
Grades 3–4 Science Stems and Expectations

Earth and Space Science

ESS1 - The Earth and Earth materials, as we know them today, have developed over long periods of time, through constant change processes.

1. ATMOSPHERE, CLIMATE, & WEATHER

- 1) Recognize and describe how water exists in the air in different forms and changes from one form to another through various processes, such as freezing, condensation, precipitation and evaporation.
- 2) Explain that air surrounds us, takes up space, and moves with the wind.

3) *Based on data collected from daily weather observations, describe weather changes or weather patterns.*

4) *Explain how the use of scientific tools helps to extend senses and gather data about weather. (i.e., weather/wind vane: direction; wind sock: wind intensity; anemometer: speed; thermometer: temperature; meter sticks/rulers: snow depth; rain gauges: rain amount in inches).*

2. COMPOSITION & FEATURES OF EARTH MATERIALS

- 1) Describe Earth materials as rocks, soils, water in its liquid state, and the gases found in the atmosphere;
- 2) Describe rock as being composed of different combinations of minerals;

3) *Given information about Earth materials, explain how their characteristics lend themselves to specific uses.*

4) *Given certain Earth materials (soils, rocks, or minerals) use physical properties to sort, classify, and/or describe them.*

3. FOSSILS

- 1) Recognize and explain that fossils provide evidence about plants and animals that lived long ago, and about the nature of the environment at that time.

4. OBSERVATION OF EARTH FROM SPACE

- 1) Recognize features of the Earth as viewed by astronauts in orbit and as transmitted by scientific instruments on satellites and spacecraft.

5. PROCESSES AND RATES OF CHANGE OF THE EARTH'S SURFACE

- 1) Describe how features on the Earth's surface are constantly changed by a combination of slow and rapid processes, which include weathering, erosion, deposition of sediment, drought, landslides, volcanic eruptions and earthquakes;

2) *Explain how wind, water, or ice shape and reshape the Earth's surface.*

6. ROCK CYCLE

- 1) Explain that smaller rocks come from the breakage and weathering of larger rocks and bedrock;
- 2) Distinguish between the three categories of rocks, metamorphic, igneous and sedimentary, and describe the processes that create them;
- 3) Identify minerals by their physical properties and explain how minerals can be tested for them;

4) *Use results from an experiment to draw conclusions about how water interacts with earth materials (e.g., percolation, erosion, frost heaves).*

7. WATER AND THE EARTH'S SURFACE

- 1) Recognize and describe the Earth's surface as being mostly covered by water;
- 2) Explain that most of Earth's water is salt water, which is found in the oceans, and that fresh water is found in rivers, lakes, underground sources, and glaciers.

ESS2 - The Earth is part of a solar system, made up of distinct parts, which have temporal and spatial interrelationships.

1. THE EARTH, SUN AND MOON

- 1) Explain that night and day are caused by the Earth's rotation on its axis and that the Earth rotates approximately once, every 24 hours;
- 2) Describe the Sun as a star.

2. ENERGY

- 1) Recognize that the Sun provides the light and heat necessary to maintain the temperature of the Earth.

3. SOLAR SYSTEM

- 1) Recognize that the Moon orbits the Earth;
- 2) Recognize that the Earth is one of a number of planets that orbit the Sun.

4. VIEW FROM EARTH

- 1) Recognize the patterns of stars in the sky remain the same, although they appear to move slowly each night from east to west, and that different stars can be seen during different seasons;
 - 2) Recognize that planets look like stars, but observe over time that they appear to wander among the constellations.
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ESS3 - The origin and evolution of galaxies and the universe demonstrate fundamental principles of physical science across vast distances and time.

1. SIZE AND SCALE

- 1) Recognize that astronomical objects in space are massive in size and are separated from one another by vast distances.
- 2) Explain that telescopes magnify the size of distant objects and significantly increase the number of these objects that can be viewed from Earth.

