

INTERMEDIATE SCIENCE CORE

The Intended Learning Outcomes (ILOs) describe the skills and attitudes students should learn as a result of science instruction. They are an essential part of the Science Core Curriculum and provide teachers with a standard for evaluation of student learning in science. Instruction should include significant experiences that lead to student understandings using the ILOs.

The main intent of science instruction in Utah is that students will value and use science as a process of obtaining knowledge based upon observable evidence.

Students will be able to:

1. Use Scientific Processes and Thinking Skills

- a. Observe simple objects, patterns and events and report their observations.
- b. Sort and sequence data according to given criteria.
- c. Given the appropriate instrument, measure length, temperature, volume and mass in metric units as specified.
- d. Compare things, processes and events.
- e. Develop simple classification systems and investigations.
- f. Plan and conduct simple experiments.
- g. Formulate simple research questions.
- h. Predict results of investigations based on prior data.
- i. Use data to construct a reasonable conclusion.

2. Manifest Scientific Attitudes and Interests

- a. Demonstrate a sense of curiosity about nature.
- b. Voluntarily read and look at books and other materials about science.
- c. Pose science questions about objects, events and processes.
- d. Maintain an open and questioning mind toward new ideas and alternative points of view.
- e. Seek and weigh evidence before drawing conclusions. (5th)
- f. Accept and use scientific evidence to help resolve ecological problems. (5th)

3. Understand Science Concepts and Principles

- a. Know and explain science information specified for the grade level.
- b. Distinguish between examples and non-examples of concepts that have been taught.
- c. Solve problems appropriate to grade level by applying science principles and procedures.

4. Communicate Effectively Using Science Language and Reasoning

- a. Record data accurately when given the appropriate form (e.g., table, graph, chart).
- b. Describe or explain observations carefully and report with pictures, sentences and models.
- c. Use scientific language in oral and written communication.
- d. Use reference sources to obtain information and cite the source.
- e. Use mathematical reasoning to communicate information. (5th)

5. Demonstrate Awareness of Social and Historical Aspects of Science (5th)

- a. Cite examples of how science affects life.
- b. Understand the cumulative nature of science knowledge.

6. Understand the Nature of Science (5th)

- a. Understand that science investigations use a variety of methods and do not always use the same set of procedures; understand that there is not just one "scientific method."

Units 3rd Grade

Orbits
Effects of Environment
Motion
Gravity
Heat & Light

Units 4th Grade

Water
Weather patterns
Rocks & Soils
Utah geology
Utah plant/animal life
Natural Resources

Units 5th Grade

Matter
Changing earth
Magnetic fields
Electricity
Inherited traits

Science Level 3

Science Benchmark

Earth orbits around the sun, and the moon orbits around Earth. Earth is spherical in shape and rotates on its axis to produce the night and day cycle. To people on Earth, this turning of the planet makes it appear as though the sun, moon, planets and stars are moving across the sky once a day. However, this is only a perception as viewed from Earth.

Standard I Students will understand that the shape of Earth and the moon are spherical and that Earth rotates on its axis to produce the appearance of the sun and moon moving through the sky.

Objective 1: Describe the appearance of Earth and the moon.

- a. Describe the shape of Earth and the moon as spherical.
- b. Explain that the sun is the source of light that lights the moon through reflection.
- c. List the differences in the physical appearance of Earth and moon as viewed from space.

Objective 2: Describe the movement of Earth and moon and the apparent movement of other bodies through the sky.

- a. Describe the motions of Earth (i.e., the rotation (spinning) of Earth on its axis, the revolution (orbit) of Earth around the Sun).
- b. Use a chart to show that the Moon orbits Earth approximately every 28 days.
- c. Use a model of Earth to demonstrate that the Earth rotates on its axis once every 24 hours to produce the night and day cycle.
- d. Use a model to demonstrate why it seems to a person on Earth that the sun, planets and stars appear to move across the sky.

Science language students should use: model, orbit, sphere, moon, axis, rotation, revolution, appearance, reflection

Science Benchmark

For any particular environment, some types of plants and animals survive well, some survive less well and some cannot survive at all. Organisms in an environment interact with their environment. Models can be used to investigate these interactions.

