Fourth Grade Science

Course Overview

Students develop scientific reasoning and perform hands-on experiments in Earth, Life, and Physical Sciences. They construct an electromagnet, identify minerals according to their properties, use chromatography to separate liquids, and assemble food webs. Students will explore topics such as:

- **The Interdependence of Life—**producers, consumers, and decomposers; food webs
- **Animal and Plant Interactions—**populations; competition; predators and prey; symbiosis; animal behavior
- **Invertebrates—**sponges; worms; mollusks; arthropods; echinoderms
- **Chemistry—**mixtures vs. solutions; distillation, evaporation, and chromatography
- **Forces and Fluids—**pressure; forces in flight; density; buoyancy
- **Human Body—**nervous system (senses, reflexes, nerves, and brain); endocrine system (hormones, glands, growth, and digestion)
- **Electricity and Magnetism—**charges; magnets; static electricity; currents and circuits; electromagnetism
- **Rocks and Minerals—**the earth's interior; crystals; minerals; rock cycle; plate tectonics; volcanoes, earthquakes
- **The Fossil Record and the History of Life—**types of fossils; the Paleozoic, Mesozoic, and Cenozoic eras

Course Outline

Ecosystems: Interdependence of Life

- Explain that ecosystems are characterized by both their living and nonliving parts
- Explain that an *environment* is the nonliving part of an ecosystem
- Describe some ways in which organisms are dependent on each other for survival, including the need for food, pollination, and seed dispersal
- Recognize that all organisms need some source of energy to stay alive
- Explain that, in all environments, organisms are constantly growing, reproducing, dying, and decaying
- Explain that certain organisms, such as insects, fungi, and bacteria, depend on dead plants and animals for food
- State that sunlight is the major source of energy for ecosystems, and describe how its energy is passed from organism to organism in food webs
- Explain how producers and consumers (herbivores, carnivores, omnivores, and decomposers) are related in food chains and food webs in an ecosystem
- Recognize that cycles in nature provide organisms with the food, air, and water they need
- Recognize that conditions within an ecosystem are constantly changing, further recognize that some plants and animals survive because they either adapt to such changes or move to another location, while others die

Plant and Animal Interactions

- State that a *population* is a group of individuals of the same type living in a certain area
- Describe some factors that change the growth of a population
- Explain that living things cause changes in their ecosystems, some of which are detrimental to other organisms, while others are beneficial
- Recognize that organisms in an ecosystem can compete for resources such as food, shelter, and water
- Classify organisms as *predators* and *prey*
- Identify various symbiotic relationships between organisms as *mutualism, commensalism,* or *parasitism*
- Explain that an animal's behavior helps it survive
- Identify behaviors as either *inborn* or *learned*

Chemistry of Solutions

- Identify a *mixture* as a combination of two or more substances that are not chemically bound
- Identify a *solution* as a mixture in which two or more substances are evenly mixed and do not settle
- Identify a *solute* as a substance that is dissolved and a *solvent* as a substance that does the dissolving
- Recognize that solutions can be made from combinations of gases, liquids, or solids
- Identify different ways to separate solutions such as chromatography, distillation, or evaporation
- Identify some ways to change the rate at which solids dissolve in liquids, including grinding, stirring, and increasing the temperature
- Recognize that not all substances can dissolve in water in the same amounts
- Compare the concentrations of different solutions

Forces in Fluids

- Define *pressure* as the force exerted on a surface per unit area and recognize that pressure is measured in units called *pascals*
- Explain that atmospheric pressure decreases with height *above* sea level while water pressure increases

with depth *below* sea level
- Describe the forces present in flight, including lift, weight, thrust, and drag
- Measure the density of a solid and compare its mass with its volume displacement in water to predict whether it will sink or float
- Recognize that an object denser than water will sink unless it is shaped such that the weight of the water it displaces is greater than the weight of the object itself

