

Eco-Schools USA Pathways K-4 Connection to the National Science Education Standards



A well-educated student is exposed to a well-rounded curriculum. It is the making of connections, conveyed by a rich core curriculum, which ultimately empowers students to develop convictions and reach their full academic and social potential.

U.S. Secretary of Education Arne Duncan

With a number of research studies to support the viability and success of environmental education in schools as well as the tremendous academic benefits and social impacts environmental education provides for students, National Wildlife Federation recognized the need and took charge by becoming the sole host organization for the International Eco-Schools program. Eco-Schools USA is a holistic program. It strives to make environmental awareness and action, **not additional curricula, but an intrinsic part of the life and culture of a school**, including students, teachers, administrative staff, non-teaching staff and parents, as well as the local community. Eco-Schools USA works to extend learning beyond the classroom and develop responsible environmental attitudes and commitments, both at home and in the wider community. Whether you are a teacher, student, administrator or facilities manager, the Eco-Schools USA program can benefit your school and local communities.

National Wildlife Federation has identified eight areas of primary focus or “pathways” to help schools become an Eco-School, Climate Change, Consumption and Waste, Energy, Global Dimensions, Green Hour, School Grounds, Transportation, and Water. The icons that represent each pathway can be seen above. In an effort to demonstrate that Eco-Schools USA can be interwoven through any teacher’s curriculum the pathways have been aligned to the National Science Education Standards from which all states base their state standards. On the following pages each content standard is shown with one or more of Eco-Schools USA’s pathways. These icons denote the pathways that can be targeted when teaching this content standard.

The eight categories of content standards are

- Unifying concepts and processes in science.
- Science as inquiry.
- Physical science.
- Life science.
- Earth and space science.
- Science and technology.
- Science in personal and social perspectives.
- History and nature of science.

The standard for unifying concepts and processes is presented for grades K-12, because the understanding and abilities associated with major conceptual and procedural schemes need to be developed over an entire education, and the unifying concepts and processes transcend disciplinary boundaries. The next seven categories are clustered for grades K-4, 5-8, and 9-12. Those clusters were selected based on a combination of factors, including cognitive development theory, the classroom experience of teachers, organization of schools, and the frameworks of other disciplinary-based standards.



Conceptual and procedural schemes unify science disciplines and provide students with powerful ideas to help them understand the natural world. Because of the underlying principles embodied in this standard, the understandings and abilities described here are repeated in the other content standards.

Unifying concepts and processes include

- Systems, order, and organization.
- Evidence, models, and explanation.
- Change, constancy, and measurement.
- Evolution and equilibrium.
- Form and function.

This standard describes some of the integrative schemes that can bring together students' many experiences in science education across grades K-12. The unifying concepts and processes standard can be the focus of instruction at any grade level but should always be closely linked to outcomes aligned with other content standards. In the early grades, instruction should establish the meaning and use of unifying concepts and processes—for example, what it means to measure and how to use measurement tools. At the upper grades, the standard should facilitate and enhance the learning of scientific concepts and principles by providing students with a big picture of scientific ideas—for example, how measurement is important in all scientific endeavors.

All users and reviewers are reminded that the content described is not a science curriculum. Content is what students should learn. Curriculum is the way content is organized and emphasized; it includes structure, organization, balance, and presentation of the content in the classroom.

National Science Education Standards, (1996)
National Committee on Science Education Standards and Assessment, National Research Council



Content Standard A Science as Inquiry



As a result of activities in grades K-4, all students should develop

- **Abilities necessary to do scientific inquiry**
 - Ask a question about objects, organisms, and events in the environment.
 - Plan and conduct a simple investigation.
 - Employ simple equipment and tools to gather data and extend the senses.
 - Use data to construct a reasonable explanation.
 - Communicate investigations and explanations.
- **Understanding about scientific inquiry**
 - Scientific investigations involve asking and answering a question and comparing the answer with what scientists already know about the world.
 - Scientists use different kinds of investigations depending on the questions they are trying to answer.
 - Simple instruments provide more information than scientists obtain using only their senses.
 - Scientists develop explanations using observations (evidence) and what they already know about the world (scientific knowledge). Good explanations are based on evidence from investigations.
 - Scientists make the results of their investigations public; they describe the investigations in ways that enable others to repeat the investigations.

