COLORADO
Department of Education

Prepared Graduates:

4. Students can use the full range of science and engineering practices to make sense of natural phenomena and solve problems that require understanding how waves are used to transfer energy and information.

Grade Level Expectation:

1. Sound can make matter vibrate and vibrating matter can make sound.

Evidence Outcomes

Students Can:

a. Plan and conduct investigations to provide evidence that vibrating materials can make a sound and that sound can make materials vibrate. (1-PS4-1) *(Clarification Statement: Examples of vibrating materials that make sound could include tuning forks and plucking a stretched string. Examples of how sound can make matter vibrate could include holding a piece of paper near a speaker making sound and holding an object near a vibrating tuning fork.)*

b. Make observations to construct an evidence-based account that objects can be seen only when illuminated. (1-PS4-2) *(Clarification Statement: Examples of observations could include those made in a completely dark room, a pinhole box, and a video of a cave explorer with a flashlight. Illumination could be from an external light source or by an object giving off its own light.)*

c. Plan and conduct an investigation to determine the effect of placing objects made with different materials in the path of a beam of light. (1-PS4-3) *(Clarification Statement: Examples of materials could include those that are transparent [such as clear plastic], translucent [such as wax paper], opaque [such as cardboard] and reflective [such as a mirror].)*

d. Use tools and materials to design and build a device that used light or sound to solve the problem of communicating over a distance. (1-PS4-4) *(Clarification Statement: This performance expectation integrates transitional science content with engineering through a practice or disciplinary core idea.)*

Academic Context and Connections

Colorado Essential Skills and Science and Engineering Practices:

1. Plan and conduct investigations collaboratively to produce evidence to answer a question. (Planning and Carrying Out Investigations) (Personal: Initiative/Self-direction)
2. Make observations (firsthand or from media) to construct an evidence-based conclusion and use tools and materials provided to design and build devices. (Constructing Explanations and Designing Solutions) (Entrepreneurial: Critical thinking/Problem solving)
3. Scientific Investigations Use a Variety of Methods: Scientists use different ways to study the world. Science investigations begin with a question.

Elaboration on the GLE:

1. Students can answer the question: What are the characteristic properties and behaviors of waves?
2. PS4:A Wave Properties: Waves, which are regular patterns of motion, can be made in water by disturbing the surface. When waves move across the surface of deep water, the water goes up and down in place; it does not move in the direction of the wave - observe, for example, a bobbing cork or seabird - except when the water meets the beach. Sound can make matter vibrate and vibrating matter can make sound.
3. PS4:B Electromagnetic Radiation: Objects can be seen only when light is available to illuminate them. Very hot objects give off light (e.g., a fire, the sun).
4. PS4:C Information Technologies and Instrumentation: People use their senses to learn about the world around them. Their eyes detect light, their ears detect sound, and they can feel vibrations by touch.

Cross Cutting Concepts:

1. Cause and Effect: Simple tests can be designed to gather evidence to support or refute student ideas about causes.

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Prepared Graduates:

5. Students can use the full range of science and engineering practices to make sense of natural phenomena and solve problems that require understanding how individual organisms are configured and how these structures function to support life, growth, behavior and reproduction.

Grade Level Expectation:

1. All organisms have external parts that they use to perform daily functions.

Evidence Outcomes

Students Can:

a. Use materials to design a solution to a human problem by mimicking how plants and/or animals use their external parts to help them survive, grow and meet their needs. (1-LS1-1) *(Clarification Statement: Examples of human problems that can be solved could include designing clothing or equipment to protect bicyclists by mimicking turtle shells, acorn shells and animal scales; stabilizing structures by mimicking animal tails and roots on plants; keeping out intruders by mimicking thorns on branches and animal quills; and detecting intruders by mimicking eyes and ears.)*

b. Read texts and use media to determine patterns in behavior of parents and offspring that help offspring survive. (1-LS1-2) *(Clarification Statement: Examples of patterns of behaviors could include the signals that offspring make [such as crying, cheeping and other vocalizations] and the responses of the parents [such as feeding, comforting and protecting the offspring].)*

Academic Context and Connections

Colorado Essential Skills and Science and Engineering Practices:

1. Use materials to design a device that solves a specific problem or a solution to a specific problem. (Constructing Explanations and Designing Solutions) (Entrepreneurial: Creativity/Innovation)
2. Read grade-appropriate texts and use media to obtain scientific information to determine patterns in the natural world. (Obtaining, Evaluating, and Communicating Information) (Civic/Interpersonal: Communication)
3. Connections to Nature of Science: Science Knowledge is Based on Empirical Evidence. Scientists look for patterns and order when making observations about the world.