The Human Body

- Explain that the various systems of the human body function because the cells, tissues, and organs all work together
- Explain that the brain gets information about the rest of the body, and the outside world, through nerves, and likewise use nerves to direct actions in other parts of the body
- Define *senses, reflexes, voluntary nervous system,* and *involuntary nervous system*
- Identify various parts of the nervous system (such as the brain, spinal cord, nerves, nerve cells, and neurotransmitters) along with their structures and functions
- Explain that the *endocrine system* is composed of glands and chemical messengers called *hormones,* which function over a wide range of time scales
- Identify the locations of some major glands of the endocrine system (such as the adrenals, thyroid, pituitary, and pancreas)
- Describe how glands and their hormones affect major body processes, including growth, stress, digestion, and the sleep-wake cycle

Classification of Invertebrates

- Identify different groups of invertebrates, such as sponges, cnidarians, worms, mollusks, arthropods, and echinoderms, according to their common characteristics

Electricity and Magnetism

- Recognize that objects with the same electrical charges repel, while those with different electrical charges attract
- Demonstrate that magnets have two poles (north and south) and that like poles repel while unlike poles attract
- Describe the earth's magnetic field, and identify magnetic north and south
- Explain how to construct a temporary magnet
- Explain that friction can build up static electrical charge when two objects are rubbed together by transferring electrons from one surface to the other
- State that electric currents flow easily through materials that are conductors and do not flow easily through materials that are insulators
- Identify the parts of a circuit: battery, light, wire, and switch
- Differentiate between *series* and *parallel circuits*
- State that electric currents produce magnetic fields, and that an electromagnet can be made by wrapping a wire around a piece of iron and then running electricity through the wire
- Recognize that electromagnets are used in a variety of everyday devices, including electric motors, generators, doorbells, and earphones

Rocks and Minerals

- Identify and describe the properties of the earth's layers: crust, mantle, outer core, and inner core
- Explain that rock is composed of different combinations of minerals
- Recognize that minerals have their own distinct crystal shape, determined by the arrangement of their atoms
- Identify common rock-forming minerals using their physical properties: color, streak, luster, and hardness
- Recognize that ore is rock with a high metal content and that most metals come from minerals mined from the earth's crust
- Know how to differentiate among igneous, sedimentary, and metamorphic rocks by referring to both their properties and methods of formation
- Explain that the surface of the earth is made of rigid plates that are in constant motion, and that the motion of these plates against, over, and under each other causes earthquakes, volcanoes, and the formation of mountains
- Identify the various structures of volcanoes, describe the types of eruptions that form them, and explain how they change the landscape
- Describe what happens during an earthquake and how the landscape can change as a result

Weathering, Erosion, and Deposition

- Explain both the physical and the chemical weathering of rocks
- Describe a soil profile and explain how new soil forms as a result of many years of weathering
- Explain that soil is a mixture of weathered rock, humus, air, and water
- Describe how gravity, moving water, wind, and glaciers reshape the surface of the land by weathering, eroding, and transporting sediment from one location to another

Fossils and Geologic Time

- Describe the conditions under which fossils may form and distinguish among the different types, such as *petrified, molds, casts* and *trace fossils*

- Explain that fossils provide information about organisms that lived long ago and that they help scientists reconstruct the history of life on Earth
- State that fossils provide evidence that many types of organisms that once lived on Earth are now extinct
- Recognize that scientists divide geologic time into four eras (Precambrian, Paleozoic, Mesozoic, and Cenozoic) and that each era covers one major stage in Earth's history
- Name one major event that occurred in each of the four geologic eras: Precambrian, Paleozoic, Mesozoic, and Cenozoic

Lesson Time and Scheduling

Total lessons: 72
Lesson time: 60 minutes. You might choose to split the lessons into smaller segments and take breaks as needed. The K¹² online lesson tracking system allows you to pick up wherever you left off in any given lesson.

Standard Curriculum Items

Come Learn with Me: Animals Without Backbones—Invertebrates by Bridget Anderson
Come Learn with Me: The Fossil Record and the History of Life by Bridget Anderson
Bar magnets
Safety goggles
Graduated cylinder
Lamp receptacles
Lamp bulbs
Magnifying glass
Rock kit
Spring scale
Thermometer

Additional Curriculum Items

Some lessons require additional resources, including common household items, and books that are readily available online or in your local library:
Modeling clay
Copper wire
Gravel
Adding machine paper
Pipe cleaners
Sand
Sea shell
White tile
Plastic aquarium tubing

NOTE: List subject to change.