

# Grade Four

The fourth-grade standards stress the importance of using information, analyzing data, and validating experimental results. Defining variables in experimentation is emphasized, and making simple predictions from picture, bar, and basic line graphs is underscored. Questioning and hypothesizing become more detailed at this level. Students are introduced to basic principles of electricity and to the concept of motion. Relationships are investigated in the interactions among the Earth, moon, and sun and among plants and animals and their environments. In examining weather phenomena and conditions, students identify various factors, make predictions based on data, and evaluate the results. The importance of natural resources in Virginia is emphasized.

## Scientific Investigation, Reasoning, and Logic

- 4.1 The student will plan and conduct investigations in which
- distinctions are made among observations, conclusions, inferences, and predictions;
  - hypotheses are formulated based on cause-and-effect relationships;
  - variables that must be held constant in an experimental situation are defined;
  - appropriate instruments are selected to measure linear distance, volume, mass, and temperature;
  - appropriate metric measures are used to collect, record, and report data;
  - data are displayed using bar and basic line graphs;
  - numerical data that are contradictory or unusual in experimental results are recognized; and
  - predictions are made based on data from picture graphs, bar graphs, and basic line graphs.

## Force, Motion, and Energy

- 4.2 The student will investigate and understand characteristics and interaction of moving objects. Key concepts include
- motion is described by an object's direction and speed;
  - forces cause changes in motion;
  - friction is a force that opposes motion; and
  - moving objects have kinetic energy.
- 4.3 The student will investigate and understand the characteristics of electricity. Key concepts include
- conductors and insulators;
  - basic circuits (open/closed, parallel/series);
  - static electricity;
  - the ability of electrical energy to be transformed into heat, light, and mechanical energy;
  - simple electromagnets and magnetism; and
  - historical contributions in understanding electricity.

## **Life Processes**

- 4.4 The student will investigate and understand basic plant anatomy and life processes. Key concepts include
- a) the structures of typical plants (leaves, stems, roots, and flowers);
  - b) processes and structures involved with reproduction (pollination, stamen, pistil, sepal, embryo, spore, and seed);
  - c) photosynthesis (sunlight, chlorophyll, water, carbon dioxide, oxygen, and sugar); and
  - d) dormancy.

## **Living Systems**

- 4.5 The student will investigate and understand how plants and animals in an ecosystem interact with one another and the nonliving environment. Key concepts include
- a) behavioral and structural adaptations;
  - b) organization of communities;
  - c) flow of energy through food webs;
  - d) habitats and niches;
  - e) life cycles; and
  - f) influence of human activity on ecosystems.

## **Interrelationships in Earth/Space Systems**

- 4.6 The student will investigate and understand how weather conditions and phenomena occur and can be predicted. Key concepts include
- a) weather measurements and meteorological tools (air pressure – barometer, wind speed – anemometer, rainfall – rain gauge, and temperature – thermometer); and
  - b) weather phenomena (fronts, clouds, and storms).

## **Earth Patterns, Cycles, and Change**

- 4.7 The student will investigate and understand the relationships among the Earth, moon, and sun. Key concepts include
- a) the motions of the Earth, moon, and sun (revolution and rotation);
  - b) the causes for the Earth's seasons and phases of the moon;
  - c) the relative size, position, age, and makeup of the Earth, moon, and sun; and
  - d) historical contributions in understanding the Earth-moon-sun system.

## **Resources**

- 4.8 The student will investigate and understand important Virginia natural resources. Key concepts include
- a) watershed and water resources;
  - b) animals and plants;
  - c) minerals, rocks, ores, and energy sources; and
  - d) forests, soil, and land.