Elaboration on the GLE:

1. Students can answer the question: How do the structures of organisms enable life's functions?
2. LS1:A Structure and Function: All organisms have external parts. Different animals use their body parts in different ways to see, hear, grasp objects, protect themselves, move from place to place and seek, find and take in food, water and air. Plants also have different parts (roots, stems, leaves, flowers, fruits) that help them survive, grow and produce more plants.
3. LS1:B Growth and Development of Organisms: Plants and animals have predictable characteristics at different stages of development. Plants and animals grow and change. Adult plants and animals can have young. In many kinds of animals, parents and the offspring themselves engage in behaviors that help the offspring to survive.
4. LS1:D Information Processing: Animals have body parts that capture and convey different kinds of information needed for growth and survival - for example, eyes for light, ears for sounds, and skin for temperature or touch. Animals respond to these inputs with behaviors that help them survive (e.g., find food, run from a predator). Plants also respond to some external inputs (e.g., turn leaves toward the sun).

Cross Cutting Concepts:

1. Structure and Function: The shape and stability of structures of natural and designed objects are related to their function(s).
2. Patterns: Patterns in the natural world can be observed, used to describe phenomena and used as evidence.

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Prepared Graduates:

7. Students can use the full range of science and engineering practices to make sense of natural phenomena and solve problems that require understanding how genetic and environmental factors influence variation of organisms across generations.

Grade Level Expectation:

2. Young organisms are very much, but not exactly, like their parents, and also resemble other organisms of the same kind.

Evidence Outcomes

Students Can:

a. Make observations to construct an evidence-based account that young plants and animals are like, but not exactly like, their parents. (1-LS3-1) *(Clarification Statement: Examples of patterns could include features that plants or animals share. Examples of observations could include leaves from the same kind of plant that are the same shape but can differ in size; and, a particular breed of dog looks like its parents but is not exactly the same. This performance expectation integrates traditional science content with engineering through a practice or disciplinary core idea.)*

Academic Context and Connections

Colorado Essential Skills and Science and Engineering Practices:

1. Make observations (firsthand or from media) to construct an evidence-based account for natural phenomena. (Constructing Explanations and Designing Solutions) (Civic/Interpersonal: Communications).

Elaboration on the GLE:

1. Students can answer the questions: How are the characteristics of one generation related to the previous generation? Why do individuals of the same species vary in how they look, function, and behave?
2. LS3:A Inheritance of Traits: Young animals are very much, but not exactly, like their parents. Plants also are very much, but not exactly, like their parents.
3. LS3:B Variation of Traits: Individuals of the same kind of plant or animal are recognizable as similar but can also vary in many ways.

Cross Cutting Concepts:

1. Patterns: Patterns in the natural and human designed world can be observed, used to describe phenomena and used as evidence.

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Prepared Graduates:

9. Students can use the full range of science and engineering practices to make sense of natural phenomena and solve problems that require understanding the universe and Earth's place in it.

Grade Level Expectation:

1. Patterns of movement of the sun, moon and stars as seen from Earth can be observed, described and predicted.

Evidence Outcomes

Students Can:

a. Use observations of the sun, moon, and stars to describe patterns that can be predicted. (1-ESS1-1) *(Clarification Statement: Examples of patterns could include that the sun and moon appear to rise in one part of the sky, move across the sky and set; and stars other than our sun are visible at night but not during the day.)*
b. Make observations at different times of year to relate the amount of daylight to the time of year. (1-ESS1-2) *(Clarification Statement: Emphasis is on relative comparisons of the amount of daylight in the winter to the amount in the spring or fall.) (Boundary Statement: Limited to relative amounts of daylight, not quantifying the hours or time of daylight.)*

Academic Context and Connections

Colorado Essential Skills and Science and Engineering Practices:

1. Plan and conduct investigations collaboratively to produce evidence to answer a question. (Planning and Carrying out Investigations) (Personal: Personal responsibility).
2. Use observations (firsthand or from media) to describe patterns in the natural world in order to answer scientific questions. (Analyzing and Interpreting Data) (Entrepreneurial: Creativity/Innovation).

Elaboration on the GLE:

1. Students can answer the questions: What is the universe, and what goes on in stars? (ES1.A) What are the predictable patterns caused by Earth's movement in the solar system? (ES1.B)
2. ESS1:A The Universe and its Stars: Patterns of the motion of the sun, moon and stars in the sky can be observed, described and predicted. At night one can see the light coming from many stars with the naked eye, but telescopes make it possible to see many more and to observe them and the moon and planets in greater detail.
3. ESS1:B Earth and the Solar System: Seasonal patterns of sunrise and sunset can be observed, described and predicted.

Cross Cutting Concepts:

1. Patterns: Patterns in the natural world can be observed, used to describe phenomena and used as evidence.
2. Scientific Knowledge Assumes an Order and Consistency in Natural Systems: Science assumes natural events happen today as they happened in the past.