2010 Beaches, Birds & Barrier Islands Workshop, Dauphin Island Sea Lab Alabama Course of Study: Science Objectives Met

Grade K, Life Science, Content Standard 6

Compare size, shape, structure, and basic needs of living things.
Identifying similarities of offspring and their parents

Grade K, Life Science, Content Standard 7

Classify objects using the five senses.
Grouping objects according to color, shape, size, sound, taste, smell, texture, and temperature

Grade K, Earth and Space Science, Content Standard 8

Identify features of Earth as landmasses or bodies of water.

1st Grade, Life Science, Content Standard 4

Describe survival traits of living things, including color, shape, size, texture, and covering.

- Classifying plants and animals according to physical traits
  Examples: animals—six legs on insects,
  plants—green leaves on evergreen trees
- Identifying developmental stages of plants and animals
  Examples: plants—seed developing into seedling, seedling developing into tree;
  animals—piglet developing into pig, kid developing into goat
- Describing a variety of habitats and natural homes of animals

2nd Grade, Physical Science, Content Standard 4

Describe observable effects of forces, including buoyancy, gravity, and magnetism.
Examples: buoyancy—boat floating on water, gravity—apple falling from tree, magnetism—magnets adhering to metal

2nd Grade, Life Science, Content Standard 5

Identify the relationship of structure to function in plants, including roots, stems, leaves, and flowers.

2nd Grade, Life Science, Content Standard 6

Identify characteristics of animals, including behavior, size, and body covering.

- Comparing existing animals to extinct animals
  Examples: iguana to stegosaurus, elephant to wooly mammoth
- Identifying migration and hibernation as survival strategies

2nd Grade, Earth and Space Science, Content Standard 7

Identify geological features as mountains, valleys, plains, deserts, lakes, rivers, and oceans.

- Identifying local landforms and bodies of water
- Identifying components of soil, including sand, clay, and silt

2nd Grade, Earth and Space Science, Content Standard

Identify evidence of erosion and weathering of rocks.

2nd Grade, Earth and Space Science, Content Standard 9

Describe evaporation, condensation, and precipitation in the water cycle.

3rd Grade, Physical Science, Content Standard 3

Describe ways energy from the sun is used.

Examples: plant growth, light, heat

Identifying fossil fuels as a source of energy

3rd Grade, Life Science, Content Standard 7

Describe the life cycle of plants, including seed, seed germination, growth, and reproduction.

- Describing the role of plants in a food chain
- Identifying plant and animal cells
- Describing how plants occupy space and use light, nutrients, water, and air
- Classifying plants according to their features
  Examples: evergreen or deciduous, flowering or nonflowering
- Identifying helpful and harmful effects of plants
  Examples: helpful—provide food, control erosion;
  harmful—cause allergic reactions, produce poisons
- Identifying how bees pollinate flowers
- Identifying photosynthesis as the method used by plants to produce food

3rd Grade, Life Science, Content Standard 8

Identify how organisms are classified in the Animalia and Plantae kingdoms.

3rd Grade, Life Science, Content Standard 10

Determine habitat conditions that support plant growth and survival.

Examples: deserts support cacti, wetlands support ferns and mosses

3rd Grade, Earth and Space Science, Content Standard 12

Identify conditions that result in specific weather phenomena, including thunderstorms, tornadoes, and hurricanes.

Identifying cloud types associated with specific weather patterns

Identifying positive and negative effects of weather phenomena
Examples: positive—flooding deposits good soil when waters recede,
negative—flooding kills crops

Identifying technology used to record and predict weather, including thermometers, barometers, rain gauges, anemometers, and satellites

Explaining symbols shown on a weather map

Organizing weather data into tables or charts

3rd Grade, Earth and Space Science, Content Standard 13

Describe ways to sustain natural resources, including recycling, reusing, conserving, and protecting the environment.

- Recognizing the impact of society on human health and environmental conditions

4th Grade, Life Science, Content Standard 5

Describe the interdependence of plants and animals.

- Describing behaviors and body structures that help animals survive in particular habitats
  Examples: behaviors—migration, hibernation, mimicry;
  body structures—quills, fangs, stingers, webbed feet

- Describing life cycles of various animals to include incomplete and complete metamorphosis
  Examples: damsel fly, mealworms
- Tracing the flow of energy through a food chain
  Example: producer, first-level consumer, second-level consumer, and third-level consumer
- Identifying characteristics of organisms, including growth and development, reproduction, acquisition and use of energy, and response to the environment

4th Grade, Life Science, Content Standard 6

Classify animals as vertebrates or invertebrates and as endotherms or ectotherms.

