

SCIENCE CONTENT STANDARDS GRADE 5/6 Year B

The hydrologic cycle (water cycle) is the process by which water moves between the land and the oceans. In grade 5 students learn that cooling in the atmosphere returns water vapor to a liquid or solid state as rain, hail, sleet or snow. Students have observed, measured, and predicted weather phenomena and now are presented with factors that control clouds, precipitation, and other weather phenomena. Students learn how the hydrologic cycle influences the distribution of weather related precipitation and, as a consequence, types and rates of erosion. Student knowledge of the solar system includes a descriptive understanding of the relative motions of the planets, and in grade 5/6 students learn about the composition of the Sun and discover that the solar system includes smaller asteroids and comets in addition to the Sun, nine planets, and moons. They learn the relationship between gravity and planetary orbits.

Energy that reaches the Earth's surface comes primarily from the sun. The atmosphere and surface of the Earth are heated unevenly, giving rise to both local and global temperature differences. Furthermore, the amount of heat varies with latitude and this is primarily due to the height of the sun in the sky. The lower the sun in the sky, the less direct its radiation so less radiation falls on each square meter of surface area. Polar regions are cold because the sun is low in the sky and its rays fall at very large angles. Closer to the equator, the sun's rays fall more directly, and it is hot. The effect of this uneven heating is local and global temperature differences, which create convection currents in the oceans and atmosphere.

The solar system includes nine planets in order from the Sun: Mercury, Venus, Earth, Mars, Jupiter, Saturn, Uranus, Neptune, and Pluto. Asteroids and comets are smaller bodies in mostly irregular orbits about the Sun.

All living organisms are part of dynamic systems that continually exchange energy. These systems are regulated by both biotic and abiotic factors. Nutrients needed to sustain life in an ecosystem are cycled and reused, but the energy that flows through the ecosystem is lost as heat and must constantly be renewed. Green plants are the foundation of the energy flow in most ecosystems because they are capable of producing their own food by photosynthesis. Because energy is either used by consumers or depleted in a logical progression, the flow through a food web can be represented as a pyramid with many green plants as a base, mid-level consumers in the middle, and a few top-level predators at the apex. Scavengers and decomposers are the final members of a food pyramid as they clean up the environment and return matter (nutrients) to the Earth. This can also be represented by a food web that shows the various roles played by plants and animals as producers, consumers, and decomposers.

Much of the energy and most of the materials used worldwide depend on "nonrenewable" natural resources such as coal, oil and natural gas, also known as fossil fuels. These are being used at rates far faster than their geologically slow formation rates. Renewable energy resources include solar, wind, hydroelectric and geothermal energy. The primary factors that affect the choices and investments we make in energy resources, including their availability and cost, determine which resources we consider useful. Other, secondary considerations include the ability and cost of storing the energy extracted from a resource, so that it is readily available when we need it. The cost and availability of the technology required to transport and convert energy resources into usable energy forms are additional factors.

Students formulate hypotheses, make predictions, and design simple experiments. Students develop testable questions and plan their own investigations, selecting appropriate tools to make quantitative observations. They use graphs to make inferences based on the data and analyze the data to draw logical conclusions.

Earth Sciences (Oceans & Weather)

- Water on Earth moves between the oceans and land through the processes of evaporation and condensation. As a basis for understanding this concept, students know:
 - most of the Earth's water is present as salt water in the oceans, which cover most of the Earth's surface.
 - many organisms are adapted for life in the ocean.
 - **ocean water moves in many different ways. When liquid water evaporates, it turns into water vapor in the air and can reappear as a liquid when cooled, or as a solid if cooled below the freezing point of water.**
 - Water moves in the air from one place to another in the form of clouds or fog, which are tiny droplets of water or ice, and falls to the Earth as rain, hail, sleet, or snow.
 - the amount of fresh water, located in rivers, lakes, underground sources, and glaciers, is limited, and its availability can be extended through recycling and decreased use.

- Energy from the sun heats Earth unevenly, causing air movements that result in changing weather patterns. As a basis for understanding this concept, students know:
 - **the sun is the major source of energy for phenomena on Earth's surface; it powers winds, ocean currents, and the water cycle.**
 - uneven heating of Earth causes air movements (convection currents).
 - **the influence that the ocean has on weather and the role that the water cycle plays in weather patterns.**
 - the causes and effects of different types of severe weather.
 - **how to use weather maps and data to predict local weather and know that weather forecasts depend on many variables.**
 - that the Earth's atmosphere exerts a pressure that decreases with distance above the Earth's surface and that at any point it exerts this pressure equally in all directions.

- The solar system consists of planets and other bodies that orbit the Sun in predictable paths. As a basis for understanding this concept, students know:
 - the Sun, an average star, is the central and largest body in the solar system and is composed primarily of hydrogen and helium.
 - **the solar system includes the planet Earth, the Moon, the Sun, eight other planets and their satellites, and smaller objects, such as asteroids and comets.**
 - the path of a planet around the Sun is due to gravitational attraction between the Sun and the planet.

- Sources of energy and materials differ in amounts, distribution, usefulness, and the time required for their formation. As a basis for understanding this concept, students know:
 - the utility of energy sources is determined by factors that are involved in converting these sources to useful forms and the consequences of the conversion process.

- ⊖ **different natural energy and material resources, including air, soil, rocks, minerals, petroleum, fresh water, wildlife, and forests, and know how to classify them as renewable or nonrenewable.**
- ⊖ the natural origin of the materials used to make common objects.

Life Science (Oceanic Ecosystems)

- Organisms in ecosystems exchange energy and nutrients among themselves and with the environment. As a basis for understanding this concept, students know:
 - ⊖ energy entering ecosystems as sunlight is transferred by producers into chemical energy through photosynthesis, and then from organism to organism in food webs.
 - ⊖ **over time, matter and energy is transferred from one organism to others in the food web, and between organisms and the physical environment.**
 - ⊖ populations of organisms can be categorized by the functions they serve in an ecosystem.
 - ⊖ different kinds of organisms may play similar ecological roles in similar biomes.
 - ⊖ **the number and types of organisms an ecosystem can support depends on the resources available and abiotic factors, such as quantity of light and water, range of temperatures, and soil composition.**

Science Process Skills (Investigation and Experimentation)

- Scientific progress is made by asking meaningful questions and conducting careful investigations. As a basis for understanding this concept, and to address the content of the other three strands, students should develop their own questions and perform investigations. Students will:
 - ⊖ develop a hypothesis.
 - ⊖ **select and use appropriate tools to perform tests, and to collect and display data.**
 - ⊖ construct appropriate graphs from data and develop qualitative statements about the relationships between variables.
 - ⊖ **communicate the steps and results from an investigation in written reports and verbal presentations.**
 - ⊖ recognize whether evidence is consistent with a proposed explanation.
 - ⊖ interpret events by sequence and time from natural phenomena (e.g., relative ages of rocks and intrusions).
 - ⊖ identify changes in natural phenomena over time without manipulating the phenomena (e.g., a tree limb, a grove of trees, a stream, a hillslope).