach about environmental issues, and their outdoor teaching skills. Many of the curriculum guides used in these programs correlate with the state's required K-12 Standard Course of Study and can be used by educators to teach multiple subjects across grade levels; however, PD providers need to make more teachers aware of PD offerings and curriculum-relevant resources.

Overview

Colleges and universities, statewide agencies and organizations, and environmental education facilities offer professional development programs in environmental education throughout the state. **More than 200 facilities identified as environmental education centers provide quality environmental education programming.** These centers employ many nonformal educators who provide direct education to students and community members and provide PD opportunities for teachers.

The North Carolina Environmental Education Certification Program, administered by the NC Office of Environmental Education and Public Affairs, encourages professional development in environmental education and recognizes educators committed to environmental stewardship. **It establishes standards for professional excellence in environmental education for formal and nonformal educators; provides educators with content knowledge, practice in environmental teaching methods, and field experiences with trained instructors; and fosters community leadership.** It is also a preferred credential for hiring nonformal educators in various positions. Certified educators are introduced to various environmental education resources, including educational materials, facilities, and organizations. The program builds capacity for environmental education in the state by enhancing the ability of educators and organizations to provide quality programs and resources that benefit local communities and that increase investment in the future of North Carolina's environment.

Environmental education professional development can also meet the requirements for Continuing Education Units (CEUs) for our state's Professional Educator's License renewal. Facilitators of these workshops often provide documentation that teachers can submit to their public school unit for approval.

Why This Matters

Formal and nonformal educators often experience training gaps in environmental education. By providing enhanced and ongoing professional development opportunities, formal and nonformal educators gain access to vetted curricula correlated to the NC K-12 Standard Course of Study. **These curricula contain age-appropriate, interdisciplinary, place-based instruction and incorporate best practices in environmental education.** Many professional development programs focus on modeling effective outdoor teaching methods and how to successfully teach through an environmental lens.

Professional educators working in and outside of the classroom often enter the field with gaps in skills and knowledge related to environmental education. **Providing information and increasing opportunities to build confidence when teaching outdoors is key to building environmental content knowledge –especially for elementary teachers** (*Ham and Sewing*). In contrast, many nonformal educators enter the field with minimal training in teaching best practices. So, while these nonformal educators may be comfortable being outdoors, they need training with not only the environmental content, but also the pedagogical best practices (*Wiek, Withycombe, and Redman*).

Effective professional development can also elevate all practitioners. It provides engaging tools and resources for educators and builds awareness of the best practices for high-quality instruction.

Professional development can provide North Carolina-specific content and connections that increase place-based learning and build community among educators. When teachers and nonformal educators learn from each other, they foster relationships that can result in future collaborations, a continued exchange of ideas, and mutual support.

Goals FOR EDUCATOR PROFESSIONAL DEVELOPMENT

1. Increase current and future educators' access to training that strengthens their pedagogical practices and cultural competency, increases awareness of existing curricula, expands their environmental content knowledge, and increases confidence in teaching outdoors.
2. Create a community of practice that allows classroom teachers, nonformal educators, and others from the environmental education community to learn from one another and collaborate.
3. Recognize and reward educators for their commitment to environmental stewardship and community leadership.
4. Increase the number of employers considering environmental education certification, workshop certificates, and other credentials provided by environmental education professional development to demonstrate progress or expertise in hiring, advancement, and performance reviews.
5. Increase the number of teachers who utilize environmental education professional development to obtain CEU credits for teaching licensure renewal.
6. Increase funding and leadership support for teacher professional development in environmental education.

North Carolina’s well-being, health, and economic growth are inseparable from the quality of its environment.

Conclusion

The North Carolina Environmental Literacy Plan aims to enhance students’ environmental literacy by providing them with essential content, experiences, and support. It prepares future generations to address significant environmental challenges present in both North Carolina and the United States, including air and water pollution, food waste, plastic and chemical pollution, destruction of natural habitats, and declining species populations. These pressing issues are further exacerbated by the impact of climate change, leading to extreme weather events, flooding, and the spread of vector-borne diseases that affect urban, suburban, and rural communities.

The environmental challenges facing our state and country are considerable and complex. Increasing environmental literacy across the K-12 population strengthens our ability to analyze our shared problems and make the sound environmental decisions required to improve communities and sustain future generations.

This critical moment is an opportunity for us to improve environmental literacy. We can develop economies that work in concert with our ecological systems. We can equip North Carolina’s students with the knowledge to solve the existential environmental problems they and future generations face. We can increase student understanding of the ways they may engage in civic life.

The Environmental Literacy Plan emphasizes the need for equitable investment in environmental education and literacy. By prioritizing equity in environmental education, we ensure a brighter future where North Carolina thrives, guided by the responsible stewardship of its environment. Students must possess the knowledge and skills required to protect themselves, their communities, and our state and nation from the perils of environmental harm.

Glossary

For the purposes of the North Carolina Environmental Literacy Plan:

Citizen/Community Science
The involvement of the public in scientific research. These non-professionals contribute to data collection, analysis, and interpretation, promoting public engagement and advancing scientific knowledge.

Environmental Education
The curriculum, resources, activities, and instruction that help individuals develop the awareness, knowledge, and skills needed to make informed environmental decisions for themselves and their communities. It is essential in achieving environmental literacy. It is for all ages and often incorporates direct experiences and learning in the environment.