Standard II Students will understand that organisms depend on living and non-living things within their environment.

Objective 1: Classify living and non-living things in an environment.

- a. Identify characteristics of living things (i.e., growth, movement, reproduction, food consumption).
- b. Identify characteristics of non-living things.
- c. Classify living and non-living things in an environment.

Objective 2: Describe the interactions between living and non-living things in a small environment.

- a. Identify living and nonliving things in a small environment (e.g., terrarium, aquarium, flowerbed).
- b. Predict the effects of changes in the environment (e.g., temperature, light, moisture) on a living organism.
- c. Observe and record the effect of changes (e.g., temperature, amount of water, light) upon the living organisms and non-living things in a small-scale environment.
- d. Compare a small-scale environment to a larger environment (e.g., aquarium to a pond, terrarium to a forest).
- e. Pose a question about the interaction between living and non-living things in the environment that could be investigated by observation.

Science language students should use: environment, interaction, living, non-living organism, survive, observe, terrarium, aquarium

Science Benchmark

Forces cause changes in speed or direction of motion. The greater the force the greater the change in motion. The more massive an object is the less effect a given force will have upon the motion of the object. Earth's gravity pulls objects toward it without touching them.

Standard III Students will understand the relationship between an applied force and the resulting motion of an object.

Objective 1: Demonstrate how forces cause changes in speed or direction of objects.

- a. Show that objects at rest will not move unless a force is applied to them.
- b. Compare the forces of pushing and pulling.
- c. Investigate how forces applied through simple machines affect the direction and/or amount of resulting force.

Objective 2: Demonstrate that the greater the force applied to an object, the greater the change in speed or direction of the object.

- a. Predict and observe what happens when a force is applied to an object (e.g., wind, flowing water).
- b. Compare and chart the relative effects of a force of same strength on objects of different weight (e.g., the breeze from a fan will move a piece of paper but may not move a piece of cardboard).
- c. Compare the relative effect of forces of different strengths on an object (e.g., strong wind affects an object differently than a breeze).
- d. Conduct a simple investigation to show what happens when objects of various weights collide with one another (e.g., marbles, balls).
- e. Show how these concepts apply to various activities (e.g., batting a ball, kicking a ball, hitting a golf ball with a golf club) in terms of force, motion, speed, direction and distance (e.g. slow, fast, hit hard, hit soft).

Standard IV Students will understand that objects near Earth are pulled toward Earth by gravity.

Objective 1: Demonstrate that gravity is a force.

- a. Demonstrate that a force is required to overcome gravity.
- b. Use measurement to demonstrate that heavier objects require more force than lighter ones to overcome gravity.

Objective 2: Identify that gravity effects the motion of an object.

- a. Compare how the motion of an object rolling up or down a hill changes with the incline of the hill.
- b. Observe, record, and compare the effect of gravity on several objects in motion (e.g., a thrown ball and a dropped ball falling to Earth).
- c. Pose questions about gravity and forces.

Science language students should use: force, gravity, weight, motion, speed, direction, distance

Science Benchmark

Light is produced by the sun and observed on Earth. Living organisms use heat (energy) and light from the sun. Heat is also produced from motion when one thing rubs against another. Things that give off heat often also give off light. Mechanical and electrical machines while operating produce heat and sometimes light.

Standard V. Students will understand that the sun is the main source of heat (energy) and light for things living on Earth. They will also understand that the motion of rubbing objects together (friction) may produce heat.

Objective 1: Provide evidence showing that the sun is the source of heat (energy) and light for Earth.

- a. Compare temperatures in sunny and shady places.
- b. Observe and report how sunlight affects plant growth.
- c. Provide examples of how sunlight affects people and animals by providing heat and light.
- d. Identify and discuss some misconceptions about heat sources (e.g., clothes do not produce heat, ice cubes do not give off cold).

