



Curriculum Guide for 4th Grade SDP Science Teachers



STATES OF MATTER



Please note: Pennsylvania & Next Generation Science Standards as well as Instructional Resources are found on the SDP Curriculum Engine

4th Grade Science Curriculum Term 1 (9/5-11/13/17)

Topic: Land and Water



Duration: 9-10 Weeks

Performance Objectives

SWBAT:

- model the water cycle **IOT** explain how water moves through the atmosphere.
- develop a model using an example **IOT** describe ways the geosphere, biosphere, hydrosphere, and/or atmosphere interact.
- describe and graph the amounts and percentages of water and fresh water in various reservoirs **IOT** provide evidence about the distribution of water on earth.
- investigate the effect of different water flows and slopes on erosion and deposition **IOT** observe the role of water in erosion and river formation.
- identify the relationship between pore space (porosity) and water runoff **IOT** understand their impact on Earth materials.
- research how humans (landscape, dams, houses, grass, etc.) and nature (force and frequency of river flow) affect land **IOT** predict their impact on the environment.
- observe and classify different soils by properties, such as particle size, color and composition **IOT** to identify soil types.
- analyze the ability of soil to support the growth of certain plants **IOT** identify how the properties of different soils affect plants.
- employ simple equipment and measuring tools **IOT** carry out investigations.
- organize appropriate and accurate measurement and observations using charts, graphs diagrams and journaling **IOT** draw conclusions from data collected.

Key Terms and Definitions

condensation: The change of state from a gas to a liquid

evaporation: The change of state from a liquid to a gas

land formations: A physical feature of Earth's surface

weather - the short-term state of the atmosphere, including temperature, humidity, precipitation, wind, and visibility

barometer: An instrument that measures atmospheric pressure

Celsius: A unit used to measure temperature

deposition: The process in which material is laid down

erosion: A process in which the materials of Earth's surface are loosened, dissolved, or worn away and transported from one place to another by a natural agent, such as wind, water, ice, or gravity

Fahrenheit: A unit used to measure temperature

ground water: The water that is beneath the Earth's surface

precipitation: Any form of water that falls to Earth's surface from the clouds; includes rain, snow, sleet, and hail

runoff: Precipitation that flows over the land and into streams and rivers

surface water: All the bodies of fresh water, salt water, ice, and snow that are found above the ground.

thermometer: An instrument that measures and indicates temperature

water cycle: The continuous movement of water between the atmosphere, the land, and the oceans.

water table: The upper surface of underground water; the upper boundary of the zone of saturation.

weathering: The natural process by which atmospheric and environmental agents, such as wind, rain, and temperature changes, disintegrate and decompose rocks.

Essential Questions

How does water move above, below and on land?

How and why is the earth constantly changing?

How do Earth's processes and human activities affect each other?

What are the forces that build landforms?

What are the forces that break down landforms?

What is the relationship between air, water, and land?

How does the study of rocks give us clues about the composition of the earth?

How does water change forms as it moves through the water cycle?

How do river and streams shape the surface of the earth?

How do man-made and natural land features affect the flow and direction of water, influencing erosion?

How does nature and human activity affect the flow of water and the landscape?

Why and how do we change the flow of water?

How do soil properties affect the ways in which soil is eroded and deposited by water?

How does the earth's surface affect the flow of rivers and streams?

What role does the water cycle play in shaping the landscape?

Starting Points

Water covers approximately 73% of the earth's surface. Students need to understand how the sun's energy drives the water cycle and that water has an important role in shaping the land and Earth.

Geologists are scientists who study landforms (the natural features of the land's surface). There are three major types of landforms.

- Mountains are high, steep slopes.
- Plateaus are high but relatively level areas, often next to mountains.
- Plains are areas of relatively flat land that has been leveled either by erosion or the deposition of earth materials.

Earth's materials (rocks and minerals) are formed and may undergo change by certain conditions, such as erosion or metamorphism, and can occur over various amounts of time.

The Earth's landscape is a result of natural and man-made processes that interact with the Earth. Human activities impact the landscape sometimes resulting in changes in erosion and changes to water flow

Have them research and investigate different types of landforms in Pennsylvania for their similarities and differences. As they do the teacher can assess the student's observing, describing and recording skills.

4th Grade Science Curriculum Term 2 (11/18-1/29/18)

Topic: Introduction to Matter



Duration: 9-10 Weeks

Performance Objectives

SWBAT:

- demonstrate that materials are composed of parts that are too small to be seen without magnification **IOT** explain that all objects are composed of matter.
- identify properties of matter **IOT** classify and categorize matter into groups.
- use rulers, balances, graduated cylinders and other scientific measuring tools **IOT** describe an object's mass, size, and volume.
- describe characteristics of an object **IOT** identify physical and chemical properties of that object.
- identify movement of particles of matter **IOT** classify matter as a solid, liquid, or gas.
- demonstrate how matter (water, in particular) can be present in different states **IOT** identify and explain phase changes (melting, evaporation, condensation, and freezing).
- identify the different types of physical and chemical changes **IOT** explain the difference between a physical and chemical change in matter.
- create a basic reaction **IOT** demonstrate how matter can undergo a chemical change, creating a new substance with different properties.
- compare mass of an object before and after a state change **IOT** demonstrate and describe the law of conservation of matter.

