

Standard 4—Science

Elementary

Physical Setting

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

Students:

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

This is evident, for example, when students:

- ▲ 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. Many of the phenomena that we observe on Earth involve interactions among components of air, water, and land.

Students:

- describe the relationships among air, water, and land on Earth.

This is evident, for example, when students:

- ▲ 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. Matter is made up of particles whose properties determine the observable characteristics of matter and its reactivity.

Students:

- observe and describe properties of materials using appropriate tools.
- describe chemical and physical changes, including changes in states of matter.

This is evident, for example, when students:

- ▲ 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. Energy exists in many forms, and when these forms change energy is conserved.

Students:

- 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.
- observe the way one form of energy can be transformed into another form of energy present in common situations (e.g., mechanical to heat energy, mechanical to electrical energy, chemical to heat energy).

This is evident, for example, when students:

- ▲ investigate the interactions of liquids and powders that result in chemical reactions (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 milliammeter. Students can compare the success of a variety of these electrical cells.

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

Students:

- describe the effects of common forces (pushes and pulls) on objects, such as those caused by gravity, magnetism, and mechanical forces.
- describe how forces can operate across distances.

This is evident, for example, when students:

- ▲ investigate simple machines and use them to perform tasks.

Key ideas are identified by numbers (1).
Performance indicators are identified by bullets (•).
Sample tasks are identified by triangles (▲).

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.

The Living Environment

1. Living things are both similar to and different from each other and nonliving things.

Students:

- describe the characteristics of and variations between living and nonliving things.
- describe the life processes common to all living things.

This is evident, for example, when students:

- ▲ grow a plant or observe a pet, investigating what it requires to stay alive, including evaluating the relative importance and necessity of each item.
- ▲ investigate differences in personal body characteristics, such as temperature, pulse, heart rate, blood pressure, and reaction time.

2. Organisms inherit genetic information in a variety of ways that result in continuity of structure and function between parents and offspring.

Students:

- recognize that traits of living things are both inherited and acquired or learned.
- recognize that for humans and other living things there is genetic continuity between generations.

This is evident, for example, when students:

- ▲ interact with a classroom pet, observe its behaviors, and record what they are able to teach the animal, such as navigation of a maze or performance of tricks, compared to that which remains constant, such as eye color, or number of digits on an appendage.
- ▲ use breeding records and photographs of racing horses or pedigreed animals to recognize that variations exist from generation to generation but “like begets like.”

3. Individual organisms and species change over time.

Students:

- describe how the structures of plants and animals complement the environment of the plant or animal.
- observe that differences within a species may give individuals an advantage in surviving and reproducing.

This is evident, for example, when students:

- ▲ relate physical characteristics of organisms to habitat characteristics (e.g., long hair and fur color change for mammals living in cold climates).
- ▲ visit a farm or a zoo and make a written or pictorial comparison of members of a litter and identify characteristics that may provide an advantage.

4. The continuity of life is sustained through reproduction and development.

Students:

- describe the major stages in the life cycles of selected plants and animals.
- describe evidence of growth, repair, and maintenance, such as nails, hair, and bone, and the healing of cuts and bruises.

This is evident, for example, when students:

- ▲ grow bean plants or butterflies; record and describe stages of development.

5. Organisms maintain a dynamic equilibrium that sustains life.

Students:

- describe basic life functions of common living specimens (guppy, mealworm, gerbil).
- describe some survival behaviors of common living specimens.
- describe the factors that help promote good health and growth in humans.

This is evident, for example, when students:

- ▲ observe a single organism over a period of weeks and describe such life functions as moving, eating, resting, and eliminating.
- ▲ observe and demonstrate reflexes such as pupil dilation and contraction and relate such reflexes to improved survival.
- ▲ analyze the extent to which diet and exercise habits meet cardiovascular, energy, and nutrient requirements.

6. Plants and animals depend on each other and their physical environment.

Students:

- describe how plants and animals, including humans, depend upon each other and the nonliving environment.
- describe the relationship of the sun as an energy source for living and nonliving cycles.

This is evident, for example, when students:

- ▲ investigate how humans depend on their environment (neighborhood), by observing, recording, and discussing the interactions that occur in carrying out their everyday lives.
- ▲ observe the effects of sunlight on growth for a garden vegetable.

7. Human decisions and activities have had a profound impact on the physical and living environment.

Students:

- identify ways in which humans have changed their environment and the effects of those changes.

This is evident, for example, when students:

- ▲ give examples of how inventions and innovations have changed the environment; describe benefits and burdens of those changes.