- Describing the organization of cells into tissues, organs, and organ systems
- Describing the grouping of organisms into populations, communities, and ecosystems
- Classifying common organisms into kingdoms, including Animalia, Plantae, Protista, Fungi, Archaebacteria, and Eubacteria

4th Grade, Earth and Space Science, Content Standard 7

Describe geological features of Earth, including bodies of water, beaches, ocean ridges, continental shelves, plateaus, faults, canyons, sand dunes, and ice caps.

5th Grade, Life Science, Content Standard 9

Describe the relationship of populations within a habitat to various communities and ecosystems.

- Describing the relationship between food chains and food webs
- Describing symbiotic relationships

5th Grade, Earth and Space Science, Content Standard 10

Identify spheres of Earth, including the geosphere, atmosphere, and hydrosphere.

- Describing technology used to investigate Earth
  Examples: sonar, radar, seismograph, weather balloons, satellites
- Describing the rock cycle

6th Grade, Earth and Space Science, Content Standard 2

Describe factors that cause changes to Earth's surface over time.

Examples: earthquakes, volcanoes, weathering, erosion, glacial erosion or scouring, deposition, water flow, tornadoes, hurricanes, farming and conservation, mining and reclamation, deforestation and reforestation, waste disposal, global climate changes, greenhouse gases

6th Grade, Earth and Space Science, Content Standard 5

Describe layers of the oceanic hydrosphere, including the pelagic zone, benthic zone, abyssal zone, and intertidal zone.

7th Grade, Life Science, Content Standard 4

Describe organisms in the six-kingdom classification system by their characteristics.

- Recognizing genus and species as components of a scientific name
- Identifying contributions of Aristotle and Linnaeus to the early history of taxonomy

7th Grade, Life Science, Content Standard 5

Identify major differences between plants and animals, including internal structures, external structures, methods of locomotion, methods of reproduction, and stages of development.

- Describing the processes of photosynthesis and cellular respiration

7th Grade, Life Science, Content Standard 6

Describe evidence of species variation due to climate, changing landforms, interspecies interaction, and genetic mutation.

Examples: fossil records over geologic time, rapid bacterial mutations due to environmental pressures

7th Grade, Life Science, Content Standard 7

Describe biotic and abiotic factors in the environment.

Examples: biotic—plants, animals;
abiotic—climate, water, soil

- Classifying organisms as autotrophs or heterotrophs
- Arranging the sequence of energy flow in an ecosystem through food webs, food chains, and energy pyramids

9th-12th Grade, Biology Core, Content Standard 9

Differentiate between the previous five-kingdom and current six-kingdom classification systems.

- Sequencing taxa from most inclusive to least inclusive in the classification of living things
- Identifying organisms using a dichotomous key
- Identifying ways in which organisms from the Monera, Protista, and Fungi kingdoms are beneficial and harmful

  Examples: beneficial—decomposers,
  harmful—diseases
- Justifying the grouping of viruses in a category separate from living things
- Writing scientific names accurately by using binomial nomenclature

9th-12th Grade, Biology Core, Content Standard 10

Distinguish between monocots and dicots, angiosperms and gymnosperms, and vascular and nonvascular plants.

- Describing the histology of roots, stems, leaves, and flowers
- Recognizing chemical and physical adaptations of plants

  Examples: chemical—foul odor, bitter taste, toxicity;
  physical—spines, needles, broad leaves

9th-12th Grade, Biology Core, Content Standard 11

Classify animals according to type of skeletal structure, method of fertilization and reproduction, body symmetry, body coverings, and locomotion.

Examples: skeletal structure—vertebrates, invertebrates;
fertilization—external, internal;
reproduction—sexual, asexual;
body symmetry—bilateral, radial, asymmetrical;
body coverings—feathers, scales, fur;
locomotion—cilia, flagella, pseudopodia

9th-12th Grade, Biology Core, Content Standard 12

Describe protective adaptations of animals, including mimicry, camouflage, beak type, migration, and hibernation.

- Identifying ways in which the theory of evolution explains the nature and diversity of organisms

- Describing natural selection, survival of the fittest, geographic isolation, and fossil record

9th-12th Grade, Biology Core, Content Standard 13

Trace the flow of energy as it decreases through the trophic levels from producers to the quaternary level in food chains, food webs, and energy pyramids.