Environmental Education Centers
Facilities that provide both active and passive environmental education opportunities and programs for schools and the public, including outdoor experiences, exhibits, workshops, and classes. They serve as a valuable educational resource for classroom teachers, parents, informal educators, and their communities. These facilities may include nature and science museums; local, state, and national parks; coastal reserves; educational state forests; aquariums, arboretums, and botanical gardens; and many others. The NC Office of Environmental Education and Public Affairs and the NC Association of Environmental Education Centers identify more than 200 of these facilities.

Environmental Justice
As defined by the US Environmental Protection Agency, "is the fair treatment and meaningful involvement of all people regardless of race, color, national origin, or income, with respect to the development, implementation, and enforcement of environmental laws, regulations, and policies."

Environmental Literacy
Having the knowledge, skills, and ability to practice personal and civic responsibility and make informed decisions about complex environmental issues affecting the economy, public health and safety, and shared natural resources on which life depends.

Formal Education
Instruction and instructional activities in public, private, and charter schools, homeschools, and homeschool groups that follow assigned or selected standards and curriculum. It includes instruction at the college and university level.

Informal or Nonformal Education
Includes learning in parks, coastal reserves, gardens and arboretums, science and nature centers, community centers, youth camps, and similar public settings. The audience includes adults, families, and school-aged children. Informal education generally describes lifelong learning during one's experiences and interactions. In contrast, nonformal education describes a structured and facilitated learning experience or set of learning experiences outside of the school system, often associated with community groups, nonprofit organizations, and government program providers (Smith). Educators in these settings may still be highly trained and experienced and often correlate their education offerings to the needs and standards of the formal school groups they serve.

Outdoor Learning Environments
Spaces outside the indoor classroom that provide an additional or enhanced learning setting for observation, exploration, and interaction with nature and the environment. An outdoor learning environment should be used for more than science education or nature study, including reading, math, and other subjects. Ideally, these are planned spaces and may combine the existing environment and introduced plants, rocks, logs, etc. They may also include functional structures to enhance learning and to provide a transition to indoor spaces, such as decks, stages, paths, benches, sunshades, or other features.

Place-based Learning
Grounds learning in the local community by using or including the local natural and built environment and an area's people, cultures, history, and more. It is authentic, inquiry-based, student-centered, and participatory. It encourages students to explore community needs and issues and to seek solutions to community, regional, and world problems.

Project-based Learning
An active, hands-on, student-centered approach involving students in meaningful, real-world projects. Ideally, students explore and respond to authentic and engaging questions, problems, or challenges.

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NC Environmental Literacy Plan: Goals at A Glance

K-12 Education Focus Area

1. Increase the number of schools that provide connected and sustained opportunities for students to participate in direct outdoor learning experiences and hands-on classroom activities at every grade level and across disciplines (math, science, English language arts, social studies, and art).
2. Increase the number of students actively engaged in environmental issues in the local community through service learning, citizen/community science, and project-based learning experiences.
3. Prepare students to work in STEM fields related to environmental challenges that directly impact human health and economic prosperity.
4. Provide opportunities for students to develop competencies of NCDPI's portrait of a graduate: adaptability, collaboration, communication, critical thinking, empathy, learner's mindset, and personal responsibility.
5. Increase funding for K-12 schools to provide environmental education, STEM, and outdoor learning opportunities for their students, prioritizing schools in counties with limited funding and resources.

School Grounds and Facilities Focus Area

1. Increase school staff knowledge, skills, and abilities related to creating and maintaining on-campus outdoor learning spaces and resources.
2. Increase the number of schools with outdoor classrooms, native habitats, outdoor learning materials and resources, and campus-wide sustainability plans.
3. Increase the number of schools participating in national and regional recognition programs for sustainability efforts.
4. Improve access to funding pathways to assist schools with limited resources in obtaining support for staff education and on-site improvements for outdoor learning.

Place-Based and Outdoor Learning Focus Area

1. Increase the number of students who regularly participate in place-based and outdoor learning.
2. Increase teachers' skills, comfort, confidence, and frequency in leading place-based and outdoor learning experiences.
3. Improve funding and resources to increase access to curriculum resources, local content experts, and equipment needed for place-based and outdoor learning.

Guides for implementing the NC K-12 Environmental Literacy Plan can be found online by audience (Schools and Classrooms, Nonformal EE Providers, Statewide Agencies and Organizations, Higher Education, Community Organizations and Conservation Groups) at www.eenorthcarolina.org. The implementation guides are designed to provide different audiences with strategies for implementing the environmental literacy plan. The guides are living documents intended to be continually revised and updated.

Community Collaborations and Partnerships Focus Area

1. Increase partnerships between teachers, schools, school districts, and nonformal educators to better support student learning during and beyond the school day.
2. Increase students' exposure to careers in science and environmental STEM fields.
3. Prepare students with the skills and tools to solve the most challenging environmental issues impacting human health and economic prosperity.
4. Provide funding to support collaborations and partnerships between schools, nonformal educators, science professionals, businesses, organizations, and agencies.

Educator Professional Development Focus Area

1. Increase current and future educators' access to training that strengthens their pedagogical practices and cultural competency, increases awareness of existing curricula, expands their environmental content knowledge, and increases confidence in teaching outdoors.
2. Create a community of practice that allows classroom teachers, nonformal educators, and others from the environmental education community to learn from one another and collaborate.
3. Recognize and reward educators for their commitment to environmental stewardship and community leadership.
4. Increase the number of employers considering environmental education certification, workshop certificates, and other credentials provided by environmental education professional development to demonstrate progress or expertise in hiring, advancement, and performance reviews.
5. Increase the number of teachers who utilize environmental education professional development to obtain CEU credits for teaching licensure renewal.
6. Increase funding and leadership support for teacher professional development in environmental education.


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