SCIENCE LEVEL 4

Science Benchmark

Matter on Earth cycles from one form to another. The cycling of matter on Earth requires energy. The cycling of water is an example of this process. The sun is the source of energy for the water cycle. Water changes state as it cycles between the atmosphere, land, and bodies of water on Earth.

STANDARD I: Students will understand that water changes state as it moves through the water cycle.

Objective 1: Describe the relationship between heat energy, evaporation and condensation of water on Earth.

- a. Identify the relative amounts of water found in various locations on Earth (e.g., oceans have most of the water, glaciers and snowfields contain most fresh water).
- b. Identify the sun as the source of energy that evaporates water from the surface of Earth.
- c. Compare the processes of evaporation and condensation of water.
- d. Investigate and record temperature data to show the effects of heat energy on changing the states of water.

Objective 2: Describe the water cycle.

- a. Locate examples of evaporation and condensation in the water cycle (e.g., water evaporates when heated and clouds or dew forms when vapor is cooled).
- b. Describe the processes of evaporation, condensation, and precipitation as they relate to the water cycle.
- c. Identify locations that hold water as it passes through the water cycle (e.g., oceans, atmosphere, fresh surface water, snow, ice, and ground water).
- d. Construct a model or diagram to show how water continuously moves through the water cycle over time.
- e. Describe how the water cycle relates to the water supply in your community (e.g., watershed areas of Utah)..

Science language students should use:	vapor, precipitation, evaporation, clouds, dew, condensation, temperature, watershed
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Science Benchmark

Weather describes conditions in the atmosphere at a certain place and time. Water, heat from the sun and wind create a cycle of changing weather. The sun's energy warms the oceans and lands at Earth's surface, creating changes in the atmosphere that cause the weather. The temperature and movement of air can be observed and measured to determine the effect on cloud formation and precipitation. Recording weather observations provides data that can be used to predict future weather conditions and establish patterns over time. Weather affects many aspects of people's lives.

STANDARD II: Students will understand that the elements of weather can be observed, measured, and recorded to make predictions and determine simple weather patterns.

Objective 1: Observe, measure, and record the basic elements of weather.

- a. Identify basic cloud types (i.e., cumulus, cirrus, stratus clouds).
- b. Observe, measure, and record data on the basic elements of weather over a period of time (i.e., precipitation, air temperature, wind speed and direction, and air pressure).
- c. Investigate evidence that air is a substance (e.g., takes up space, moves as wind, temperature can be measured).
- d. Compare the components of severe weather phenomena to normal weather conditions (e.g., thunderstorm with lightning and high winds compared to rainstorm with rain showers and breezes).

Objective 2: Interpret recorded weather data for simple patterns.

- a. Observe and record effects of air temperature on precipitation (e.g., below freezing results in snow, above freezing results in rain).
- b. Graph recorded data to show daily and seasonal patterns in weather.
- c. Infer relationships between wind and weather change (e.g., windy days often precede changes in the weather; in Utah south winds often precede a cold front coming from the north).

Objective 3: Evaluate weather predictions based upon observational data.

- a. Identify and use the tools of a meteorologist.
- b. Describe how weather and forecasts affect people's lives.
- c. Predict weather and justify prediction with observable evidence.
- d. Evaluate the accuracy of student and professional weather forecasts.
- e. Relate weather forecast accuracy to evidence or tools used to make the forecast (e.g., feels like rain vs. barometer is dropping).

Science language
students should use:

atmosphere, meteorologist, freezing, cumulus, stratus, cirrus, air pressure, thermometer, air temperature, wind speed, forecast, severe, phenomena, precipitation, seasonal, accuracy, barometer, rain, gauge, components, anemometer

Science Benchmark

Earth materials include rocks, soils, water, and gases. Rock is composed of minerals. Earth materials change over time from one form to another. These changes require energy. Erosion is the movement of materials and weathering is the breakage of bedrock and larger rocks into smaller rocks and soil materials. Soil is continually being formed from weathered rock and plant remains. Soil contains many living organisms. Plants generally get water and minerals from soil.

STANDARD III: Students will understand the basic properties of rocks, the processes involved in the formation of soils, and the needs of plants provided by soil.