- Describing the interdependence of biotic and abiotic factors in an ecosystem
  Examples: effects of humidity on stomata size, effects of dissolved oxygen on fish respiration
- Contrasting autotrophs and heterotrophs
- Describing the niche of decomposers
- Using the ten percent law to explain the decreasing availability of energy through the trophic levels

9th-12th Grade, Biology Core, Content Standard 14

Trace biogeochemical cycles through the environment, including water, carbon, oxygen, and nitrogen.

- Relating natural disasters, climate changes, nonnative species, and human activity to the dynamic equilibrium of ecosystems
  Examples: natural disasters—habitat destruction resulting from tornadoes;
  climate changes—changes in migratory patterns of birds;
  nonnative species—exponential growth of kudzu and Zebra mussels due to absence of natural controls;
  human activity—habitat destruction resulting in reduction of biodiversity, conservation resulting in preservation of biodiversity
- Describing the process of ecological succession

9th-12th Grade, Biology Core, Content Standard 16

Identify density-dependent and density-independent limiting factors that affect populations in an ecosystem.

Examples: density-dependent—disease, predator-prey relationships, availability of food and water;
density-independent—natural disasters, climate

- Discriminating among symbiotic relationships, including mutualism, commensalism, and parasitism

9th-12th Grade, Aquascience Elective Core, Content Standard 1

Differentiate among freshwater, brackish water, and saltwater ecosystems.

- Identifying chemical, geological, and physical features of aquatic ecosystems

9th-12th Grade, Aquascience Elective Core, Content Standard 6

Describe adaptations that allow organisms to exist in specific aquatic environments.

9th-12th Grade, Aquascience Elective Core, Content Standard 7

Describe processes and environmental characteristics that affect growth rates of aquatic animals.

Examples: reproductive habits, feeding habits, interdependence of organisms, overcrowding, seasonal changes

Ocean Literacy: Essential Principles and Fundamental Concepts

1.The Earth has one big ocean with many features.

a. The ocean is the dominant physical feature on our planet Earth—covering approximately 70% of the planet's surface. There is one ocean with many ocean basins, such as the North Pacific, South Pacific, North Atlantic, South Atlantic, Indian and Arctic.

d. Sea level is the average height of the ocean relative to the land, taking into account the differences caused by tides. Sea level changes as plate tectonics cause the volume of ocean basins and the height of the land to change. It changes as ice caps on land melt or grow. It also changes as sea water expands and contracts when ocean water warms and cools

g. The ocean is connected to major lakes, watersheds and waterways because all major watersheds on Earth drain to the ocean. Rivers and streams transport nutrients, salts, sediments and pollutants from watersheds to estuaries and to the ocean.

h. Although the ocean is large, it is finite and resources are limited.

2. The ocean and life in the ocean shape the features of the Earth.

c. Erosion—the wearing away of rock, soil and other biotic and abiotic earth materials—occurs in coastal areas as wind, waves, and currents in rivers and the ocean move sediments.

d. Sand consists of tiny bits of animals, plants, rocks and minerals. Most beach sand is eroded from land sources and carried to the coast by rivers, but sand is also eroded from coastal sources by surf. Sand is redistributed by waves and coastal currents seasonally.

e. Tectonic activity, sea level changes, and force of waves influence the physical structure and landforms of the coast.

5. The ocean supports a great diversity of life and ecosystems.

d. Ocean biology provides many unique examples of life cycles, adaptations and important relationships among organisms (symbiosis, predator-prey dynamics and energy transfer) that do not occur on land.

h. Tides, waves and predation cause vertical zonation patterns along the shore, influencing the distribution
and diversity of organisms.

i. Estuaries provide important and productive nursery areas for many marine and aquatic species.

6. The ocean and humans are inextricably interconnected.

a. The ocean affects every human life. It supplies freshwater (most rain comes from the ocean) and nearly all Earth's oxygen. It moderates the Earth's climate, influences our weather, and affects human health.

c. The ocean is a source of inspiration, recreation, rejuvenation and discovery. It is also an important element
in the heritage of many cultures.

d. Much of the world's population lives in coastal areas.

e. Humans affect the ocean in a variety of ways. Laws, regulations and resource management affect what is taken out and put into the ocean. Human development and activity leads to pollution (point source, non-point source, and noise pollution) and physical modifications (changes to beaches, shores and rivers). In addition, humans have removed most of the large vertebrates from the ocean.

f. Coastal regions are susceptible to natural hazards (tsunamis, hurricanes, cyclones, sea level change, and storm surges).

g. Everyone is responsible for caring for the ocean. The ocean sustains life on Earth and humans must live in ways that sustain the ocean. Individual and collective actions are needed to effectively manage ocean resources for all.