2. STARS AND GALAXIES

- 1) Recognize and describe that stars, like our sun, as spherical in nature;
- 2) Recognize that stars come in different colors, and that the Earth's sun is a yellow star.

3. UNIVERSE

None at this grade span.

ESS4 – The growth of scientific knowledge in Earth Space Science has been advanced through the development of technology and is used (alone or in combination with other sciences) to identify, understand, and solve local and global issues.

1. DESIGN TECHNOLOGY

- 1) Recognize that man uses various mechanical devices to record changes in the weather and the Earth.

2. TOOLS

- 1) Demonstrate the use of simple instruments including, thermometers, wind socks, meter sticks, rain gauges to collect weather data.

3. SOCIAL ISSUES (LOCAL AND GLOBAL)
USES OF EARTH MATERIALS

- 1) Distinguish between and provide examples of materials that can be recycled/reused and those that cannot.
- 2) Provide examples of technology that have changed the environment and explain whether the effect had a positive or negative impact.
- 3) Explain how to dispose of waste so that it does not harm the environment.

ENVIRONMENTAL CHANGE

- 4) Recognize there are pros and cons to using different types of energy, such as solar energy and fossil fuels, and compare the differences.

CAREER TECHNICAL EDUCATION CONNECTIONS

- 1) Identify some jobs/careers that require knowledge and use of Earth science content and/or skills.

Life Science

LS 1 – All living organisms have identifiable structures and characteristics that allow for survival (organisms, populations, & species).

1. CLASSIFICATION

- 1) Recognize and identify the various ways in which living things can be grouped.

2) *Sort/classify different living things using similar and different characteristics. Describe why organisms belong to each group or cite evidence about how they are alike or not alike. [LS1 (K-4) INQ+POC –1]*

2. LIVING THINGS AND ORGANIZATION

- 1) Recognize that living organisms have certain structures and systems that perform specific functions, facilitating survival, growth and reproduction.
- 2) Identify and describe the function of the plant structures responsible for food production, water transport, support, reproduction, growth and protection.

3) *Identify and explain how the physical structures of an organism (plants or animals) allow it to survive in its habitat/environment (e.g., roots for water; nose to smell fire). [LS1 (K-4) FAF –4]*

4) *Identify the basic needs of plants and animals in order to stay alive (i.e., water, air, food, space). [LS1 (K-4) SAE -2]*

3. REPRODUCTION

- 1) Distinguish between plant and animal characteristics that are inherited, such as eye color in humans and the shape of leaves in plants, and those that are affected by their environment, such as grass turning brown due to lack of water.
- 2) Recognize that living organisms have life cycles, which include birth, growth and development, reproduction, and death; and explain how these life cycles vary for different organisms.
- 3) Describe the reproductive process of plants, explaining some plants grow from seed, while others grow from the parts of other plants.

4) *Predict, sequence, or compare the life stages of organisms – plants and animals (e.g., put images of life stages of an organism in order, predict the next stage in sequence, and compare two organisms). [LS1 (K-4) POC –3]*

LS 2 – Energy flows and matter recycles through an ecosystem.

1. ENVIRONMENT

- 1) Describe how the nature of an organism’s environment, such as the availability of a food source, the quantity and variety of other species present, and the physical characteristics of the environment, affect the organism’s patterns of behavior.
- 2) Describe the interaction of living organisms with nonliving things.

2. FLOW OF ENERGY AND RECYCLING OF MATERIALS

- 1) Recognize that the transfer of energy through food is necessary for all living organisms and describe the organization of food webs.

2) *Recognize that energy is needed for all organisms to stay alive and grow or identify where a plant or animal gets its energy. [LS2 (K-4) SAE –5]*

3. RECYCLING OF MATERIALS

- 1) Recognize that plants and animals interact with one another in various ways besides providing food, such as seed dispersal or pollination.

2) *Describe ways plants and animals depend on each other (e.g., shelter, nesting, food). [LS2 (K-4) SAE –6]*

LS 3 – Groups of organisms show evidence of change over time (e.g. evolution, natural selection, structures, behaviors, and biochemistry).