Key Terms and Definitions

Matter: Anything that has mass and takes up space

Atom: The smallest unit of an element that maintains the chemical properties of that element

physical property: A characteristic of a substance that does not involve a chemical change, such as density, color, or hardness

chemical property: A property of matter that describes a substance's ability to participate in chemical reactions

physical change: A change of matter from one form to another without a change in chemical properties

chemical change: The process by which one or more substances change to produce one or more

different substances

solid: The state of matter in which the volume and shape of a substance are fixed

liquid: The state of matter that has a definite volume but not a definite shape

gas: A form of matter that does not have a definite volume or shape

phase change: The physical change of a substance from one state (solid, liquid, or gas) to another

melting: The change of state from a liquid to a gas

evaporation: The change of state from a liquid to a gas

condensation: The change of state from a gas to a liquid

freezing: The change of state in which a liquid becomes a solid as heat is removed

Law of Conservation of Mass: The law that states that mass cannot be created or destroyed in ordinary chemical and physical changes

mass: A measure of the amount of matter in an object; a fundamental property of an object that is not affected by the forces that act on the object, such as the gravitational force

volume : A measure of the size of a body or region in three-dimensional space

Essential Questions

How can you prove that matter is made of particles too small to be seen?

What causes matter to change from one state to another?

How can matter be classified?

How can you prove that that mass is neither created or destroyed when a object goes through a change?

Starting Points

Prior to this unit, students should have had exposure to states of matter (definitely solids and liquids and possibly gas) and be able to give examples of each, however they may not yet be able to articulate how the particles in each differ. Students should also be able to observe some physical properties of matter (e.g., color, size, weight, shape, etc.) and classify objects according to these properties. Students should have also had an introduction to measuring matter using rulers and balances/scales.

4th Grade Science Curriculum Term 3 (1/30-4/9/18)

Topic: Magnetism and Electricity



Duration: 9-10 Weeks

Performance Objectives

SWBAT:

- explore and investigate the properties of magnets **IOT** explain how they can be used to identify and separate mixtures of solid materials.
- explain that magnets have two poles **IOT** demonstrate the properties of attraction and repulsion.

- investigate the force of magnets **IOT** describe the relationship between distance between a magnet and an object and magnetic force.
- explain the components of series and parallel circuits **IOT** create a series and parallel circuit.
- investigate various batteries, wires and bulbs **IOT** explain how energy can transfer energy to light a light bulb.
- create a simple electrical circuits **IOT** determine which materials conduct electricity and which are insulators.
- ask questions **IOT** determine cause and effect relationships of electric or magnetic interactions between two objects not in contact with each other.
- define and solve a simple design problem **IOT** apply scientific ideas about magnets

Key Terms and Definitions

amperes (amps): A measure of the amount of current in a wire

attract: To pull something closer

charge: The smallest parts of an element

circuit: A closed path along which an electric current travels

compass: A tool with a needle that always points north, used for showing direction

conductor: A material, usually a metal, that transmits electricity

electric current: The movement of electrons through matter

electricity: A form of energy made when tiny parts move around in an atom; energy that can power many devices

electromagnet: A magnet that can be turned on or off and is made by sending electricity through metal

electromagnetism: A combined force of electricity and magnetism

generator: A machine that turns motion into electricity

insulator: A material, such as rubber or plastic, that does not transmit electricity

magnetic field: An area around a magnet where magnetic force can be felt

magnetism: A force that pushes and pulls certain metals

north pole: The end of a magnet where lines of force flow out

repel: To push something away

south pole: The end of a magnet where lines of force flow in

volts: A measure of the amount of push that gets an electric current moving

watts: A measure of the rate at which electrical energy is being used

Essential Questions

How is electricity used to create heat, sound, light, and motion?

How is electricity used in our world?

How do batteries and wires conduct electricity to a light a bulb?

What types of materials are conductors of electricity and what materials are not conductors (insulators)?

How do magnets interact with each other and other objects?

What are properties of magnets?

How does the size and strength of a magnet affect its ability to push and pull?

Can magnetic forces work through different materials?

Starting Points

In previous years, students should have had a very basic introduction to electricity and magnetism through units on force and motion as well as energy. Students will likely have heard of these terms and be able to describe examples of things that use electricity and where magnets can be found, however, they will have little knowledge of how electricity is created and transferred or the science behind the force of magnets.

By the end of this unit, students should be able to explain the properties of magnets and how magnets act in the presence of different materials.