Objective 1: Identify basic properties of minerals and rocks.

- a. Describe the differences between minerals and rocks.
- b. Observe rocks using a magnifying glass and draw shapes and colors of the minerals.
- c. Sort rocks by appearance according to the three basic types: sedimentary, igneous and metamorphic (e.g., sedimentary - rounded mineral and rock particles that are cemented together, often in layers; igneous - glasslike, with or without observable crystals that are not in layers or with air holes; metamorphic - crystals/minerals, often in layers).
- d. Classify common rocks found in Utah as sedimentary (i.e., sandstone, conglomerate, shale), igneous (i.e., obsidian, granite, pumice, basalt) and metamorphic (i.e., marble, gneiss, schist).

Objective 2: Explain how the processes of weathering and erosion breakdown and move materials that form soils.

- a. Identify the processes of physical weathering that break down rocks at Earth's surface (i.e., water movement, freezing, plant growth, wind).
- b. Distinguish between weathering (i.e., wearing down and breaking of rock surfaces) and erosion (i.e., the movement of materials).
- c. Describe the movement of materials during erosion.
- d. Model erosion of Earth materials (e.g., water running over sand in playground area, wave action in tub of water and sand, digging at the base of a sand slope to model landslide).
- e. Identify examples of erosion in the local area.

Objective 3: Observe the basic components of soil and relate the components to plant growth.

- a. Observe and list the components of soil (i.e., minerals, rocks, air, water, living and dead organisms).
- b. Distinguish between the living, remains of once living, and non-living components of soil.
- c. Diagram or model a soil profile showing topsoil, subsoil, and bedrock, and how the layers differ in composition.
- d. Relate the components of soils to the growth of plants in soil (e.g., mineral nutrients, water).
- e. Research and investigate ways to provide mineral nutrients and structural support for plants to grow without soil (e.g., grow plants in wet towels, grow plants in wet gravel, grow plants in water).

Science language
students should use:

mineral, weathering, erosion, sedimentary, igneous, metamorphic,
topsoil, subsoil, bedrock, organism, freeze, thaw, profile, non-
living, structural support, nutrients

Science Benchmark

Fossils are evidence of living organisms from the past and are usually preserved in sedimentary rocks. A fossil may be an impression left in sediments, the preserved remains of an organism, or a trace mark showing that an organism once existed. Fossils are usually made from the hard parts of an organism because soft parts decay quickly. Fossils provide clues to Earth's history. They provide evidence that can be used to make inferences about past environments. Fossils can be compared to one another, to living organisms, and to organisms that lived long ago.

STANDARD IV: Students will understand how fossils are formed, where they may be found in Utah, and how they can be used to make inferences.

Objective 1: Describe Utah fossils and explain how they were formed.

- a. Identify features of fossils that can be used to compare them to living organisms that are familiar (e.g., shape, size and structure of skeleton, patterns of leaves).
- b. Describe three ways fossils are formed in the sedimentary rock (i.e., preserved organisms, mineral replacement of organisms, and impressions or tracks).
- c. Research locations where fossils are found in Utah and construct a simple fossil map.

Objective 2: Explain how fossils can be used to make inferences about past life, climate, geology, and environments.

- a. Explain why fossils are usually found in sedimentary rock.
- b. Based on the fossils found in various locations, infer how Utah environments have changed over time (e.g., trilobite fossils indicate that Millard County was once covered by a large shallow ocean; dinosaur fossils and coal indicate that Emery and Uintah County were once tropical and swampy).
- c. Research information on two scientific explanations for the extinction of dinosaurs and other prehistoric organisms.
- d. Formulate questions that can be answered using information gathered on the extinction of dinosaurs.

Science language
students should use:

infer, environments, climate, dinosaur, preserved, extinct,
extinction, impression, fossil, prehistoric, mineral, organism,
replacement, trilobite, sedimentary, tropical

Science Benchmark

Utah has diverse plant and animal life that is adapted to and interacts in areas that can be described as wetlands, forests, and deserts. The characteristics of the wetlands, forests, and deserts influence which plants and animals survive best there. Living and nonliving things in these areas are classified based on physical features.

