

NEW YORK STATE LEARNING STANDARD DOCUMENTS



NEW YORK STATE LEARNING STANDARDS

MATH SCIENCE & TECHNOLOGY

Content Standard



SCIENCE (4) Students will understand and apply scientific concepts, principles, and theories pertaining to the physical setting and living environment and recognize the historical development of ideas in science.

Area of Study: **PHYSICAL SETTING**



LEVEL: **Elementary**

CORE GUIDE INFORMATION

KEY IDEAS

4 1 2 3 4 5

Pre-School Intermediate Students with Severe Disabilities

Elementary Commencement

MAJOR UNDERSTANDINGS

RESOURCES (SKILLS)

GRADE LEVEL **K 1 2 3 4 K-4**

KEY IDEAS PERFORMANCE INDICATORS MAJOR UNDERSTANDINGS

Key Idea 1: The Earth and celestial phenomena can be described by principles of relative motion and perspective.

PI 1.1 Describe patterns of daily, monthly, and seasonal changes in their environment.

MU 1.1a Natural cycles and patterns include:
 • Earth spinning around once every 24 hours (rotation), resulting in day and night
 • Earth moving in a path around the Sun (revolution), resulting in one Earth year
 • the length of daylight and darkness varying with the seasons.
 • weather changing from day to day and through seasons
 • the appearance of Moon changing as it moves in a path around Earth to complete a single cycle

MU 1.1b Humans organize time into units based on natural motions of Earth:
 • second, minute, hour
 • week, month

MU 1.1c The Sun and other stars appear to move in a recognizable pattern both daily and seasonally.

Key Idea 2: Many of the phenomena that we observe on Earth involve interactions among components of air, water, and land.

PI 2.1 Describe the relationship among air, water, and land on Earth.

MU 2.1a Weather is the condition of the outside air at a particular moment.

MU 2.1b Weather can be described and measured by:
 • temperature
 • wind speed and direction
 • form and amount of precipitation
 • general sky conditions (cloudy, sunny, partly cloudy)

MU 2.1c Water is recycled by natural processes on Earth.
 • evaporation: changing of water (liquid) into water vapor (gas)
 • condensation: changing of water vapor (gas) into water (liquid)
 • precipitation: rain, sleet, snow, hail
 • runoff: water flowing on Earth's surface
 • groundwater: water that moves downward into the ground.

MU 2.1d Erosion and deposition result from the interaction among air, water, and land.
 • interaction between air and water breaks down earth materials
 • pieces of earth material may be moved by air, water, wind, and gravity
 • pieces of earth material will settle or deposit on land or in the water in different places
 • soil is composed of broken-down pieces of living and nonliving earth material

MU 2.1e Extreme natural events (floods, fires, earthquakes, volcanic eruptions, hurricanes, tornadoes, and other severe storms) may have positive or negative impacts on living things.

Key Idea 3: Matter is made up of particles whose properties determine the observable characteristics of matter and its reactivity.

PI 3.1 Observe and describe properties of materials, using appropriate tools.

PI 3.2 Describe chemical and physical changes, including changes in states of matter.

MU 3.1a Matter takes up space and has mass. Two objects cannot occupy the same place at the same time.

MU 3.1b Matter has properties (color, hardness, odor, sound, taste, etc.) that can be observed through the senses.

MU 3.1c Objects have properties that can be observed, described, and/or measured: length, width, volume, size, shape, mass or weight, temperature, texture, flexibility, reflectiveness of light.

MU 3.1d Measurements can be made with standard metric units and nonstandard units.
 (Note: Exceptions to the metric system usage are found in meteorology.)

MU 3.1e The material(s) an object is made up of determine some specific properties of the object (sink/float, conductivity, magnetism). Properties can be observed or measured with tools such as hand lenses, metric rulers, thermometers, balances, magnets, circuit testers, and graduated cylinders.

MU 3.1f Objects and/or materials can be sorted or classified according to their properties.

MU 3.1g Some properties of an object are dependent on the conditions of the present surroundings in which the object exists. For example:
 • temperature—hot or cold
 • lighting—shadows, color
 • moisture—wet or dry

MU 3.2a Matter exists in three states: solid, liquid, gas.
 • solids have a definite shape and volume
 • liquids do not have a definite shape, but have a definite volume
 • gases do not hold their shape or volume

MU 3.2b Temperature can affect the state of matter of a substance.

MU 3.2c Changes in the properties or materials of objects can be observed and described.

Key Idea 4: Energy exists in many forms, and when these forms change, energy is conserved.

PI 4.1 Describe a variety of forms of energy (e.g., heat, chemical, light) and the changes that occur in objects when they interact with those forms of energy.

PI 4.2 Observe the way one form of energy can be transferred into another form of energy present in common situations (e.g., mechanical to heat energy, mechanical to electrical energy, chemical to heat energy).

MU 4.1a Energy exists in various forms: heat, electric, sound, chemical, mechanical, light.

MU 4.1b Energy can be transferred from one place to another.

MU 4.1c Some materials transfer energy better than others (heat and electricity).

MU 4.1d Energy and matter interact: water is evaporated by the Sun's heat; a bulb is lit by means of electrical current; a musical instrument is played to produce sound; dark colors may absorb light, light colors may reflect light.

MU 4.1e Electricity travels in a closed circuit.

MU 4.1f Heat can be released in many ways, for example, by burning, rubbing (friction), or combining one substance with another.

MU 4.1g Interactions with forms of energy can be either helpful or harmful.