Background Information for Teachers:

There are two kinds of electricity: static electricity and electric currents. There are also two kinds of electric currents: direct (DC) and alternating (AC). Electricity and magnetism are closely related. Flowing electrons produce a magnetic field, and spinning magnets cause an electric current to flow. Electromagnetism is the interaction of these two important forces. Electricity and magnetism are integral to the workings of nearly every gadget, appliance, vehicle, machine we use.

4th Grade Science Curriculum Term 4 (4/10-6/15/18)

Topic: Structure and Function of Organisms



Duration: 9-10 Weeks

Performance Objectives

SWBAT:

- analyze the structures of plants **IOT** determine how plants meet their needs.
- observe and compare the parts of a variety of plants **IOT** gain a deeper understanding of the structure and function of each part.
- model how the parts of the (digestive, circulatory, respiratory, skeletal, muscular) system work together **IOT** explain the function of this system in the human body.
- give examples of how human body systems depend on one another **IOT** describe how humans meet their needs.
- compare the structures of plants and humans **IOT** find similarities and differences between how they meet their needs.
- identify and describe similarities and differences in the structures of various animals **IOT** describe how different structures can perform the same function.

Key Terms and Definitions

flower: A plant part that helps it reproduce. It has petals, is often colorful, and makes seeds.

leaf: A plant part that takes in gases from the air and uses sunlight to turn gases and water into food.

root: A plant part that takes in water and nutrients from the soil, supports the plant and holds the plant in the soil.

seed: A plant part that contains a tiny plant and stored food.

stem: A plant part that supports the plant and moves water, food, and nutrients around inside the plant.

reproduce: To make more living things of the same kind.

adaptation: Modification of a species' characteristics over time in a way that increases its chances of survival in a particular habitat.

aquatic - living in water.

backbone: The column of vertebrae encasing the spinal cord. Also called spine.

camouflage: Coloration, shape, or behavior that allows an animal to be hidden against its surroundings.

extinct: No longer exists.

invertebrate: Animal that does not have a backbone.

species: A distinct kind of animal that is able to breed and produce fertile offspring under natural conditions.

terrestrial: Living on land.

vertebrate: Animal with a spinal column (backbone) and a cranium (brain case). Fish, amphibians, reptiles, birds and mammals are all vertebrates.

wild: Not raised by humans.

digestive system: The organs that break down food so that it can be used by the body

circulatory system: The heart and vessels that move blood through the body

respiratory system: A collection of organs whose primary function is to take in oxygen and get rid of carbon dioxide; the organs of this system include the lungs, the throat, and the passageways that lead to the lungs

skeletal system: The bones, cartilage, ligaments, and tendons whose primary function is to support and protect the body and to allow the body to move

muscular system: A collection of muscles whose primary function is movement and flexibility

Essential Questions

How do plants and animals get the things they need to survive?

How are the parts of plants and animals rely on each other?

How are the structures of plants and animals similar?

How do environmental factors affect the way plants and animals grow?

Starting Points

In this unit, fourth grade students will be examining similarities and differences of living things. They should have many opportunities to explore the physical characteristics of both plants and animals, and compare the function of these characteristics. The students should be able to describe a variety of ways in which plants and animals function similarly and how different structures in plants and animals fulfill similar functions. Conversely, students should also be able to describe the main differences between the structures of plants and animals.

Teacher Background Information About Plants:

- Plants have adaptations for getting the sunlight they need to survive. Examples include growing or leaning toward a light source and sending out tendrils to get themselves taller than neighboring plants.
- Plants have adaptations for protection from predators. Examples include spines, thorns and toxins.
- Plants have adaptations for surviving in different environmental conditions. Examples include dropping leaves in winter, when sunlight and water are limited, having needle-shaped leaves that shed snow, and surviving drought by storing liquid in large or thick stems.
- The most important things that a plant needs is water, air, and sunlight. Plants use these three things to make food. Plants need energy in the food to grow and develop. To grow means to get bigger and to develop means to change.
- Plants also need space to grow. Most trees cannot grow in a pot, there isn't enough room. Soil is another thing that plants need. Soil supports the plant, and has water and nutrients for the plant to grow.
- A plant's root system takes in water and minerals, holds the plant in place, and stores food the plant makes. A taproot is a large root that stores food. We eat some roots such as, beets, radishes, carrots, and turnips.
- The stem system supports the plant's leaves, flowers, and fruits. The stem systems of many plants have tubes that carry water and minerals from the roots to the leaves and other tubes that carry food from the leaves to the stems and roots. Different plants have different kinds of stems that help them survive in their environments.
- The plant's leaves will turn toward the light from the window. This behavior is called phototropism. It is an adaptation that helps plants survive. Plants use the energy in sunlight to make their own food. And leaves are where the food is made. So when leaves turn toward light, they collect more energy to make food. A plant can sense the pull of gravity. Its roots grow downward, toward the pull of gravity. Its stems grow upward, away from the pull of gravity. do this experiment: Plant seeds in a clear storage bag or cup with a wet paper towel so the growth of the roots may be seen.