STANDARD V: Students will understand the physical characteristics of Utah's wetlands, and watershed forests, and deserts and identify common organisms for each environment.

Objective 1: Describe the physical characteristics of Utah's wetlands, watersheds, forests, and deserts.

- a. Compare the physical characteristics (e.g., precipitation, temperature, and surface terrain) of Utah's wetlands, forests, and deserts.
- b. Locate examples of areas that have characteristics of wetlands, forests, or deserts in Utah.
- c. Based upon information gathered, classify areas of Utah that are generally identified as wetlands, forests, or deserts.
- d. Create models of wetlands, forests, and deserts.
- e. Understand the need for conservation of our natural resources.

Objective 2: Describe the common plants and animals found in Utah environments and how these organisms have adapted to the environment in which they live.

- a. Identify common plants and animals that inhabit Utah's forests, wetlands, and deserts.
- b. Cite examples of physical features that allow particular plants and animals to live in specific environments (e.g., duck has webbed feet, cactus has waxy coating).
- c. Describe some of the interactions between animals and plants of a given environment (e.g., woodpecker eats insects that live on trees of a forest, brine shrimp of the Great Salt Lake eat algae and birds feed on brine shrimp).
- d. Identify the effect elevation has on types of plants and animals that live in a specific wetland, forest, or desert.
- e. Find examples of endangered Utah plants and animals and describe steps being taken to protect them.

Objective 3: Use a simple scheme to classify Utah plants and animals.

- a. Explain how scientists use classification schemes.
- b. Use a simple classification system to classify unfamiliar Utah plants or animals (e.g., fish/amphibians/reptile/bird/mammal, invertebrate/vertebrate, tree/shrub/grass, deciduous/conifers).

Objective 4: Observe and record the behavior of Utah animals.

- a. Describe and record the behavior of birds (e.g., caring for young, obtaining food, surviving winter).
- b. Describe how the behavior and adaptations of Utah mammals help them survive winter (e.g., obtaining food, building homes, hibernation, migration).
- c. Research and report on the behavior of a species of Utah fish.
- d. Compare the structure and behavior of Utah amphibians and reptiles.
- e. Use simple classification schemes to sort Utah's common insects and spiders.

Science language students should use:	wetland, forest, desert, adaptation, deciduous, coniferous, invertebrate, vertebrate, bird, amphibian, reptile, fish, mammal, insect, hibernation, migration, propagation, congregation, generation, insulation, diurnal, nocturnal, carnivore, herbivore, omnivore, scavenger, decomposer, consumer, producer
Common plants:	sagebrush, pinion pine, Utah juniper, spruce, fir, gamble oak, quaking aspen, cottonwood, cattail, bulrush, prickly pear cactus
Common animals:	jackrabbit, cottontail rabbit, red fox, coyote, mule deer, elk, moose, cougar, bobcat, deer mouse, kangaroo rat, muskrat, beaver, gopher snake, rattlesnake, lizard, tortoise, frog, salamander, red-tailed hawk, barn owl, lark, robin, pinion jay, magpie, crow, trout, catfish, carp, grasshopper, ant, moth, butterfly, housefly, bee, wasp, pill bug, millipede

STANDARD VI: Students will evaluate conservation practices in relation to natural resources.

Objective 1: Identify available natural resources.

- a. Classify resources as renewable and non-renewable.
- b. Describe the role of technology in developing natural resources.
- c. Describe the relationship between the use of different natural resources and the effect of their use on the environment.

Objective 2: Analyze conservation practices and pollution problems.

- a. Research conservation practices and pollution problem.
- b. Compare and contrast conservation practices in local communities with practices in other communities.

Objective 3: Based on gathered information of plant and animal species in relation to human survival.

- a. Evaluate the importance of plant and animal species in relation to human survival.
- b. Survey the environmental changes made by people and describe how the changes have affected plants and animals.
- c. Evaluate the cause and effect of changes which have led to the extinction of various plants and animals.

Objective 4: Become aware of ecological and social issues related to natural resources.