Scientific inquiry is the backbone of a strong science classroom. Beginning from its foundations in kindergarten students are cognitively molded into scientists, becoming science literate young men and women. The pathways provide a haven of opportunities to invite students into inquiry as you, the educator facilitate student learning utilizing sound inquiry methods and strategies.

Check out NSTA's position statement on [scientific inquiry](#).

Content Standard B Physical Science



As a result of the activities in grades K-4, all students should develop an understanding of

- **Properties of objects and materials**
 - Objects have many observable properties, including size weight, shape, color, temperature, and the ability to react with other substances. Those properties can be measured using tools, such as rulers, balances, and thermometers.
 - Objects are made of one or more materials. Objects can be described by the properties of the materials from which they are made, and those properties can be used to separate or sort a group of objects or materials.
- **Light, heat, electricity, and magnetism**
 - Light travels in a straight line until it strikes an object. Light can be reflected by a mirror, refracted by a lens, or absorbed by the object.
 - Heat can be produced in many ways. Heat can move from one object to another by conduction.
 - Electricity in circuits can produce light and heat. Electrical circuits require a complete loop through which an electrical current can pass.

Matter is everywhere. Using materials designed for energy consumption such as light bulbs and listing the properties of matter for an Incandescent, CFL, and LED could be a potential activity as well as discussing and making a tree map about the energy pros and cons, energy consumption, etc. of each bulb. What type of energy does soil use? What are the properties of soil and of the sun?



**Content Standard C
Life Science**



As a result of activities in grades K-4, all students should develop understanding of

- **The Characteristics of Organisms**

- Organisms have basic needs. For example, animals need air, water, and food; plants require air, water, nutrients, and light. Organisms can survive only in environments in which their needs can be met. The world has many different environments, and distinct environments support the life of different types of organisms.
- The behavior of individual organisms is influenced by internal cues (such as hunger) and by external cues (such as a change in the environment). Humans and other organisms have senses that helps them detect internal and external cues.

- **Life Cycles of Organisms**

- Plants and animals have life cycles that include being born, developing into adults, reproducing, and eventually dying. The details of this life cycle are different for different organisms.
- Many characteristics of an organism are inherited from the parents of the organism, but other characteristics result from an individual's interactions with the environment.

- **Organisms and Environments**

- All animals depend on plants. Some animals eat plants for food. Other animals eat animals that eat the plants.
- An organism's patterns of behavior are related to the nature of that organism's environment, including the kinds and numbers of other organisms present, the availability of food and resources, and the physical characteristics of the environment. When the environment changes, some plants and animals survive and reproduce and others die or move to new locations.
- All organisms cause changes in the environment where they live. Some of these changes are detrimental to the organism or other organisms, whereas others are beneficial.
- Humans depend on their natural and constructed environments. Humans change environments in ways that can be either beneficial or detrimental for themselves and other organisms.

Probably one of the most obvious signs of climate change is seen through the lives of wildlife and the delicate web that ties all organisms together. Through inquiry students can learn each of the life science standards. For instance, polar bear's basic needs are not being met at this time-lack of shelter/habitat is causing problems with polar bear's ability to attain food and support their young. How will and are polar bears adapting to their environment? What would happen if the species were to become extinct? What would happen to this particular food chain?



**Content Standard D
Earth and Space Science**



As a result of activities in grades K-4, all students should develop an understanding of

- **Properties of Earth Materials**

- Earth materials are solid rocks and soils, water, and the gases of the atmosphere. The varied materials have different physical and chemical properties, which make them useful in different ways, for example, as building materials, as sources of fuel, or for growing the plants we use as food. Earth materials provide many of the resources that humans use.
- Soils have properties of color and texture, capacity to retain water, and ability to support the growth of many kinds of plants, including those in our food supply.

- **Objects in the Sky**

- The sun provides the light and heat necessary to maintain the temperature of the earth.

- **Changes in Earth and Sky**

- The surface of the earth changes. Some changes are due to slow processes, such as erosion and weathering, and some changes are due to rapid processes, such as landslides, volcanic eruptions, and earthquakes.
- Weather changes from day to day and over the seasons. Weather can be described by measurable quantities, such as temperature, wind direction and speed, and precipitation.

Earth and Space science are the foundations to understanding Earth as a part of a larger system and as a system itself, containing many intricate systems of its own. Climate change affects the lithosphere, hydrosphere, and the atmosphere—all studied in the **Earth and Space Science** standard. Students can track many of Earth's processes and compare them to past years. There are numerous opportunities for learning fundamental measurement and change over time concepts.