MU 4.2a Everyday events involve one form of energy being changed to another.
 • animals convert food to heat and motion
 • the Sun's energy warms the air and water

MU 4.2b Humans utilize interactions between matter and energy.
 • chemical to electrical, light, and heat: battery and bulb
 • electrical to sound (e.g., doorbell buzzer)
 • mechanical to sound (e.g., musical instruments, clapping)
 • light to electrical (e.g., solar-powered calculator)

Key Idea 5: Energy and matter interact through forces that result in changes in motion.

PI 5.1 Describe the effects of common forces (pushes and pulls) of objects, such as those caused by gravity, magnetism, and mechanical forces.

PI 5.2 Describe how forces can operate across distances.

MU 5.1a The position of an object can be described by locating it relative to another object or the background (e.g., on top of, next to, over, under, etc.).

MU 5.1b The position or direction of motion of an object can be changed by pushing or pulling.

MU 5.1c The force of gravity pulls objects toward the center of Earth.

MU 5.1d The amount of change in the motion of an object is affected by friction.

MU 5.1e Magnetism is a force that may attract or repel certain materials.

MU 5.1f Mechanical energy may cause change in motion through the application of force and through the use of simple machines such as pulleys, levers, and inclined planes.

MU 5.2a The forces of gravity and magnetism can affect objects through gases, liquids and solids.

MU 5.2b The force of magnetism on objects decreases as distance increases.

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STANDARD 4 SCIENCE - Physical Setting



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MATH SCIENCE & TECHNOLOGY

Content Standard

SCIENCE (4) Students will understand and apply scientific concepts, principles, and theories pertaining to the physical setting and living environment and recognize the historical development of ideas in science.

Area of Study: **LIVING ENVIRONMENT**



LEVEL: ★ **Elementary**

CORE GUIDE INFORMATION

KEY IDEAS

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MAJOR UNDERSTANDINGS

RESOURCES (SKILLS)

GRADE LEVEL **K 1 2 3 4 K-4**

Physical Environment KEY 'OPENINGS'

Physical Environment SAMPLE TASKS



Key Idea 1 The Earth and celestial phenomena can be described by principles of relative motion and perspective.

The universe is made up of many different objects. Students should observe and describe the motions of the Sun, Moon, and stars. The movement of these objects through space can be traced and measured over various time segments. By keeping daily records, students will learn to identify sequences of changes and look for patterns; this skill will be useful throughout their study of the natural world. Younger students should draw what they see. Older students should be encouraged to keep journals and use instruments to measure and record their observations.

they can directly observe should be discussed. Drawing models that show size and position and discussing phenomena based on gravity are too abstract and may lead to misconceptions. Note: the use of e.g. denotes examples which may be used for in-depth study. The terms for example and such as denote material which is testable. Items in parenthesis denote further definition of the word(s) preceding the item and are testable.

Describe patterns of daily, monthly, and seasonal changes in their environment.

Note: Students at this age are concrete thinkers; therefore, only the effects of gravity



Key Idea 2 Many of the phenomena that we observe on Earth involve interactions among components of air, water, and land.

The water cycle, weather, erosion, deposition, and extreme natural events involve interactions among air, water, and land. Students should observe and describe naturally occurring changes in their world involving these phenomena. They can also investigate these phenomena in classroom experiments.

Younger students should be engaged in observation of their immediate surroundings with emphasis on recognizing change around them. As students mature, they can begin to recognize cycles and identify the processes and natural events which are causing the changes they are observing.



Key Idea 3 Matter is made up of particles whose properties determine the observable characteristics of matter and its reactivity.

Students should describe, categorize, compare, and measure observable physical properties of matter and objects. Students' initial efforts in performing these processes may yield simple descriptions and sketches, which may lead to increasingly more detailed drawings and richer verbal descriptions. Things can be done to

materials to change their properties, but not all materials respond in the same way to what is done to them. Younger students emphasize physical properties while older students will recognize chemical changes. Appropriate tools can aid students in their efforts.



Key Idea 4 Energy exists in many forms, and when these forms change energy is conserved.

Students should understand that energy exists in a variety of forms. Students should observe the results of simple energy transformations from one form to another in their physical environment. The safe use and respect of various energy forms should be stressed in the classroom.

Note: Attempting to understand heat and its difference from temperature is too abstract a concept for elementary students. Energy is a subject that is difficult for students to understand. Students cannot hold it in their hands and, with the exception of light, they cannot see it.



Key Idea 5 Energy and matter interact through forces that result in changes in motion.

Students should be able to observe and describe relative positions between objects in their world. Exploring the observable effects of gravity and magnetism may help students develop an understanding of the reason for the

direction of an object's motion. Manipulation and application of simple tools and machines may help students learn about the relationships between forces and motion.

1

- conduct a long-term weather investigation, such as running a weather station or collecting weather data.
- keep a journal of the phases of the moon over a one-month period. This information is collected for several different one-month periods and compared.

2

- observe a puddle of water outdoors after a rainstorm. On a return visit after the puddle has disappeared, students describe where the water came from and possible locations for it now.
- assemble rock and mineral collections based on characteristics such as erosional features or crystal size features.

3

- compare the appearance of materials when seen with and without the aid of a magnifying glass.
- investigate simple physical and chemical reactions and the chemistry of household products, e.g. freezing, melting and evaporating; a comparison of new and rusty nails; the role of baking soda in cooking.

4

- investigate the interactions of liquids and powders that result in chemical reaction (e.g., vinegar and baking soda) compared to interactions that do not (e.g., water and sugar).
- in order to demonstrate the transformation of chemical to electrical energy, construct electrical cells from objects, such as lemons or potatoes, using pennies and aluminum foil inserted in slits at each end of fruits or vegetables; the penny and aluminum are attached by wires to a millimeter. Students can compare the success of a variety of these electrical cells.

5

- investigate simple machines and use them to perform tasks.

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