- a. Research an issue related to natural resources and/or alternative fuels.
- b. Research careers that deal with ecological issues.
- c. Communicate with an agency or person dealing with ecological issues.
- d. Justify a position on an issue related to natural resources.

SCIENCE LEVEL 5

Science Benchmark

The weight of an object is always equal to the sum of its parts, regardless of how it is assembled. In a chemical reaction or physical change matter is neither created nor destroyed. When two or more materials are combined, either a chemical reaction or physical change may occur. Chemical reactions are indicated when the materials heat or cool, give off light, give off gas, or change colors. In a chemical reaction, the materials are changed into new substances. In a physical change a new substance is not formed.

STANDARD 1: Students will understand that chemical and physical changes occur in matter.

Objective 1: Define matter as any substance that has mass, volume, and is comprised of atoms.

- a. Measure the mass of various objects using a balance scale.
- b. Measure the volume of various objects using two strategies:
 - 1) Water displacement
 - 2) Length times width times height
- c. Explain that all matter is made of atoms.

Objective 2: Evaluate evidence that indicates a physical change has occurred.

- a. Identify the physical properties of matter (e.g., hard, soft, solid, liquid, gas, mass, volume, density).
- b. Compare changes in substances that indicate a physical change has occurred.
- c. Describe the appearance of a substance before and after a physical change.
- d. Explain that a physical change is a change in matter's physical properties (e.g., size, shape, state, mass)

Objective 3: Investigate evidence for changes in matter that occur during a chemical reaction.

- a. Identify observable evidence of a chemical reaction (e.g., color change, heat or light given off, heat absorbed, gas given off).
- b. Explain that in chemical changes, a totally new substance is formed; the atoms have rearranged to form new substances.
- c. Explain why the measured weight of a remaining product is less than its reactants when a gas is produced.
- d. Explain chemical reactions in the environment. (ex. Rust)
- e. Cite examples of chemical reactions in daily life. (ex. Hard boiling egg)
- f. Compare a physical change to a chemical change.
- g. Hypothesize how changing one of the materials in a chemical reaction will change the results.

Objective 4: Describe that matter is neither created nor destroyed even though it may undergo physical or chemical change.

- a. Compare the mass of an object to the mass of its individual parts after being disassembled.
- b. Compare the mass of a specified quantity of matter before and after it undergoes melting or freezing.
- c. Investigate the results of the combined mass of a liquid and a solid after the solid has been dissolved and then recovered from the liquid (e.g., salt dissolved in water then water evaporated).
- d. Investigate chemical reaction in which the total mass of the materials before and after reaction is the same (e.g., cream and vinegar before and after mixing, borax and glue mixed to make a new substance).
- e. Explain why the mass of the products is less than the reactants when a gas is produced (e.g., baking soda and vinegar).

Science language students should use:

Heat, substance, chemical change, dissolve, physical change, matter, product, reactants, solid, liquid, gas, mass, volume, atom, molecule

Science Benchmark

The Earth's surface is constantly changing. Some changes happen very slowly, over long periods of time such as weathering, erosion, and uplift. Other changes happen abruptly such as landslides, volcanic eruptions, and earthquakes. All around us, we see the visible effects of the building up and breaking down of the Earth's surface.

STANDARD II: Students will understand that volcanoes, earthquakes, uplift, weathering, and erosion cause reshaping of Earth's surface.

Objective 1: Describe the structure of earth

- a. Identify four main layers of earth (crust, mantle, inner/outer core, lithosphere)
- b. Explain that the earth's crust is made up of plates that are constantly changing.
- c. Explore different theories of plate movement (plate tectonics, Pangaea)

Objective 2: Describe how weathering and erosion change Earth's surface.

- a. Identify the objects, process or forces that weather and erode Earth's surface (e.g., ice, plants, animals, abrasion, gravity, water, wind).
- b. Describe how geological features (e.g., valleys, canyons, buttes, and arches) are changed through erosion (e.g., waves, wind, glaciers, gravity, and running water).
- c. Explain the relationship between time and specific geological changes.