1. CHANGE

- 1) Provide examples of how environmental changes can cause different effects on different organisms
- 2) Provide examples of how an organism’s inherited characteristics can adapt and change over time in response to changes in the environment.

3) *Using information (data or scenario), explain how changes in the environment can cause organisms to respond (e.g., survive there and reproduce, move away, die). [LS3 (K-4) SAE –7]*

2. EVIDENCE OF EVOLUTION

- 1) Compare information about fossils to living organisms and other fossils to determine any similarities and differences.

3. NATURAL SELECTION

- 1) Recognize that individuals of the same species differ in their characteristics, and explain that sometimes these differences give individuals an advantage in survival and reproduction.
 - 2) Recognize that for any particular environment, some kinds of animals and plants survive well, some less well, and some cannot survive at all.
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LS4 – Humans are similar to other species in many ways, and yet are unique among Earth’s life forms.

1. BEHAVIOR

- 1) Recognize that an individual organism’s behavior is affected by internal cues, such as hunger and thirst; and describe how an organism uses its senses to understand and respond to these cues.
- 2) Recognize that an individual organism’s behavior is influenced by external cues, such as seasonal change, and describe how an organism might react, such as migrating or hibernating.

3) Recognize behaviors that may be unsafe or unhealthy for themselves and others.

2. DISEASE

- 1) Explain how the amount of rest and the types of food, exercise and recreation humans choose can influence and affect their well-being.
- 2) Recognize that vitamins and minerals are needed in small amounts and are essential to maintain proper health.
- 3) Explain how proper food preparation and appropriate food handling practices can maintain the safety and quality of food.

3. HUMAN IDENTITY

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| 1) <i>Identify what the physical structures of humans do (e.g., sense organs – eyes, ears, skin, etc.) or compare physical structures of humans to similar structures of animals. [LS4 (K-4) FAF -8]</i> |
| 2) <i>Distinguish between characteristics of humans that are inherited from parents (i.e., hair color, height, skin color, eye color) and others that are learned (e.g., riding a bike, singing a song, playing a game, reading). [LS4 (K-4) POC -9]</i> |
- 3) Recognize the nutritional value of different foods and distinguish between healthy and unhealthy food choices using data gathered from food labels and dietary guidelines, such as the food pyramid.
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LS5 – The growth of scientific knowledge in Life Science has been advanced through the development of technology and is used (alone or in combination with other sciences) to identify, understand and solve local and global issues.

1. DESIGN TECHNOLOGY

- 1) Recognize that man uses various mechanical devices to record and describe living organisms

2. TOOLS

- 1) Demonstrate the use of appropriate tools and simple equipment, such as thermometers, magnifiers and microscopes to gather data and extend the senses.
- 2) Identify and describe the purpose of tools used by health care professionals, such as X-rays and stethoscopes.

3. SOCIAL ISSUES (LOCAL AND GLOBAL)

MEDICAL TECHNOLOGIES

- 1) Recognize that medical technology provides information about a body's condition, such as determining blood pressure, and recognizing the need to repair, replace and support the affected body parts.

BIOTECHNOLOGIES

- 2) Recognize that biotechnology refers to the different ways humans modify the living environment to meet their needs, including growing food, genetic engineering and using living organisms such as yeast to prepare foods.

4. CAREER AND TECHNICAL EDUCATION CONNECTIONS

- 1) Identify some jobs/careers that require knowledge and use of life science content and/or skills.
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Physical Science

PS1 – All living and nonliving things are composed of matter having characteristic properties that distinguish one substance from another (independent of size/amount of substance).

1. COMPOSITION

1) Explain that materials may be composed of parts that are too small to be seen without magnification.

2) *Use measures of weight (data) to demonstrate that the whole equals the sum of its parts. [PS1 (K-4) SAE –3]*

3) *Collect and organize data about physical properties in order to classify objects or draw conclusions about objects and their characteristic properties (eg., temperature, color, size, shape, weight, texture, flexibility). [PS1 (K-4) INQ –1]*

2. PROPERTIES

1) Recognize that substances can be classified by observable properties.

