Wells National Estuarine Research Reserve

Research • Education • Stewardship

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Exploring Estuaries (Grades 3 – 5)

Next Generation Science Standards Alignment

"Within the Next Generation Science Standards (NGSS), there are three distinct and equally important dimensions to learning science. These dimensions are combined to form each standard – or performance expectation – and each dimension works with the other two to help students build a cohesive understanding of science over time."

1. **Disciplinary Core Ideas (DCI):** "DCIs are the key ideas in science that have broad importance within or across multiple science or engineering disciplines. These core ideas are grouped into the following domains."
    - Physical Science (PS), Life Science (LS), Earth and Space Science (ESS), Engineering Technology and Applications of Science (ETS)

2. **Crosscutting Concepts (CC):** "CCs help students explore connections across the four domains of science.
    - Patterns; Cause and Effect; Scale, Proportion, and Quantity; Systems and System Models; Energy and Matter; Structure and Function; Stability and Change

3. **Science and Engineering Practices (SEP):** "Science and Engineering Practices describe what scientists do to investigate the natural world and what engineers do to design and build systems."

Source: www.nextgenscience.org

Exploring Estuaries School Program

The following pages explain the alignment of Exploring Estuaries with NGSS Performance Expectations and the more general three dimensions of science. If interested in more detail, please don't hesitate to contact the Program Coordinator, Caryn Beiter, via phone or email. 207-646-1555x110, caryn@wellsnerr.org

Relevant Performance Expectations

The following are the specific performance expectations based on grade level (first number) and DCI (letters).

3-ESS3-1: Make a claim about the merit of a design solution that reduces the impacts of a weather-related hazard.

3-LS3-2: Use evidence to support the explanation that traits can be influenced by the environment.

3-LS4-3: Construct an argument with evidence that in a particular habitat some organisms can survive well, some survive less well, and some cannot survive at all.

3-LS4-4: Make a claim about the merit of a solution to a problem caused when the environment changes and the types of plants and animals that live there may change.

4-ESS3-1: Obtain and combine information to describe that energy and fuels are derived from natural resources and that their uses affect the environment.

4-ESS3-2: Generate multiple solutions to reduce the impacts of natural Earth processes on humans.

4-LS1-1: Construct an argument that plants and animals have internal and external structures that function to support survival, growth, behavior, and reproduction.

5-ESS3-1: Obtain and combine information about ways individual communities use science ideas to protect the Earth's resources and environment.

5-LS1-1: Support an argument that plants get the materials they need for growth chiefly from the air and water.

5-LS2-1: Develop a model to describe the movement of matter among plants, animals, decomposers, and the environment.

5-PS3-1: Use models to describe that energy in animals' food (used for body repair, growth, and motion and to maintain body warmth) was once energy from the sun.

Disciplinary Core Ideas (DCI)

ESS2.C: The Role of Water in Earth's Surface Processes
Nearly all of Earth's available water is in the ocean. Most fresh water is in glaciers or underground; only a tiny fraction is in streams, lakes, wetlands, and in the atmosphere.

ESS3.A: Natural Resources
Energy and fuels that humans use are derived from natural sources, and their use affects the environment in multiple ways. Some resources are renewable over time, and others are not.

ESS3.B: Natural Hazards
A variety of natural hazards result from natural processes. Humans cannot eliminate natural hazards but can take steps to reduce their impacts.

ESS3.C: Human Impacts on Earth Systems
Human activities in agriculture, industry, and everyday life have had major effects on land, vegetation, streams, oceans, air, and even outer space. But individuals and communities are doing things to help protect Earth's resources and environments.

LS1.A: Structure and Function
Plants and animals have both internal and external structures that serve various functions in growth, survival, behavior, and reproduction.

LS1.B: Growth and Development of Organisms
Reproduction is essential to the continued existence of every kind of organism. Plants and animals have unique and diverse life cycles.

LS1.C: Organization for Matter and Energy Flow in Organisms
Animals and plants alike generally need to take in air and water, animals must take in food, and plants need light and minerals; anaerobic life, such as bacteria in the gut, functions without air.

LS1.D: Information Processing
Different sense receptors are specialized for particular kinds of information, which may then be processed by an animal's brain. Animals are able to use their perceptions and memories to guide their actions.

LS2.A: Interdependent Relationships in Ecosystems
The food of almost any kind of animal can be traced back to plants. Organisms are related in food webs… Decomposition eventually restores some materials back to the soil… Newly introduced species can damage the balance of an ecosystem.

LS2.B: Cycles of Matter and Energy Transfer in Ecosystems
Matter cycles between the air and soil and among plants, animals, and microbes as these organisms live and die.

LS2.C: Ecosystem Dynamics, Functioning, and Resilience
When the environment changes in ways that affect a place's physical characteristics, temperature, or availability of resources, some organisms survive and reproduce, others move to new locations, yet others move into the transformed environment, and some die.

LS3.B: Variation of Traits
Different organisms vary in how they look and function because they have different inherited information. The environment also affects the traits that an organism develops.

LS4.C: Adaptation
For any particular environment, some kinds of organisms survive well, some survive less well, and some cannot survive at all.

LS4.D: Biodiversity and Humans
Populations live in a variety of habitats, and change in those habitats affects the organisms living there.

PS3.D: Energy in Chemical Processes and Everyday Life
The expression "produce energy" typically refers to the conversion of stored energy into a desired form for practical use. The energy released from food was once energy from the sun that was captured by plants in the chemical process that forms plant matter.

Crosscutting Concepts (CC)

CC1: Patterns
Students identify similarities and differences in order to sort and classify natural objects and designed products.

CC4: Systems and Models
Students understand that a system is a group of related parts that can make up a whole and can carry out functions its individual parts cannot. They can also describe a system in terms of its components and their interactions.

CC5: Energy and Matter
Students learn matter is made of particles and that energy can be transferred in various ways and between objects.

CC6: Structure and Function
Students learn that different materials have different substructure, which can sometimes be observed, and substructures have shapes and parts that serve functions.

Science and Engineering Practices (SEP)

SEP1: Asking Questions and Defining Problems
A practice of science is to ask and refine questions that lead to descriptions and explanations of how the natural and designed world works and which can be empirically tested.

SEP2: Developing and Using Models
A practice of both science and engineering is to use and construct models as helpful tools for representing ideas and explanations. These tools include diagrams, drawings, physical replicas, mathematical representations, analogies, and computer simulations.

SEP3: Planning and Carrying Out Investigations
Scientists and engineers plan and carry out investigations in the field or laboratory, working collaboratively as well as individually. Their investigations are systematic and require clarifying what counts as data and identifying variables or parameters.

SEP6: Constructing Explanations and Designing Solutions
The products of science are explanations and the products of engineering are solutions.