Objective 3: Explain how volcanoes, earthquakes, and uplift affect Earth's surface.

- a. Identify specific geological features created by volcanoes, earthquakes, and uplift.
- b. Give examples of different landforms that are formed by volcanoes, earthquakes, and uplift (e.g., mountains, valleys, new lakes, canyons).
- c. Describe how volcanoes, earthquakes and uplift change landforms.
- d. Research examples of how technology is used to predict volcanoes and earthquakes.

Objective 4: Relate the building up and breaking down of Earth's surface over time to the various physical land features.

- a. Explain how layers of exposed rock, such as those observed in the Grand Canyon and Arches National Park, are the result of natural processes acting over long periods of time.
- b. Use a timeline to identify the sequence and time required for building up and breaking down of geologic features on Earth.
- c. Describe and justify how the surface of Earth would appear if there were no mountain uplift, weathering or erosion.

Science language students should use.

Earthquakes, erode, erosion, faults, uplift, volcanoes, weathering, buttes, arches, glaciers, geology, convergent, divergent, transfers (sliding lateral), lithosphere, plates, crust, mantle, inner/outer core

Science Benchmark

Earth and some earth materials have magnetic properties. Without touching them, a magnet attracts things made of iron and either pushes or pulls on other magnets. Electricity is a form of energy. Current electricity can be generated and transmitted through pathways. Some materials are capable of carrying electricity more effectively than other materials. Static electricity is a result of objects being electrically charged. Without touching them, materials that are electrically charged may either push or pull other charged materials.

STANDARD III: Students will understand that magnetism can be observed when there is an interaction between the magnetic fields of magnets or between a magnet and materials made of iron.

Objective 1: Investigate and compare the behavior of magnetism using magnets.

- a. Compare various types of magnets (e.g., permanent, temporary, and natural magnets) and their abilities to push or pull iron no objects they are or touching.
- b. Investigate how magnets will both attract and repel other magnets.
- c. Discover that like poles repel and opposite poles attract.
- d. Compare permanent magnets and electromagnets.
- e. Research and report the use of magnets.

Objective 2: Describe how the magnetic field of Earth and a magnet are similar.

- a. Compare the magnetic fields of various types of magnets (e.g., bar magnet, disk magnet, and horseshoe magnet).
- b. Compare Earth's magnetic field to a magnet.
- c. Construct a compass and explain how it works.
- d. Investigate the effects of magnets on the needle of a compass and compare this to the effects of Earth's magnetic field on the needle of a compass (e.g., magnets effect the needle only at close distances, Earth's magnetic field affects the needle at great distances, magnets close to a compass overrides the Earth's effect on the needle).

STANDARD IV: Students will understand features of static and current electricity.
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Objective 1: The student will understand basic atomic structure and charges of atomic particles.

- a. Atoms consist of a nucleus and an outer shell.
- b. Outer shell contains electrons which are negatively charged.
- c. Nucleus contains neutrons which have no charge and protons which have a positive charge.
- d. A balanced atom has an equal number of positive and negative charges.
- e. A negatively charged atom has more negative charges than positive.
- f. A positively charged atom has more positive charges than negative.

Objective 2: Describe the behavior of static electricity as observed in nature and every day occurrences.

- a. List several occurrences of static electricity that happen in every day life.
- b. Explain static electricity in terms of electrons moving from a negatively charged area to a positively charged area.
- c. Describe the relationship between static electricity and lightning.
- d. Describe the behavior of objects charged with static electricity in attracting or repelling without touching.
- e. Compare the amount of static charge produced by rubbing various materials together (e.g., rubbing fur on a glass rod produces a greater charge than rubbing the fur with a metal rod, the static charge produced when a balloon is rubbed on hair is greater than when a plastic bag is rubbed on hair).
- f. Investigate how various materials react differently to statically charged objects.

Objective 3: Analyze the behavior of current electricity.