Content Standard E Science and Technology



climate change



consumption & waste



energy



green hour



school grounds



transportation



water

As a result of activities in grades K-4, all students should develop

- **Abilities of technological design**
 - Identify a problem.
 - Propose a solution.
 - Implementing proposed solution(s).
 - Evaluate a product or design.
 - Communicate a problem, design, and solution.
- **Understanding about science and technology**
 - People have always had questions about their world. Science is one way of answering questions and explaining the natural world.
 - People have always had problems and invented tools and techniques (ways of doing something) to solve problems. Trying to determine the effects of solutions help people avoid new problems.
 - Scientists and engineers often work in teams with different individuals doing different things to contribute to the results. This understanding focuses primarily on teams working together and secondarily, on the combination of scientist and engineer teams.
 - Women and men of all ages, backgrounds, and groups engage in a variety of scientific and technological work.
 - Tools help scientists make better observations, measurements, and equipment for investigations. They help scientists see, measure, and do things that they could not otherwise see, measure, and do.
- **Abilities to distinguish between natural objects and objects made by humans**
 - Some objects occur in nature; others have been designed and made by people to solve human problems and enhance the quality of life.
 - Objects can be categorized into two groups, natural and designed.

This standard ties in well with the inquiry method of teaching and is a true science teaching best practice. Eco-Action teams will find they go through this process often as they look for ideas and ways to green their school. Investigating STEM careers and engaging with local community members will demonstrate to students the need for competencies in science and technology. Computer skills are a must as we move toward the future in a green economy-build your student's confidence for using computers.



Content Standard F
Science in Personal and
Social Perspectives



As a result of activities in grades K-4 all students should develop understanding of

- **Characteristics and Changes in Populations**

- Human populations include groups of individuals living in a particular location. One important characteristic of human population is the population density-the number of individuals of a particular population that lives in a given amount of space.
- The size of a human population can increase or decrease. Populations will increase unless other factors such as disease or famine decrease the population.

- **Types of Resources**

- Resources are things that we get from the living and nonliving environments to meet the needs and wants of a population.
- Some resources are basic materials, such as air, water, and soil; some are produced from basic resources, such as food, fuel, and building materials; and some resources are nonmaterial, such as quiet places, beauty, security, and safety.
- The supply of many resources is limited. If used, resources can be extended through recycling and decreased use.

- **Changes in Environments**

- Environments are the space, conditions, and factors that affect an individual's and a population's ability to survive and their quality of life.
- Changes in environments can be natural or influenced by humans. Some changes are good, some changes are bad, and some are neither good nor bad. Pollution is a change in the environment that can influence the health, survival, or activities of organisms, including humans.
- Some environmental changes occur slowly, and others occur rapidly. Students should understand the different consequences of changing environments in small increments over long periods as compared with changing environments in large increments over short periods.

- **Science and Technology in Local Challenges**

- People continue inventing new ways of doing things, solving problems, and getting work done. New ideas and inventions often affect other people; sometimes the effects are good and sometimes they are bad. It is helpful to try to determine in advance how ideas and inventions will affect other people.
- Science and technology have greatly improved food quality and quantity, transportation, health, sanitation, and communication. These benefits of science and technology are not available to all of the people in the world.

Environmental education fits nicely with the *Science in Personal and Social Perspective* standard as there are many visuals to share with students to help them see how humans change their environment, use resources, and utilize science and technology to make differences around the world. There are many great inquiry based lessons available to help students in this cognitive age group begin to add basic ideas into what will become a robust brain folder about humans and their environment.

Check out this link in NSTA's [Science and Children](#) Journal for ideas on teaching children about natural resources.

Also check USGS: [EarthShots](#) for population characteristics and changes.



Science Content Standard G
History and Nature of Science



As a result of activities in grades K-4, all students should develop understanding of

- **Science as a Human Endeavor**

- Science and technology have been practiced by people for a long time.
- Men and women have made a variety of contributions throughout the history of science and technology.
- Although men and women using scientific inquiry have learned much about the objects events, and phenomena in nature, much more remains to be understood. Science will never be finished.
- Many people choose science as a career and devote their entire lives to studying it. Many people derive great pleasure from doing science.

While text books are a good supplement to a strong inquiry based classroom they often portray science as static-unchanging. This is a time to introduce women and men of all nationalities to children and recognize their scientific achievements. What we have learned from these scientists and how has what we have learned changed over time?

Check out Kids.gov and ScienceKids