2) Explain that some materials can exist in different states, and describes the distinct physical properties of each state of matter.

3) Explain how some materials, such as water, can change from one state to another by heating or cooling.

4) *Make a prediction about what might happen to the state of common materials when heated or cooled or categorize materials as solid, liquid, or gas. [PS1 (K-4) POC –2]*

5) *Make a prediction about what might happen to the state of common materials when heated or cooled or categorize materials as solid, liquid, or gas. [PS1 (K-4) POC –2]*

PS2 – Energy is necessary for change to occur in matter. Energy can be stored, transferred and transformed, but cannot be destroyed.

1. CHANGE

1) Recognize that energy has the ability to create change.

2. CONSERVATION

None at this grade span.

3. ENERGY

1) Identify the various forms of energy, such as electrical, light, heat, sound.

2) Recognize that electricity in circuits can produce light, heat, sound, and magnetic effects.

3) Identify and describe the organization of a simple circuit.

4) Differentiate between objects and materials that conduct electricity and those that are insulators of electricity.

5) Explain that light travels in a straight line until it strikes an object, and describe how it can be reflected by a mirror, bent by a lens, or absorbed by the object.

6) *Given a specific example or illustration (e.g., simple closed circuit, rubbing hands together, predict the observable effects of energy (i.e., light bulb lights, a bell rings, hands warm up) (E.g., a test item might ask, “what will happen when...?”) [PS2 (K-4) SAE -4]*

7) *Use observations of light in relation to other objects/substances to describe the properties of light (can be reflected, refracted, or absorbed) [PS2 (K-4) SAE – 5]*

8) *Experiment, observe, or predict how heat might move from one object to another. [PS2 (K-4) INQ+SAE – 6]*

PS3 – The motion of an object is affected by force.

1. FORCES

- 1) Recognize that magnets attract certain kinds of other materials and classify objects by those magnets will attract and those they will not.
- 2) Recognize that magnets attract and repel each other.
- 3) Explain that electrically charged material pulls on all other materials and can attract or repel other charged materials.
- 4) Recognize that the Earth's gravitational force pulls any object toward it.
- 5) *Use observations of magnets in relation to other objects to describe the properties of magnetism (i.e., attract or repel certain objects or has no effect) [PS3 (K-4) INQ+ SAE –8]*

2. MOTION

- 1) *Use data to predict how a change in force (greater/less) might affect the position, direction of motion, or speed of an object (e.g., ramps and balls) [PS3 (K-4)-INQ+SAE –7]*

PS4 – The growth of scientific knowledge in Physical Science has been advanced through the development of technology and is used (alone or in combination with other sciences) to identify, understand and solve local and global issues.

1. DESIGN TECHNOLOGY

- 1) Understand that materials are used in certain products based on their properties, such as strength and flexibility.
- 2) Recognize that products are made using a combination of technologies, such as how an escalator uses both a pulley system and an electrical motor.

2. TOOLS

- 1) Demonstrate how to use tools, such as magnifiers, scales, balances, rulers, and thermometers to gather data and extend the senses.
- 2) Describe how some tools can be used to modify natural materials by processes such as separating, shaping, and joining, to produce new materials.

3. SOCIAL ISSUES (LOCAL & GLOBAL)
ENERGY, POWER AND TRANSPORTATION

- 1) Give examples of transportation systems used in New Hampshire, such as buses, trains, cars, and bicycles and describe the sources of energy they use.

MANUFACTURING

- 1) Explain that manufactured products are designed to solve a problem or meet a need.
- 2) Provide an example to illustrate that manufacturing involves changing natural materials into finished products, and explain that this results in the production of a large number of objects that look almost identical.

4. CAREER TECHNICAL EDUCATION CONNECTIONS

- 1) Identify some jobs/careers that require knowledge and use of physical science content and/or skills.
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