- a. Explain electrical current as the movement of electrons
- b. Draw and label the components of an electrical circuit that includes switches and loads (e.g., light bulb, bell, speaker, motor)
- c. Predict the effect of changing one or more of the components (e.g., battery, load, wires) in an electric circuit
- d. Explain the difference between good conductors and good insulators.
 1. Generalize the properties of material that carry the flow of electricity from information gathered by testing different materials.
 2. Investigate materials that prevent the flow of electricity.
- e. Make a working model of a complete circuit using a power source, switch, bell or light and conductor for a pathway
- f. Explain the difference between parallel and series circuits

Objective 4: Research electricity generation and conservation.

- a. Identify and describe different way electricity is generated
- b. Investigate natural resources used to generate electricity
- c. Distinguish between renewable and nonrenewable methods of electricity generation
- d. Discuss advantages and disadvantages of various methods of generating electricity (pollution issues, political issues, economic issues, environmental issues)
- e. Research and implement new technologies in energy conservation (compact fluorescent light bulbs, low-flow showerheads)
- f. Evaluate USA household electricity with that of stewardship of the planets energy resources

- g. Discuss basic electrical safety practices.

Science language students should use:

Battery, complete circuit, incomplete circuit, current, conductor, insulator, pathway, power source, attract, compass, electromagnetism, magnetic force, magnetic field, natural magnet permanent magnet, properties, repel. Static electricity, temporary magnet, switch, load, parallel circuit, series circuit, electrons, neutrons, protons, positive charge, negative charge.

Science Benchmark

All living things inherit a set of characteristics or traits from their parents. Members of any given species transfer traits from one generation to the next. The passing of traits from parent to offspring is called heredity and causes the offspring to resemble the parent. Some traits differ among members of a population and these variations may help a particular species to survive better in a given environment in getting food, finding shelter, protecting itself, and reproducing. This variation gives the individual a survival advantage over other individuals of the same species.

STANDARD V: Students will understand that traits are passed from the parent organism to their offspring: and that sometimes, the offspring may possess variations of these traits that may help or hinder survival in a given environment.

Objective 1: Using supporting evidence, show that traits are transferred from a parent organism to its offspring.

- a. Make a chart and collect data identifying various traits among a given population (e.g., the hand span of students in the classroom, the color and texture of different apples, the number of petals of a given flower)
- b. Identify similar physical traits of a parent organism and its offspring (e.g., trees and saplings, leopards and cubs, chicken and chicks)
- c. Compare various examples of offspring that do not initially resemble the parent organism but mature to become similar to the parent organism (e.g., mealworms and darkling beetles, tadpoles and frogs, seedlings and vegetables, caterpillar and butterfly)
- d. Contrast traits and behaviors that are not inherited but may be learned or induced by environmental factors (e.g., foxes learning different hunting techniques, trees being bent due to exposure to constant wind, dogs learning to do tricks, children riding bicycles)
- e. Investigate variations and similarities in plants grown from seeds of a parent plant (e.g., how seeds from the same plant species can produce different color flowers or identical flowers. Introduce the concept of self pollination, tomatoes; offspring will be the same identical as the parent plant, and cross pollination, squash; which may produce a similar plant with different fruit)

Objective 2: Explain how some characteristics could give a species a survival advantage in a particular environment.

- a. Identify within a particular species, variations in physical abilities, instinctual behaviors, and specialized structures that have increased the survival of that species within their particular environments (e.g., difference between the feet of

snowshoe hare and cottontail rabbits, differences in leaves of plants growing at different altitudes, differences between the feathers of an owl and a humming bird, differences in behavior among various fish)

- b. Describe how a particular physical attribute may provide an advantage for survival in one environment but not in another (e.g., heavy fur in arctic climates keep animals warm whereas in hot desert climates would cause overheating; flippers on such animals as sea lions and seals provide excellent swimming structures in the water but become clumsy and awkward on land; cactus retain the right amount of water in arid regions but would develop root rot in a more temperate region; and fish gills have the ability to absorb oxygen in water but not on land)
- c. Research a specific plant or animal and report how specific physical attributes provide an advantage for survival in a specific environment

Science language students should use:

inherited, environment, species, offspring, traits, variations, survival, instincts, population, specialized structure, organism, life cycle, parent organism, learned behavior, adaptation